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73®

Amateur Radio's Technical Journal

A Wayne Green Publication

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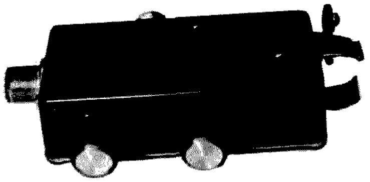
R-X Noise Bridge



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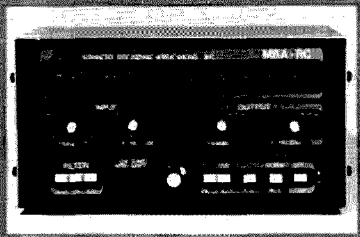

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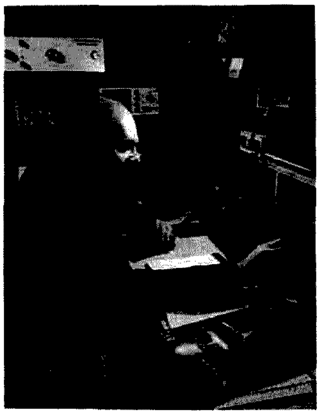
W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



IT'S SNOW FUN

Are you going to be wasting your time the second week of January chasing some fool DXpedition around twenty meters or are you going to be out with a bunch of us on the slopes of Aspen, HTing it and having a ball? That's the low season in Aspen, so the prices are still a bargain. . . and it's right after the Winter Consumer Electronics Show in Las Vegas, if you're in the electronics industry.

During the day, Chuck Martin WA1KPS (Tufts Electronics) will be leading the kamikaze group down the expert slopes, while I'll be struggling to keep up with the geriatric crowd and their walkers on the gentler slopes. It is a lot of fun to ski with fellow hams. . . keeping in touch with HTs. And it's even more fun to get together for dinner at some of the famous Aspen restaurants and talk over the ham industry, DXing, and so on.

If you can get away January 8-12, we'll be skiing out of The Limelight Hotel (again), so don't miss the Eighth Ham Industry Winter Symposium. . . obviously an historic event. We're expecting ham manufacturers there as well as dealers, so there should be some brisk discussions on discounts, service support, needed new products, technical advances, and so on.

THE VIEW FROM OVERSEAS

With such a heavy percentage of our DX contacts going not much further than an exchange of names, locations, and, possibly, in some rare cases, a recitation of the equipment being used, not only are we failing most of the time to live up to one of the fundamental rationales for amateur radio—the development of international friendship—but also we are wasting an impressive technology. When is the last time you got on the air and had a half-hour contact with someone in a relatively rare DX country?

Rather than lecture you and try to make you feel guilty for maintaining the most eternal tradition of amateur radio, meaningless contacts, I'd rather go about this in a positive fashion. I recognize that one of the problems when you meet someone new is to find a field of mutual interest about which to talk. Most of us are so used to our own areas that we tend to forget that though they are pedestrian to us, they might be of considerable interest to someone overseas.

Sure, the chap in a small town in Germany will go to a fair in his area just as you may in yours. But there the similarity ends. While the fair I go to may offer Italian hot-sausage sandwiches with fried onions and green peppers, fruit salad, green salad in a pita-bread pouch, fried dough, french-fried onion rings, french fries, do-it-yourself ice cream sundaes, and corn on the cob, my friend in Germany will be eating a wide variety of sausages, hot potato salad, grilled fish, pigs' knuckles, shashliks, and drinking new wine or a special seasonally-produced type of beer. At French fairs, the fare is again different, but no less delicious.

In order to work toward bringing amateurs together on a worldwide basis, I'd like to solicit regular reports on hamming overseas via a group of correspondents. If you are living in some area of the world which should be reported on in *73*. . . or if you know someone who might be interested in such, I'd like to hear from you.

What I have in mind is a regular. . . perhaps monthly for many areas. . . report on any news of interest to hams around the world. I think many of us would like to know about contests which are coming up which are organized in your area. We'd like to know about new certificates. We'd like to know about any outstanding ham conventions. We'd like to know about ham products which are made in your area. We'd like to know more about the growth of hamming, any special developments, important rule changes, how to get a visitor's license, and so on.

What areas? I'm open to suggestions. Perhaps we'd like to hear from the U.K., Germany, France, Benelux, Scandinavia, Southern Europe, the Mediterranean area, the Mideast, India, Japan, Southeast Asia, Australia-New Zealand, Oceania, South America, the Caribbean. . . and so on?

Regular correspondents will not only be paid for the reporting work, but also will get special press passes from the magazine, special QSL cards, business cards, and other such documents to help them with their reporting contacts.

This would be a good medium for bringing up area problems for world discussion. It would help us know more about coming and past DXpeditions. We might be able, with such a widespread correspondent system, to develop some sort of network of ham help to meet traveling hams and make them welcome. We would be better able to keep things like local net frequencies known, repeater channels publicized, and so forth.

I would love to have some correspondents from Iron Curtain countries, recognizing that they might prefer to be paid in magazine subscriptions and books rather than American cash, which can be a problem.

If you have any good friends in spots around the world who you think might be able to provide a continuing series of interesting reports, you might drop them a line with a copy of this editorial and suggest the idea. Or you could bring it up on the air. . . give you something of interest to talk to them about. The prestige of being published in an international magazine can help a person substantially, sometimes. I remember when I first ran into that. It was in 1956 and I was visiting St. Thomas and Dick Spenceley KV4AA. I was the editor of *CQ* at the time, which I didn't think of as being of much importance. Well, I stopped by a store downtown, happened to mention Dick, and was told how important he was, doing a DX column for an international magazine! Hmmm. It

NEW BAND APPROVED

The FCC has approved use of the 10-MHz band, but amateur operation is limited and the Commission did not release the new rule without a cautionary note.

According to the rule, most of the frequencies from 10.1 to 10.15 MHz are available to hams, except for a slice from 10.109 to 10.115 MHz. That section is still reserved for government use.

General-, Advanced-, and Extra-class licensees are allowed to transmit CW and RTTY (FSK and AFSK) with a final input power of up to 250 W. In its decision, the Commission cited the "limited size" of the band and the "temporary nature" of the ruling.

The FCC's action is valid until the Senate takes action on the WARC treaty, leaving present limitations open for change. Although 30 meters has been a possibility since the 1979 WARC convention, approval of the treaty was delayed.

Though the FCC previously denied an ARRL petition requesting use of the band, the amendment did not directly address the Commission's change of mind.

"Strong interest" in the amateur community was cited as a reason for the decision, but the Commission warned that since its action is subject to future Senate decisions about the treaty, the amendment "may be effective for only a brief period."

The FCC added that hams would be "ill-advised to invest heavily in equipment which can only be used in this band."—WB8JLG.

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sure cut a lot of ice in St. Thomas. I was sorry to hear that Dick passed away recently... we'll all miss that incredible fist of his. Any serious CW operator could tell Dick instantly by the perfection of his fist.

Please give me a hand with this so that we can bring amateurs worldwide together a bit. The end result will be a lot more interesting things for us to talk about... perhaps bringing more DX operators onto our bands. Ops in rare countries sure get sick of endless demands for instant contacts and QSL cards. I get ham magazines from the U.K., South Africa, Malaysia, Australia, and so on, so I have a fair idea of what is going on... but 99.99% of you don't have that sort of input or the resources to pay for such a wide variety of magazines. Columns devoted to

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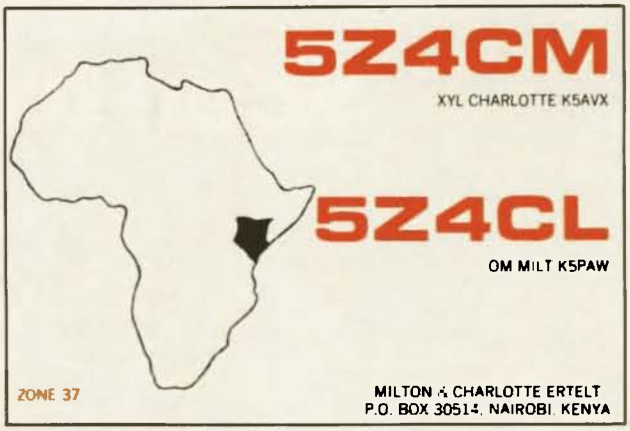

QSL OF THE MONTH

This month's winning QSL comes from a Baptist mission in Kenya, the home of Milton (5Z4CL) and Charlotte (5Z4CM) Ertelt. The design is simple and informative, using only two colors to achieve a striking contrast.

Few cards are as succinct as this one, telling the reader at a glance where in the world the station is located. And from a distance, Charlotte and Milton's calls stand out clearly, leaving no doubt that this QSL is probably the pride of many a DXer's shack.

Entering *73*'s QSL contest is easy—send your QSL, in an envelope, to: Editorial Offices, *73*, Peterborough NH 03458. Specify a book from *73*'s Radio Bookshop; if your card is chosen, we'll be happy to send the book along to you. Entries which are not in an envelope or do not specify a book will not be considered.

Well... I Can Dream, Can't I? by Bandel Linn K4PP

"I don't do anything much! He calls CQ and answers all questions!"

Frank H. Perkins WB5IPM
Box 13642
Arlington TX 76013

Action Machine for 20

Are home-brew rigs a lost art? Not yet! Here's an SSB transceiver you can build.

I designed and built mini'ceiver 20 to learn something about SSB transceiver design. Several times in the course of the project I became convinced that I was learning more about SSB transceiver design than I ever wanted to know! Anyway, mini'ceiver has worked out and it's quite a conversation piece on the air. You can run mini'ceiver from a lantern battery, which opens up a number of possibilities. I have made an effort to use readily-available parts and easy-to-tune circuits in mini'ceiver, so I feel you will have a good shot at making it work if you want to give it a try.

This article covers mini'ceiver's circuit operation once over lightly and then, in some detail, the circuit schematics. No math or theory here, just a shirt-sleeve discussion of the circuitry and how well it seems to work. If you are game at this point, I'll then give you some hints on how to build and tune up mini'ceiver, and I'll wind up with some ideas on accessories, possible design alternatives, and operation. If you've always wanted to build a good size project from scratch but never quite got around to it, this article is written for you. I'll try to give you an idea of what you've been missing.

Photo A. Mini'ceiver 20 is an SSB transceiver boiled down to the basics.

Mini'ceiver Circuit Operation

Let's first look at Fig. 1, mini'ceiver's block diagram. Mini'ceiver is a 20-meter single-conversion superheterodyne transceiver boiled down to the basics. A conventional 9-MHz i-f frequency is used.

In the receive mode, an incoming signal in the 14.25-14.30-MHz range is routed through the receiver antenna switch to a dual-gate MOSFET mixer where it is mixed with the vfo signal (vfo range is 5.250-5.300 MHz). The mixer's difference output, at 9 MHz, is routed through the receiver side of the T/R filter switch to the four-pole crystal filter, which provides the receiver's selectivity. The i-f output from the crystal filter is amplified by a single-stage IC amplifier which can provide a voltage gain of up to about 1000. The output from the i-f amplifier is mixed with the 8.9985-MHz bfo in the MOSFET product detector, recovering, typically, 5 mV of audio.

The audio output from the product detector is amplified by the low-level audio amplifier and then routed to the agc amplifier and the volume control. The agc amplifier further amplifies the audio to around five volts peak-to-peak and then detects this signal to develop the agc control voltage. Meanwhile, audio from the volume control is routed to the audio power amplifier and on to the speaker jack. While in the receive mode, the transmit circuitry is disabled by switching off the +T supply voltage.

In the transmit mode, the +T voltage is switched on as the +R voltage is switched off, enabling the transmitter circuitry as the receiver circuitry drops out. Low-level speech signals from the microphone are amplified to about 1.5 volts peak-to-peak by the speech amplifier and applied to the balanced-modulator audio input. Here the audio is mixed with the bfo signal in an IC double-balanced mod-

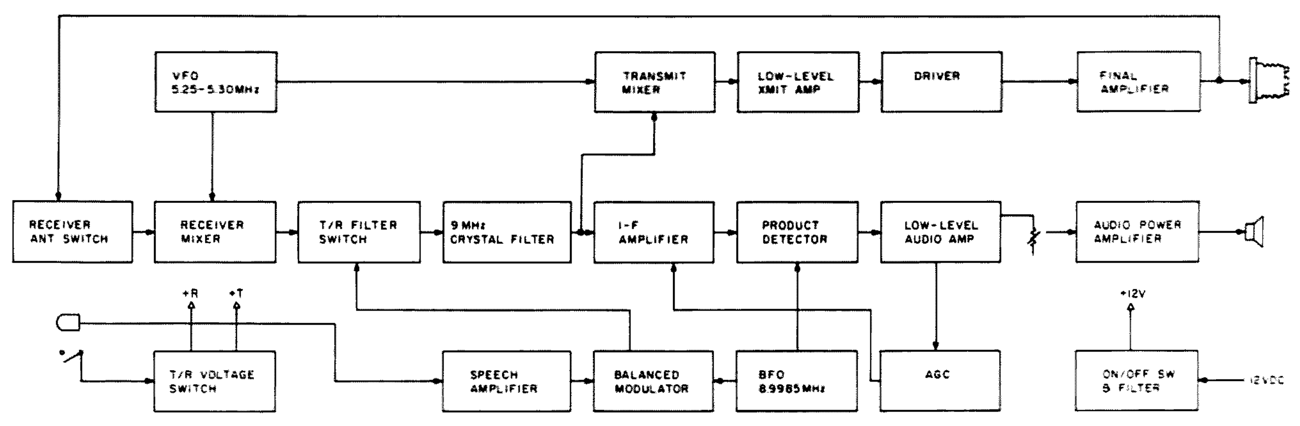

Fig. 1. Mini'ceiver 20 block diagram.

ulator. The double-sideband output from the modulator is routed through the transmit side or the T/R filter switch to the crystal filter. The crystal filter strips off the unwanted lower sideband and routes the 9-MHz SSB signal to the transmit mixer. At the transmit mixer, the 9-MHz SSB signal is mixed with the vfo signal and the sum output at 14 MHz is developed in the transmit mixer's tuned output circuit.

The 14-MHz SSB signal next is amplified by two MOSFET low-level transmit amplifiers to about 600 mV peak-to-peak. The driver stage boosts this signal to about 200 mW and the final amplifier to about 1.5 W. The output from the final is sent to the antenna. Since the receiver antenna switch is open in the transmit mode, the receiver mixer is protected from overload.

The +R and +T power-supply voltages are alternately switched on under the control of the microphone PTT switch. All in all, mini'ceiver is a simple and straightforward design.

T/R Voltage Switch

Almost every modern SSB transceiver design incorporates digital logic, and mini'ceiver is no exception. Refer to Fig. 2, the T/R voltage switch schematic. A 4093BE CMOS quad Schmitt NAND gate is the heart of this circuit. When the PTT switch is open, +12 V dc is applied to R1 and on through the gate interconnections to pull R3 low at pin 10. This turns on Q1 and supplies +R to most of the receiver circuitry. +R also turns on Q4, which helps pull down the +T voltage on a transmit-to-receive transition. Meanwhile, pin 11 is at +12 V dc and Q2, +T, and Q3 are off.

When the PTT switch is closed, the input side of R1 is grounded, which first allows pin 10 to go to 12 V dc, shutting off Q1 and Q4. About 30 milliseconds later pin 11 will go low, turning on Q2 and Q3, supplying +T to the transmit circuitry and clamping +R to ground. R2 and C3 account for the time that both +R and +T are off during a receive-to-transmit or transmit-to-receive transition. R1 and C2 simply form a glitch filter. Schmitt inputs were chosen for reliable logic switching with the slow rise times provided by R1-C2 and R2-C3.

The vfo, bfo, audio power amplifier, and the collectors of the transmitter driver and final amplifier are continuously supplied with +12 V dc from the input power jack. C1 provides dynamic filtering for operating from dry cell batteries, etc.

Vfo and Bfo

Fig. 3 provides the vfo and bfo schematics. We'll start with the latter. The bfo is a grounded-base crystal oscillator designed to work with a series-resonant 8.998500-MHz crystal. It is easily tuned ± 300 Hz, which allows you to tailor the "sound" of the rig somewhat. It will provide a 5-V peak-to-peak output when loaded by the product detector and balanced modulator. Note that it is enclosed in a minibox. This is a must. I first had the bfo circuit on the receiver main board. I also had about two volts of bfo in the i-f amplifier output, plus all the local AM radio stations, etc! Keep the bfo shielded from the i-f amplifier; that is sage advice.

The vfo consists of a buffered Hartley oscillator designed along recently-published guidelines.[1] I found the vfo to be quite stable. Tuning is very fast; you may want to use a reduction drive if you don't have a steady hand. R18 allows the vfo output to be adjusted to 5 V peak-to-peak. The vfo also is built in a minibox, primarily for its own protection. The box helps stabilize temperature and shield the vfo from other rf signals.

Receiver Rf Section

CR3, CR4, R24, R25, R26, C28, and C29 form the receiver antenna switch. In the

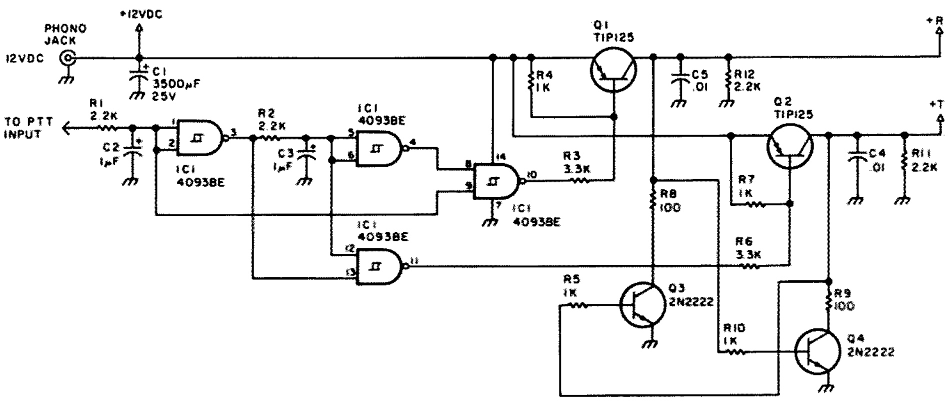

Fig. 2. T/R voltage switch.

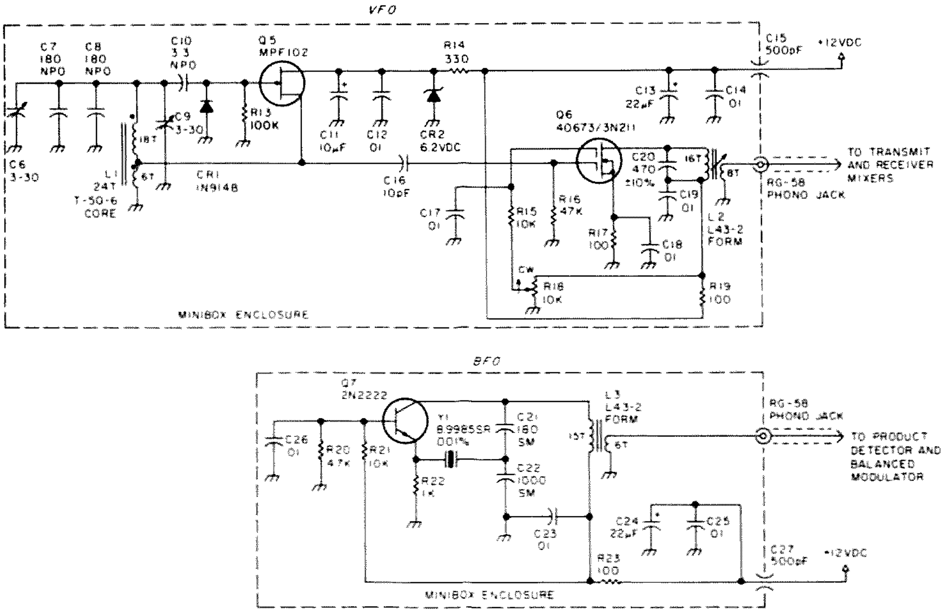

Fig. 3. Vfo and bfo schematics.

receive mode, R25 supplies current to CR3-R24 and CR4-R26 from +R. CR3 and CR4 are forward-biased with about 5 mA dc and appear to small rf signals from the antenna as 25-Ohm resistors. Receiver signals thus easily can pass through C28 and C29, which are dc blocking capacitors, and the two forward-biased diodes to the input transformer of the mixer.

When the bias to the diodes is removed in the transmit mode, the diode switch opens. Notice that when the rf output from the final amplifier is positive, CR3 is reverse-biased so little signal makes it to the mixer input transformer. When the rf output from the final is negative-going, CR3 is forward-biased so the rf signal appears at R25. However, CR4 is now reverse-biased, blocking the rf output from reaching the mixer input.

The use of this type of diode switch eliminates the need for a mechanical relay. Purists would probably add some rf chokes in series with the biasing resistors and might use PIN diodes; however, I'm not a purist —just cheap.

The receiver mixer employs the often-used 40673 (Q8) which is adequate for this application. We now come to the second diode switch in the mini'ceiver, which is used to switch signals to the crystal filter from either the receiver mixer or the double-balanced modulator. CR5 forms half the switch; CR8 (Fig. 6) forms the other half. When +R is on, CR5 is conducting about 6 mA dc, again providing a low-loss path to small rf signals. Meanwhile, CR8 is back-biased, isolating the balanced modulator from the receiver-mixer output and crystal-filter input. R30 is the biasing resistor for CR5. R31 establishes a suitable input impedance for the crystal-lattice filter.

The crystal-lattice filter uses four crystals, two cut for series-resonance 750 Hz below center frequency and two cut for series-resonance 750 Hz above center frequency. The overall 6-dB bandwidth appears to be about 2200 Hz. Unwanted sideband suppression is around 26 dB (5%) at 1000 Hz, which is OK for QRP.

While the filter can be built for under $30, you won't hurt my feelings if you use a commercial filter here. Remember to adjust R31 and R32 to suit the commercial filter's termination impedance if you decide to go this route.

I've always had good luck with the MC1350 i-f amplifier (IC2). It exhibits high but stable gain when properly terminated and smooth forward agc action, assuming you keep the bfo signal out of it. The value of R40 and the turns ratio of L6 were chosen for high stable gain. I

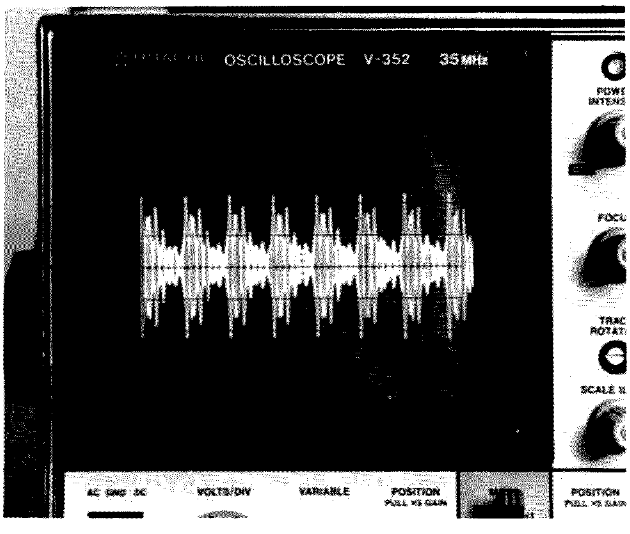

Photo B. Typical mini'ceiver SSB voice waveform. About 1.5-W p-p output.

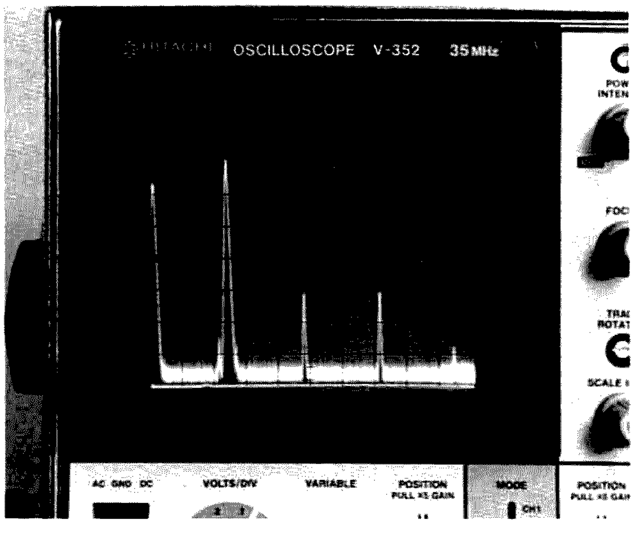

Photo C. Output spectrum consists primarily of the fundamental and harmonics. All spurs are more than 40 dB down.

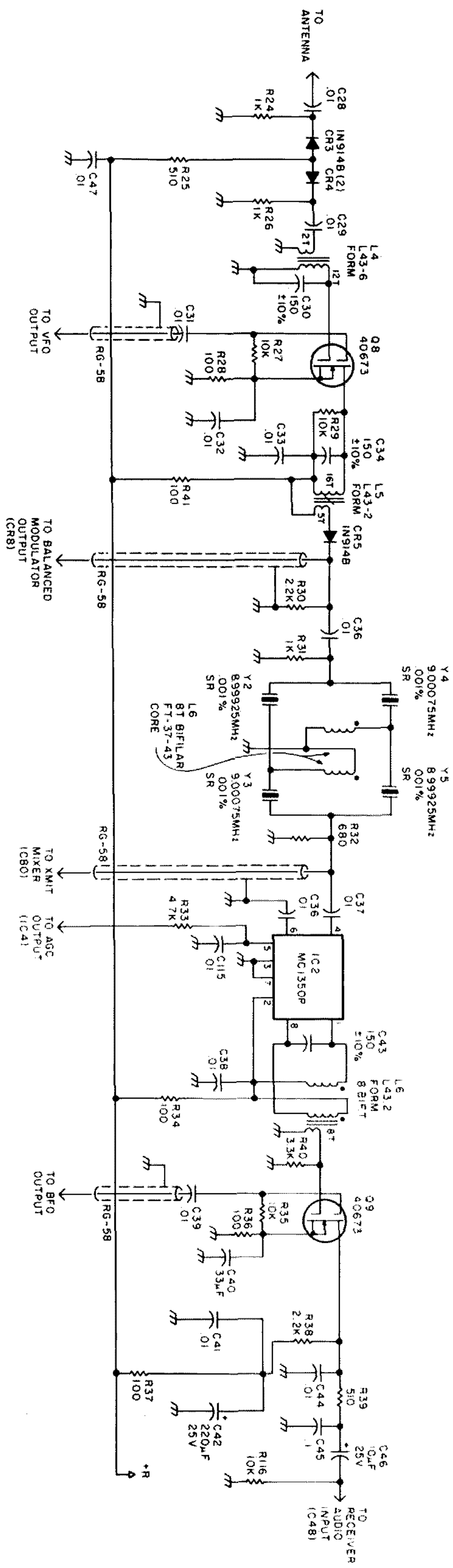

Fig. 4. Receiver rf schematic.

don't suggest pushing the IC harder by raising the value of R40. You don't need the extra gain and accompanying headache.

The faithful 40673 MOSFET is again in service as a product detector at Q9. Notice the heavy audio bypassing and decoupling.

Receiver Af Section

Refer to Fig. 5. An LF353 dual op amp (IC3) is used as the receiver low-level audio amplifier. R47 allows the audio gain to be trimmed out to suit. C50 and C51 help roll off the high-frequency response of the audio section. The LM383 audio power amplifier, IC5, is somewhat of a power overkill, but it provides low-distortion audio at normal listening levels—much better than trying to push an underrated audio section too hard.

IC4 is another LF353, this time used as an agc amplifier and detector. I seem to get the best results with audio-derived agc when the base audio frequencies are rolled off—which explains the small value of C54. R57 controls the agc attack time and R58 controls the release time. Of course, changing C58 messes up both time constants. Agc characteristics are quite subjective, so feel free to experiment here. You might consider agc something of a luxury on a basic transceiver. On 20 meters, I don't.

Speech Amp, Balanced Modulator, and Transmit Mixer

Fig. 6 details the above-mentioned circuitry. Again an LF353 is used as a two-stage audio amplifier (IC6). This time it is rigged to provide a high-impedance input to the microphone. Since high-impedance audio circuits make me nervous, I heavily decoupled the input from rf. A 1496N double-balanced mixer (IC7) is employed as the balanced modulator and works quite well. At least 40 dB of carrier suppression is easily obtained by adjusting R77. Notice the other end of the T/R filter switch (CR8) at the output of the balanced modulator.

After being routed through the crystal filter to do away with the lower sideband, our 9-MHz SSB signal is ready to be translated to 14 MHz. It was at this point that I started learning too much about SSB transceiver design. I won't bore you with all the mixer circuits that didn't work. Let me just say that I have seen just about every picket fence display on my spectrum analyzer that I could imagine (see "Poor Man's Spectrum Analyzer," *73*, August, 1982). The biggest problem was the 3rd harmonic of the vfo at 15 MHz. Now you can supposedly get this out with a carefully designed multipole bandpass filter, but it sort of compromises our simple-to-build theme. Fortunately, there is another way.

First, start with a 1496N double-balanced mixer. Next, don't drive the carrier port (pin 8) with more than 70 mV peak-to-peak of vfo signal. This leaves the mixer pretty much in "linear" operation so that not much 3rd harmonic of the vfo appears in the mixer output. (Refer to the spectrum photo, which tells the story.) Anyway, we now have a clean 14-MHz SSB signal, so on to the transmit amp chain.

Transmit Amplifier Chain

Referring to Fig. 7, we find the transmit amplifier chain uses both tuned and broadband stages. Q11 and Q12 are tuned low-level amplifier stages. There is more potential gain in these stages than needed, so the turns ratio at L9 is not for impedance matching, it's to "throw away" some extra gain without lowering Q. The turns ratio at L10 provides a suitable match between the drain of Q11 and the 30-Ohm or so input im-

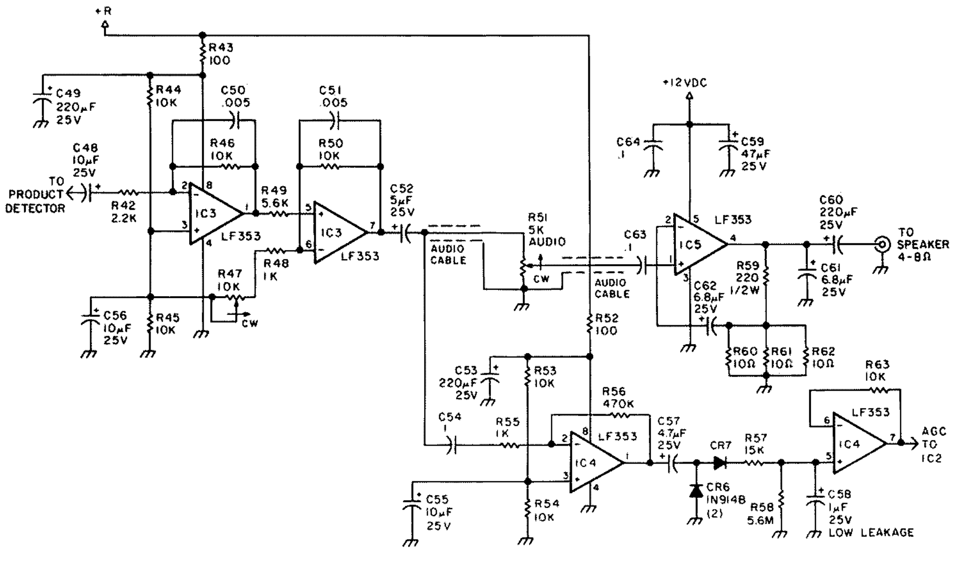

Fig. 5. Receiver af schematic.

pedance of the driver. The driver is the broadband stage. The same feedback that sets the broadbanding on this stage pretty much ensures low-frequency stability, which is what I was after. It seems a little hard to find a suitable driver for HF work, but the 2N3866, which often is used in cable TV systems, is very easy to find. Since it is a VHF transistor, feedback for the sake of stability seems prudent in an HF driver application.

L12 matches the output of the driver to the 5-Ohm or so input impedance of the final amplifier. A single pi network of rather low Q transforms the assumed 50-Ohm antenna impedance to around 35 Ohms, setting up the 1.5-W output with some room to spare. L16 and C108 form a series-resonant trap that takes care of the 2nd harmonic, which is the only offending spur. Notice that the bias to both the driver and the final amplifier are switched by +T. Despite some deliberate and undeliberate attempts, I've not managed to zing the final (probably because I have a spare). Harmonic suppression appears to be fairly insensitive to antenna impedance, which is characteristic of series trap suppression. R99 allows you to adjust the overall gain of the amplifier chain.

Mini'ceiver Construction

I feel that you will have a good chance of successfully building the mini'ceiver, or your customized version of it, if you are comfortable using a triggered oscilloscope in troubleshooting and have built several kits and scratch-built projects. Or, of course, if you can get help from a friend and/or someone in your club or repeater group with the above experience. I'm not trying to discourage anyone; I just want you to have a good chance for success if you embark on the project. Building and experimenting is great fun, and I want it to stay that way for you. I believe that you can build mini'ceiver for about $200, maybe less if you have a big junk box.

Parts

See below for the list-

Parts List

Component		**Ref#**	**Supplier#**
4093BE	IC	IC1	4
1350P	IC	IC2	2,4,6,7,8
1496N	IC	IC7-8	4
LF353	IC	IC3-4,6	2,4,7
LM383	IC	IC5	2,4,7
TIP125	DBJT	Q1-2	2,4,7
2N2222	BJT	Q3-4,7	2,4,6,7,8
MPF102	JFET	Q5	2,4,6,8
40673	MOSFET	Q6,8-10	1,2,4,6,7,8
2N3866	BJT	Q12	2,7,8
MRF476	BJT	Q13	8
1N914B	Diode	CR1-8,10	2,4,6,7,8
1N4001	Diode	CR9	2,4,6,7,8
8.998500 MHz	.001% SR crystal	Y1	5
8.999250 MHz	.001% SR crystal	Y2,5	5
9.000750 MHz	.001% SR crystal	Y3-4	5
L43-2	Coil form	L2,5-7	3
L43-6	Coil form	L4,8-10	3
FT-37-43	Toroid	L6	3
FT-50-61	Toroid	L11	3
T-50-6	Toroid	L14-16	3
3-30 pF	Var. cap., ¼" shaft	C9	6
3-30 pF	Var. cap., PC mount	C6	6
80-300	Arco trimmer	C114	8
4-40	Arco trimmer	C108	8
5% NPO	Ceramic cap	C7-8,10	Local TV supply
10% TS	Ceramic cap	C20,30,34 43,76-77 88, 91	Local TV supply or use silver mica 5%
5% SM	Silver mica cap	C21,22 C105-107	2,4,8
500 pF	Feedthrough cap, threaded type	C15,17	1
1 uF	Low-leak cap	C58	7
CU-3000A	Bud minibox		2
CU-3011A	Bud minibox		2

Note: Other components are garden variety ¼- and ½-W resistors, +80,−10% 50-V ceramic capacitors, and standard electrolytic capacitors.

Suppliers:

1. Alaska Microwave Labs, 4335 E 5th Street, Anchorage AK 99504; (907)-338-0340.
2. Allied Electronics, 401 E 8th Street, Fort Worth TX 76102; (817)-336-5401.
3. Amidon Associates, 12033 Otsego Street, N. Hollywood CA 91607; (213)-760-4429.
4. Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002; (415)-592-8097.
5. Jan Crystals, 2400 Crystal Drive, Fort Meyers FL 33906; (813)-936-2397.
6. RadioKit, Box 411S, Greenville NH 03048; (603)-878-1033.
7. Radio Shack.
8. Semiconductors Surplus, 2822 N 32nd Street #1, Phoenix AZ 85008; (602)-956-9423.

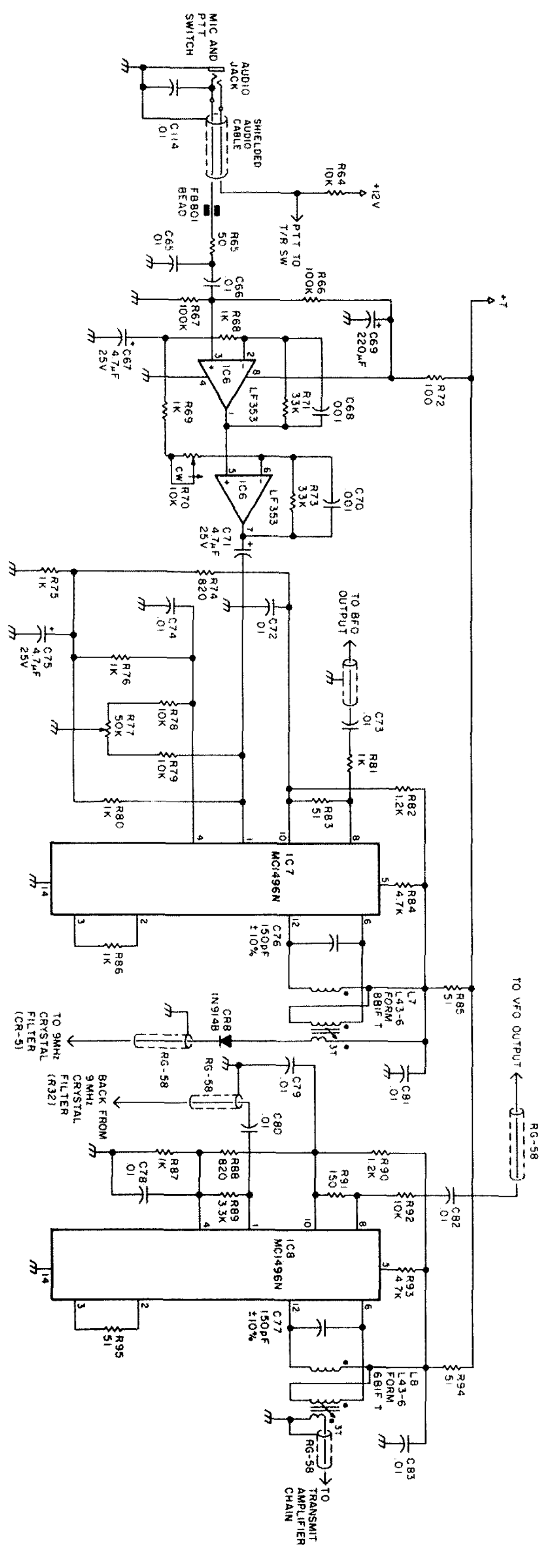

Fig. 6. Speech-amp, balanced-modulator, and transmit-mixer schematic.

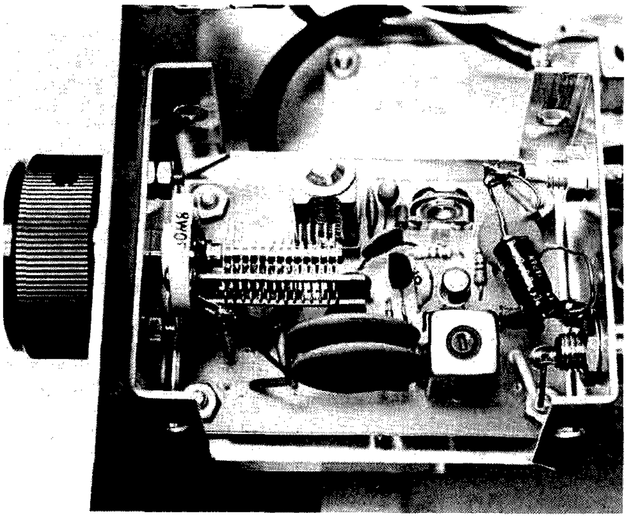

Photo D. Vfo construction detail.

ing of all major parts. As I promised, the parts are readily available. You might have a little trouble finding the NPO capacitors, but many radio-TV parts houses stock them. Keep in mind that one of your best sources for parts information is just a CQ or two away—just don't conduct your purchases directly on the air!

Chassis

I built my mini'ceiver in a 12" L × 7" W × 4" H Bud CU-3011A minibox, and used two 2¾" L × 2-1/8" W × 1-5/8" H Bud CU-3000A miniboxes within to house the vfo and bfo. As you can see in the construction photos, I put the power supply, receiver, speech amp, balanced modulator, and transmitter mixer on a main board and the transmit amp chain on a smaller piggyback board. This worked out successfully. However, I plan to use two cards of the same size mounted vertically, each facing out, in the next mini'ceiver. In this case, I would put most of the transmitter circuitry on one card. If you decide on this layout, keep the speech amplifier and final rf amp at opposite ends of the transmitter board!

Circuit Boards

The layout of high-gain rf and audio PC boards is something of an art form. For a one-shot project, it's hard to beat the use of single-sided (2-ounce copper) circuit board with the copper on the component side used as a ground plane. Notice that the transmit amplifier chain is built in this way. It's generally faster to duplicate a circuit using this approach than to go through the process of lifting circuit board art, exposing resist, etching, etc.

I've outlined the approach I like to use in an earlier article, but it's worth going through again. If nothing else, it makes component substitutions a snap. Get some drafting vellum with a light blue 1/10th-inch grid on it. After you have gathered all the parts for a circuit, you can begin developing the board layout. Start by mulling over the schematic and inspecting the components. Then lay out the components on the grid paper and think through their interconnection. Juggle the components around as needed for a neat arrangement that minimizes trace lengths and crossovers. If you think in terms of circuit strips, it makes things easier.

After you have the layout and interconnection for a section of the circuit visualized, pick up the components and sketch in their

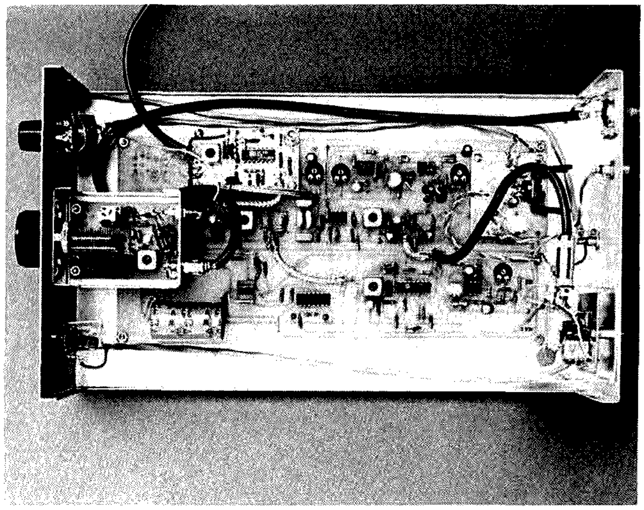

Photo E. View of the main board, which includes the receiver, speech amp, balanced modulator, and transmit mixer.

outlines on the vellum. Show the component interconnections underneath the circuit board with dotted lines. You will be surprised how fast this goes. Remember that all ground connections are on top. Be careful to keep input and output connections of high-gain rf and audio stages separated.

Once the layout is complete, you can tape it directly to your circuit board blank. Drill through the layout and the circuit board each place a component lead or wire goes through the board. I use about a #62 bit for most holes except IC leads, where I use a #68 bit. It's easy to enlarge holes later as needed for the bigger component leads.

After all the holes are drilled, lightly countersink them with a 3/32" bit—except those which are going to be direct ground connections. The countersinking keeps the leads from shorting out on the ground plane. After cleaning the board and perhaps tin-plating it, you can begin installing components. They are interconnected under the board by their leads and/or bus wire. Remember to keep connections as short as possible and watch input-output routing around high-gain stages.

Rf Coils and Transformers

Radio Shack currently markets a packet of magnet wire in three gauges: part number 278-1345. This type of wire can be stripped simply with hot solder, so it's ideal for rf coil and transformer applications. Use the 30-gauge wire for winding all the shielded transformers. Use the 22-gauge wire for winding all the toroids except L6 and L14, where the 26-gauge wire will be easier to use. I used a small 10-uH molded choke for L13. However, this should not be too critical. If you have trouble finding a molded choke, try 16 turns or so on an FT-50-61 ferrite core. It might be a good idea to put a 10-Ohm resistor in series with this choke to avoid any surprise resonances.

You will notice a number of bifilar windings are used. I use an electric drill to pretwist pairs of wires to about 6-8 turns per inch. Use an ohmmeter to figure out which wire is which after winding the bifilar coils. On the shielded coils, bring the bifilar pairs out together at each end of the bifilar winding and then separate and tin them under the circuit board. Don't try to solder directly to the coil-form posts on these transformers. You'll wind up a post short.

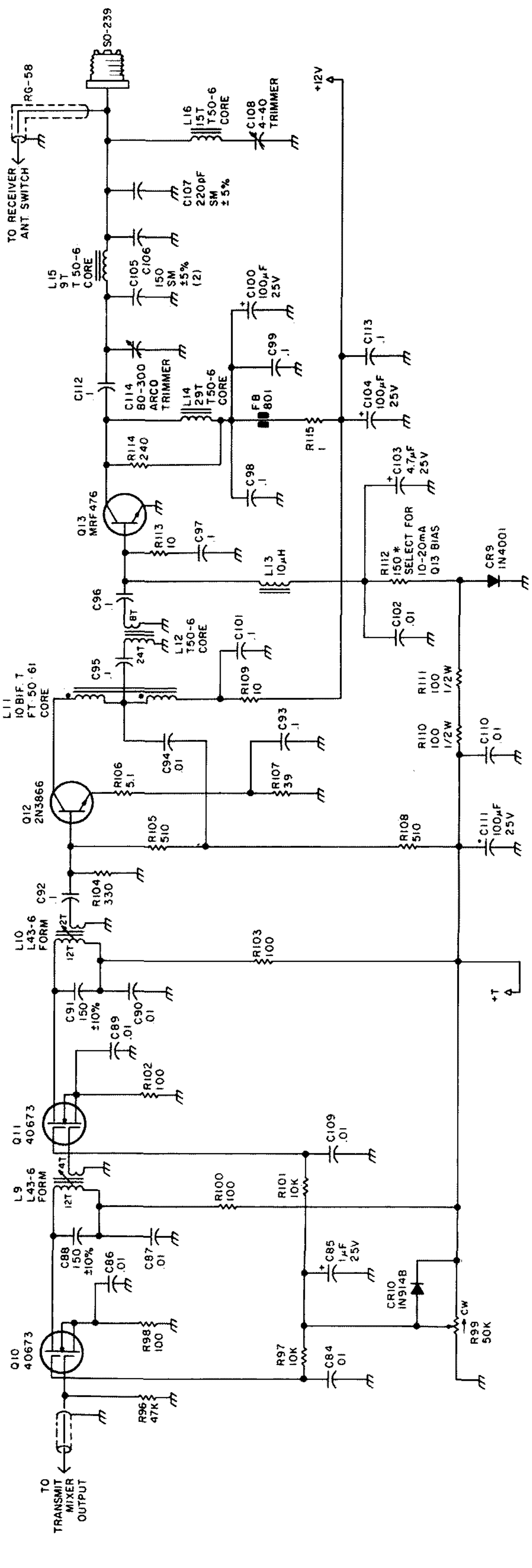

Fig. 7. Transmit-amplifier chain.

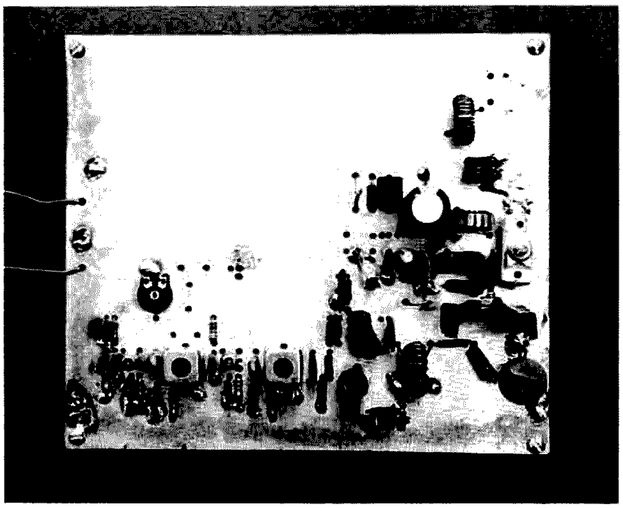

Photo F. Top view of the transmit amplifier chain. Note the "stovepipe" driver heat sink.

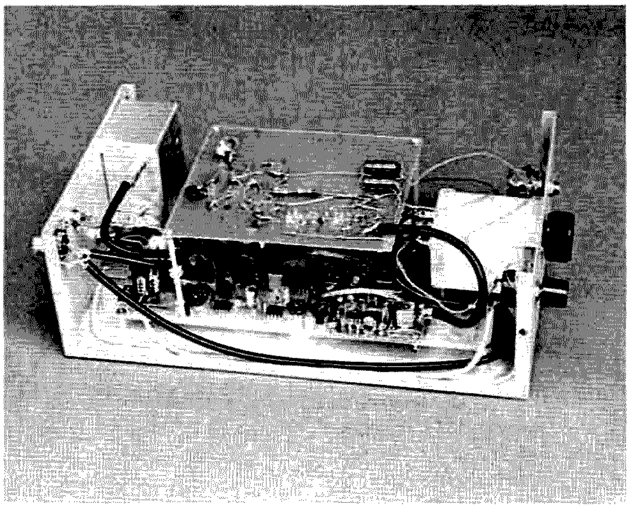

Photo G. Overall view of the mini'ceiver circuitry with the transmit amplifier card in place. The bfo is housed in the small minibox in the back.

You may find the vfo and bfo a little tight to construct since they have to fit in their respective miniboxes. With a little patience everything will fit. For the vfo, it's probably best to etch the copper off the circuit board except around the edges. Hopefully, the vfo detail photo will help with the layout.

Heat Sinks

The audio power amplifier, transmit final amplifier, and transmit driver should all have heat sinks. I made a "stovepipe" heat sink out of copper sheet for the 2N3866 driver. Standard commercial heat sinks were used elsewhere.

Tune-Up

Recommended test equipment for tuning up mini'ceiver includes a triggered oscilloscope with at least a 20-MHz bandwidth, a multiband HF transceiver, a dummy load, a frequency counter, and an audio oscillator. Luxury items for tune-up include a grid-dip oscillator, an rf signal generator with a step attenuator, a two-tone oscillator, and, of course, a spectrum analyzer.

Power Supply and T/R Voltages

You can run a mini'ceiver off a 12-V-dc, 1-A supply. Before powering up the rest of the circuitry, test the T/R voltage switch for proper action. Check the collectors of Q1 and Q2 in each PTT switch position for proper on/off action. You did wire the microphone jack up right, didn't you?

Bfo and Vfo Tune-Up

Apply +12 V dc to the vfo and check for oscillation with the scope at C16. Fully mesh tuning capacitor C9 and adjust C6 for operation around 5.250 MHz. Unmesh C9 and confirm operation at about 5.300 MHz. Set C9 about mid-range and peak L2 while looking at the vfo output. Then adjust R18, clockwise from the bottom, for a 5-V peak-to-peak output. Putting the top on the vfo will change its operating frequency somewhat, so you may want to tune and try a couple of times until you get it on frequency with the top on.

Apply +12 V dc to the bfo and back the slug nearly out of L3. While monitoring the output of L3 with the scope, slowly run the tuning slug in until oscillation starts. Peak the oscillator output. You should get about a 5-V peak-to-peak output. Check oscillation frequency with your counter and fine-tune the slug in L3 for operation at 8.998500 MHz. The bfo must be loaded with the product detector and balanced modulator for proper operation. It's a good idea to put a small hole in the top of the bfo minibox over L3 to allow for touch-up adjustment of the slug with the minibox top in place.

Receiver Tune-Up

Run the tuning slugs in on L4, L5, and L6 so that the tops of the slugs are just slightly above the top of the shield cans. Set the volume control and R47 at mid-range. You should now be able to hear 20-meter SSB signals on your antenna or on a 15' piece of wire stuck in the antenna jack.

Fire up your other HF rig into a dummy load at low output power and set its output frequency for about 14.275 MHz. Tune the mini'ceiver to find the signal. Once found, monitor pin 7 on IC4 (the agc output) and peak L4, L5, and L6 for maximum agc output. If you see the agc voltage peaking above 6 V dc during tuning, reduce your signal level a bit. You can now adjust R47 to suit. Back this pot down a bit if you run into high-volume audio distortion or instability when running off dry cells.

Transmitter Tune-Up

Hook mini'ceiver to a 50-Ohm dummy load. Short the PTT input on the mike jack to ground. Check the voltage across R115. It should be around 20 mV dc, which indicates a 20-mA quiescent bias on Q13. If it's much off this value, replace R112 with a larger or smaller resistor as needed to bring the bias in range. Incidentally, if you have trouble finding a 1-Ohm resistor for R115, you can use a 10-Ohm resistor (200 mV dc), but short the resistor out after setting up the bias.

Input a single audio tone of about 8 mV peak-to-peak into the audio side of the mike jack. Adjust R70 for a 1.5-V peak-to-peak audio signal at pin 1 of IC7. Hook the scope to the anode of CR8 and peak L7. You will see a waveform that looks like an AM signal with 20-40% modulation, about 400 mV peak-to-peak. Check pin 1 of IC8 for a fairly clean 150-200-mV CW signal. Look at the output of L8 and peak for a 14-MHz signal of about 150-200 mV. Move the scope to the output of L10 and peak L9, L10, and R99. Adjust R99 for a lower bias

voltage to Q10 and Q11 if the output of L10 is more than 500 mV peak-to-peak. Check the output of Q12 at C59 for about a 5-V peak-to-peak signal.

Hook the scope to the output of the amplifier chain (SO-239 connecter) and peak C114. This is broad tuning, so watch carefully. You should have about 25 V peak-to-peak of rf output. Find the 2nd harmonic of mini'ceiver's output on 10 meters and tune C108 for a null. Tuning is quite sharp, so tune carefully. C108 can also be tuned to peak the 2nd harmomic; be sure you tune for *minimum* output on 10 meters. You can use a short piece of wire for a receive antenna on your 10-meter rig since it's in the same room with mini'ceiver.

Disconnect the jumper and audio oscillator from the microphone jack and plug in the mike. Readjust R70 a bit, if needed, for an SSB voice signal similar to the one in Photo B. Be careful not to push too hard; there is enough flat-topping out there already.

Operation

Now the moment of truth. The results you get with mini'ceiver depend heavily on your antenna system, but this is true of any station. I think you will be surprised. I've gotten clean audio reports (except when I tried a narrower crystal filter!) and moderate signal strength reports which is expected for QRP. The fact that mini'ceiver is home-brewed does generate QSO interest.

Mods and Alternative Circuitry

An S-/rf-output meter can be added easily if you like to watch meters jiggle. For the S-meter, monitor the agc voltage which will vary from about 4 to 7 V. Add a 2:1 resistive divider across the rf output (about 1k total load) and then detect the peak rf voltage at the divider output with a diode-capacitor rf detector. This should give you about 6 V peak to drive the meter. Use a toggle switch to switch modes on the meter.

There is enough room left to add an "afterburner" if you feel you need a little more power. I suggest using an MRF477, which should take you easily into the 25-W range. No more lantern battery operation, though. The receiver antenna switch should be moved to the collector side of the matching network in this case. I don't suggest this unless you have already done some rf amplifier design.

Mini'ceiver should be fairly easy to put on other HF bands by adding the appropriate crystal oscillator and another 1496 mixer to achieve a suitable vfo output range, along with adjusting L and C values as needed.

From Here

You can never really finish an electronic design (or a computer program for that matter) and mini'ceiver is no exception. There are many ways the design can be improved. If you have an idea, try it! Experimenting is fun. If you would like to ask me a question about mini'ceiver, please send an SASE. 73! ■

References and Readings

1. "Progressive Communications Receiver," Wes Hayward and John Lawson, *QST*, November, 1981.
2. *Solid State Design for the Radio Amateur*, Wes Hayward and Doug DeMaw, ARRL publication.
3. *Crystal Oscillator Design and Temperature Compensation*, Marvin Frerking, Van Nostrand Reinhold.
4. *Introduction to Radio Frequency Design*, Wes Hayward, Prentice-Hall. (Excellent if you can handle higher math.)

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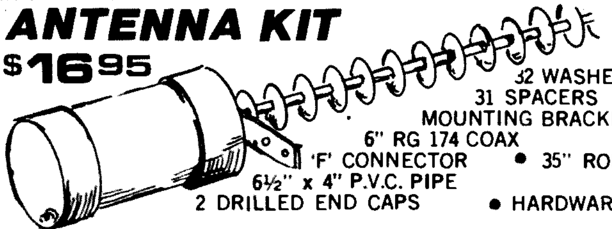

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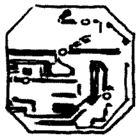

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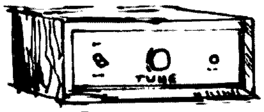

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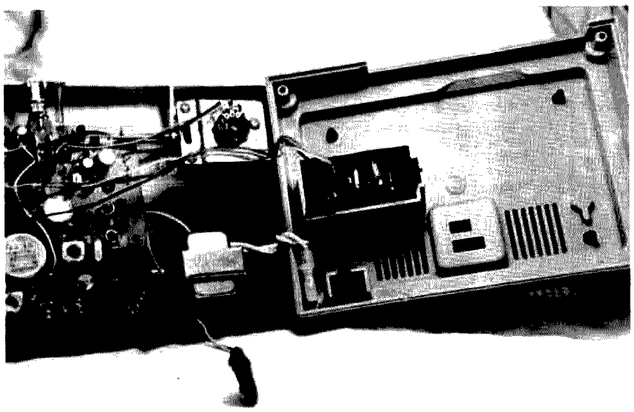

Decoder board mounted in battery compartment.

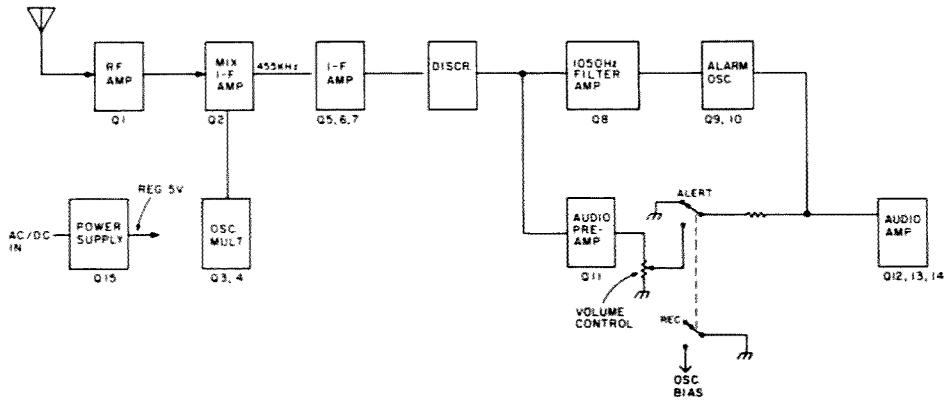

Fig. 1. Block diagram.

Two-meter repeaters provide reliable communication for relatively large areas surrounding the repeater site. There has long been a need for a reliable warning or alert system operating through a repeater for civil defense, RACES, emergency, and similar type requirements. In particular, if this need is required in the specific area within the locale of a repeater, then the approach described here-

in will prove more than satisfactory.

On the assumption that a secure alert signal must be coded in some way, it becomes readily apparent that the receiver/decoder must be immune (i.e., secure) from false triggering. The problems associated with using a repeater manifest themselves through the types of signals transmitted. For example: engine whine, noise, voice characteristics, whistling, and other distortions contained in speech must not falsely trigger the alarm mechanism. The receiver, therefore, must be of sufficient sensitivity to operate within a given signal-strength area and contain a decoder. The repeater must be able to pass the coded signal with sufficient amplitude to activate the alarm mechanism.

Additional requirements are that any operator can initiate the alarm without the necessity of a special code generator and that existing 2-meter receivers not be pressed into service to monitor and decode the alarm signals. (A previously published article out of Canada described the use of a 2-meter transceiver with a "listening" decoder placed in front of the speaker to receive and decode the alarm signal. Not only does this tie up a piece of very expensive equipment—but also it implies that the user must listen to every QSO and not forget to turn up the audio volume.) Finally, and above all, the receiver and code generator must be inexpensive.

With the rudimentary specifications as set forth above, a search was conducted into readily available equipment that could be modified for the task. After some deliberation it was decided that a crystal-controlled FM weather radio of the type used by mariners for monitoring NOAA

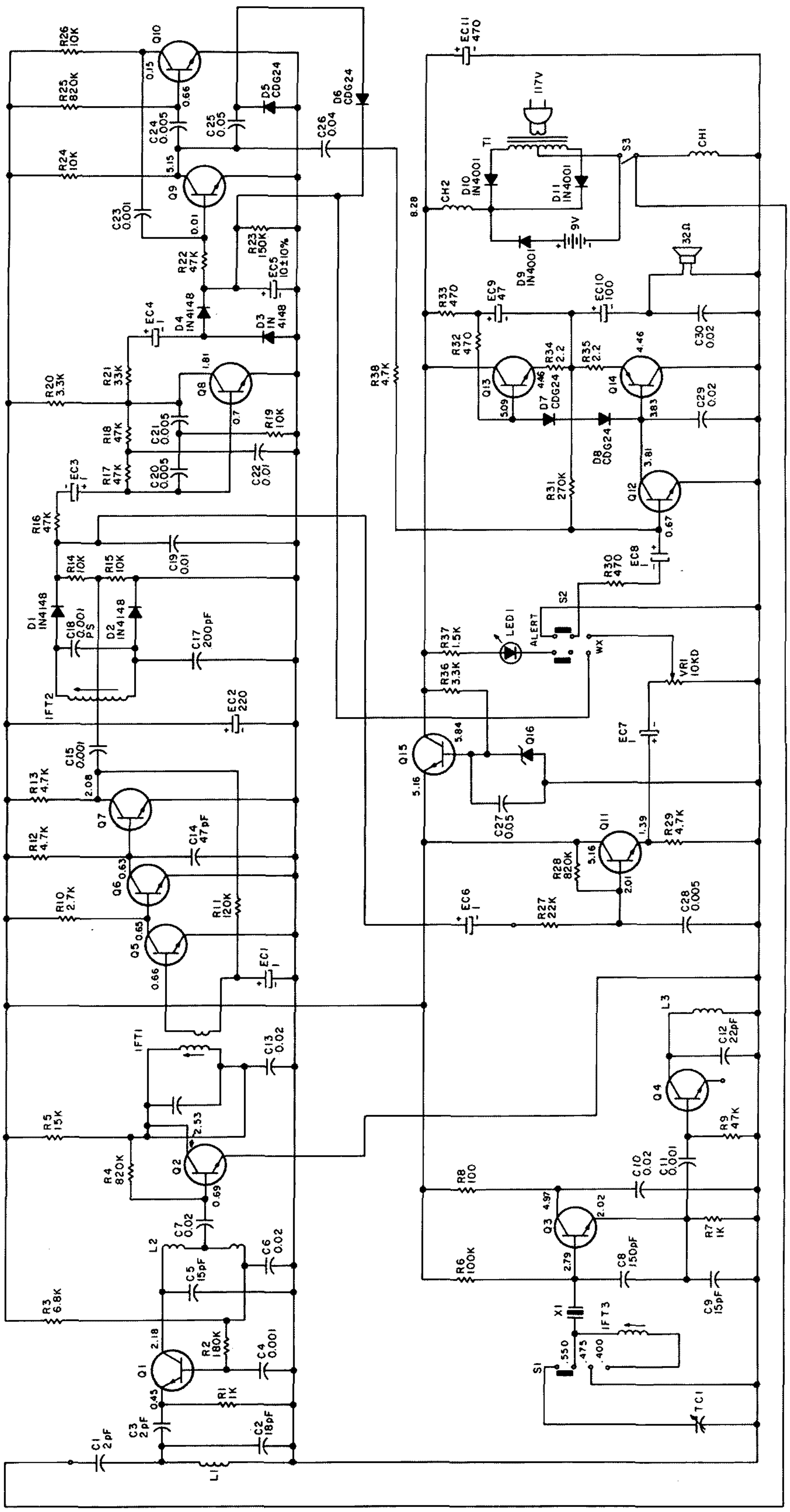

Fig. 2. Schematic diagram of unmodified Weatheradio.

weather broadcasts that also contains the built-in decoder for NOAA-broadcast weather alerts would be ideal. The Radio Shack Weatheradio Alert (catalogue #12-154) was selected and was used as the basis for design.

In the event of a weather emergency, NOAA transmits a tone (1050 Hz) which activates an alarm in the receiver which in turn alerts the listener to activate the audio portion of the receiver and listen to the detailed weather info. (Most weather-alert receivers allow the user to deactivate the audio while still keeping the receiver in the monitor mode.) Normally transmitted speech does not activate the system since a relatively long transmit time (seconds) is required of the coding signal and it is believed that NOAA also "notches out" 1050 Hz during non-coded transmissions.

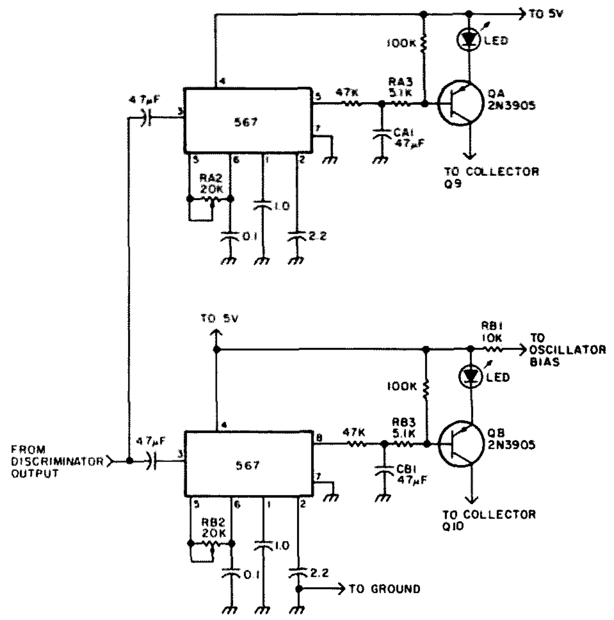

Fig. 3. Decoder subassembly schematic.

Before describing the modifications and design philosophy of our alert receiver, a cursory look at a simplified block diagram of the unmodified weather radio is necessary (Fig. 1).

The incoming rf is supplied (via a link to the ac power cord) to an rf amplifier. A crystal-controlled LO drives a diode multiplier and is loosely coupled to the input of a mixer stage. The output of the mixer (455 kHz) drives a tuned i-f amplifier and discriminator which provides detected audio to the audio preamplifier and to the 1050-Hz filter. In the normal listening (WX) mode the audio is boosted through the audio amplifier and drives the speaker. In the monitor (or alert) mode the alarm oscillator is enabled and the output of the volume control is disconnected from the audio amplifier and speaker. Reception of a 1050-Hz tone will trigger the oscillator and the signal thus produced will be amplified via the audio amplifier and sound the alert. (There are some auxiliary features which will be described in the discussion on modifications.)

NOAA broadcasts operate on frequencies of 162.400, 162.475, and 162.550. This is facilitated in the unmodified alarm receiver by operating the crystal padded with either a capacitor, an inductor, or nothing. A three-position switch on the rear of the unit is provided for this purpose. Since we will be operating on a fixed frequency, this is an unnecessary feature and must be disabled. (We set the switch in the "unpadded" position and epoxied it in place.)

The repeater frequency we are using is 146.865-MHz output. The rf stages must be retuned to this frequency as well as selecting a new crystal which will provide an i-f of 455 kHz when operating in conjunction with this frequency. A crystal frequency of 16.202 MHz is used to generate 455 kHz when operating with the "central" NOAA frequency of 162.475 MHz. Working backwards, 162.475 MHz −455 kHz = 162.02 MHz. It becomes obvious then that the multiplier is operating at a multiplication factor of 10. At the repeater operating frequency of 146.865, a crystal of (146.865 - 455 kHz)/10 = 14.641 MHz is required for the LO. (The crystal can be purchased from: Sentry Mfg. Co., Chickasha, Oklahoma: #SCM-18, HC-25/μ case with wire leads, 15-pF load.)

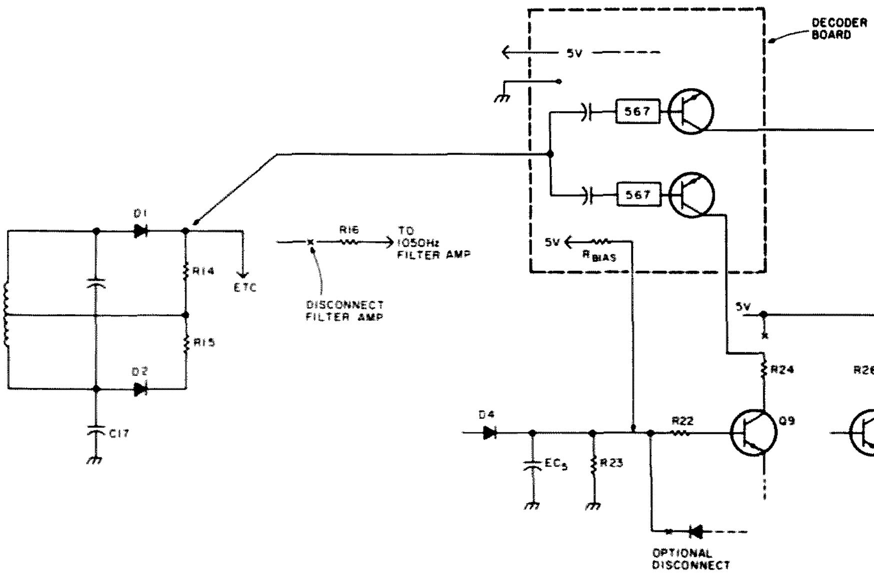

Fig. 4. Connecting the decoder board to the receiver.

With this determined and the planned use of the 1050-Hz coding signal, we set off to modify the receiver. First we applied a signal at the NOAA frequency of 162.475 MHz FM modulated with 1050 Hz (3-kHz deviation) and measured the output of the discriminator at the point where the alarm would just trigger. We observed the output of the signal generator and used this output (in microvolts) as the target sensitivity at the repeater frequency. On the trial unit this was observed as approximately 1 uV. Next we replaced the crystal, ob-

served that the LO was operating, and proceeded to retune the rf and LO stages. Unable to lower the tuned frequency adequately by squeezing the inductor coils closer together, we added capacitors in parallel to the tank circuits to bring the tuning in range of the coils. All the while we monitored the output of the discriminator and tuned for maximum output of the 1050-Hz signal. With judicious twisting and squeezing of the coils we were able to match the sensitivity observed at the NOAA frequency.

A hastily designed 1050-Hz tone generator was implemented and the receiver was put to the test. It triggered obediently in response to the coded signal—as well as from alternator whine and anybody who spoke with the right quantity of 1050-Hz energy! We quickly deduced that any decoding scheme that was dependent on a single frequency was doomed to a similar fate. In order to minimize the cost of the decoding circuitry, we decided against any scheme which required timing sequences. We also felt that the more complicated the scheme, the larger (and more costly) the decoder would be, and we did have space limitations within the receiver.

The solution decided upon was to code and decode a single two-tone composite signal much like that used in the Bell Touch-Tone™ system. In fact, for purposes of simplicity and availability, we designed around an actual DTMF tone pair. The 1050-Hz filter/amplifier was of no further use; therefore, it was bypassed. A small printed-circuit board containing the two tone decoders and their associated drivers was designed to fit into the backup battery compartment. (The backup battery would be glued to the receiver case using double-sided masking tape.) A detailed description of the electrical design and receiver modifications follows.

To understand how our decoder design developed, it is first necessary to understand the operation of the unmodified decoder-alarm circuit. Transistors Q9 and Q10 are operated as a triggered astable multivibrator. R22 and R23 keep the pair in an untriggered state by keeping Q9 off in the ab-

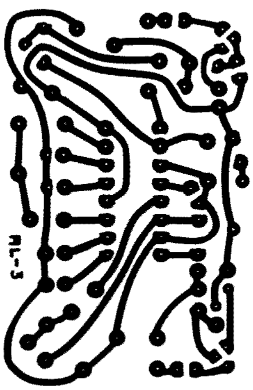

Fig. 5. PC board.

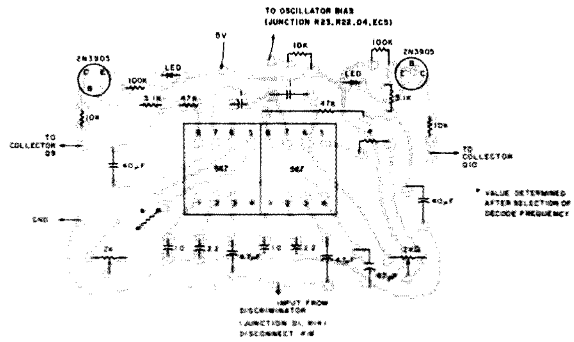

Fig. 6. Component layout. If resistors marked with asterisks are not used, they must be replaced by jumpers.

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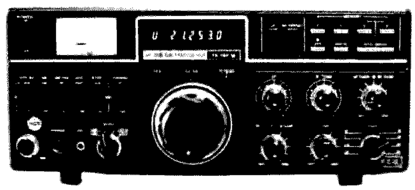

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sence of any external bias current. When the coded 1050-Hz signal is received and passed through the 1050-Hz twin-T filter/amplifier (Q8), it is rectified and doubled via D3, D4, and EC4. The resulting dc is applied to the base of Q9 through R22 as a trigger current. The multivibrator then oscillates. Diode D6 rectifies the oscillator output and feeds it back to the input of Q9, thereby maintaining the alarm even after the initial trigger signal is removed. Depending on the desired mode of operation as an alert receiver, this may or may not be a desirable feature. This will be discussed later.

The two-tone-decoder design is a relatively straightforward adaptation of a standard NE567 design. Two decoders are connected in parallel and drive a pair of PNP trigger amps. In order to use as much of the existing receiver as possible, it was decided to disconnect the collectors of the multivibrator transistors from the supply rail and drive each of them from the tone decoders. In this way the oscillator cannot function unless both tones are present, thereby acting as an AND gate as well as an oscillator. The PNP trigger amps (Fig. 3) provide the necessary inversion of the 567 output as well as a convenient node to add some time delay to the decoding functions. (To prevent accidental triggering, a time delay was added to the decoding spec.)

Referring to Fig. 3, the output of either 567 (pin 8) goes low when the correct tone is presented to its input. This in turn provides bias current for the base of the PNP (QA or QB), but not until CA1, B1 is first discharged (providing the time delay). The LEDs in the emitters of the PNPs necessitate that the base drop an additional two diode drops (in addition to VBE) before the PNP can turn on again for time delay purposes. (They also add the additional feature of illuminating for test purposes.)

As mentioned above, when both PNPs are on, the multivibrator can oscillate. Note: Since the 1050-Hz filter/amp is disconnected, a permanently enabling bias voltage is applied to multivibrator transistor Q9 through RB1 on the decoder board. Potentiometers RA2 and RB2 permit tuning the tone decoders for the desired frequency. Refer to Fig. 4 for the modified schematic showing points of connection (and disconnection). Figs. 5 and 6 show the PC layout and an assembled board, respectively.

Some final comments are in order. We decided not to depend on rf coupled through the power line for our input. A banana jack was mounted on the case and connected to the rf input through a small capacitor. An inexpensive ¼-wave antenna was implemented using a piece of #10 electrical wire soldered into a banana plug.

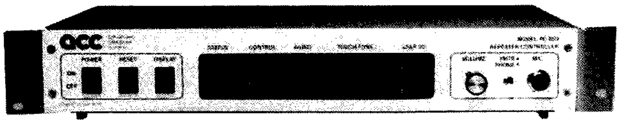
Also, for the needs of the Sharon, Massachusetts, Civil Defense group for whom this receiver was designed, the latching diode (D6) was disconnected. Our philosophy is that in time of civil emergency the intent of generating an alarm is to alert *available* personnel. If within the vicinity of the receiver, they will respond by switching to the audio mode and following the broadcast instructions coming over the repeater. If they are not around or available, latching the alarm will not serve any useful purpose. This is obviously a policy decision based on individual need.

One of the obvious advantages of this system is that any DTMF tone pair can be used. Using # or * has the advantage that they are not normally used tones in a repeater with a phone patch. If, however, it is felt that using known (and easily generated) tones can cause false alarms, then any pair can be used simply by designing simple multivibrator oscillators driving speakers and holding them against the microphone of a transmitter. Only authorized personnel would be issued coders.

The first prototype was built using perfboard and placed in continuous operation in the spring of 1980. As of this writing it has never "falsed" yet and continues to respond when needed upon adequate application (several seconds) of the coded tone pair. The unit is self-tested merely by unplugging and replugging the ac power by virtue of the momentary-charging current to the two time-delay capacitors, CA1 and CB1, applied through the base-emitter junction of the PNP drivers. That, by the way, is why the capacitors are connected to ground and not the supply rail, and why resistors RA3 and RB3 are required (to prevent burnout of the junctions).

One final comment: A more secure three-tone system is possible with no further modification of the receiver. Merely reconnect the 1050-Hz filter/amp (disconnecting the bias resistor RB1) and now a simultaneous three-tone signal (of which 1050 Hz is one) is necessary to trigger the alarm. Of course a proper three-tone generator would have to be designed. Other options are available if the filter frequency is altered from 1050 Hz.

We believe this design achieved our initial objective of providing a relatively inexpensive alert receiver wth minimal modifications and additions to an existing receiver. At the same time it did not require an elaborate code-generating device. It also does not require modifications to or need the use of other 2-meter equipment. ■



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Trimming the Fat from ATV

Why use 3 MHz when 500 kHz will do? WB6FHD proposes a way.

My colleagues of the Southern California Amateur Television Club have been asking me to submit an extended article to *73 Magazine* since my brief presentation of this concept at our monthly club meeting, July, 1980, and its subsequent publication in our August newsletter. My purpose in publishing this article is to stimulate those of my radio amateur colleagues blest with true scientific creativity to develop this concept into a refined state-of-the-art system of global amateur radio television communication.

The development of a practical narrowband system of real television, in the true sense of the word, is of tremendous importance at this time, because every time we turn around, this or the other big commercial interest wants to lobby the FCC to give them portions of our amateur bands for their own private use, even though other amateurs in other countries still continue to use these same frequencies. My proposal not only will result in making it possible to transmit a picture almost similar in quality to a commercial televison station, but will do it in only one-twelfth of the usual channel bandwidth normally required. It will do this as low as six meters if we get together and petition the FCC with a proposal for experimental narrowband television privileges on the almost disused upper three-fourths of the band.

Another reason I want the experimentation to be on six meters is that occasionally there are some pretty good band openings into other countries.

I want to give thanks to Al Lipkin W3AEH, whose narrowband TV article in the 1964 ATV Experimenter Anthology (by *73 Magazine*) inspired me to carry his idea through the next few logical steps to the present engineering conceptualization of the entire system, all the way from camera to TV receiver. I sincerely hope that this article will start an avalanche of contributions by other engineers—as happened with SSTV exactly twenty years ago.

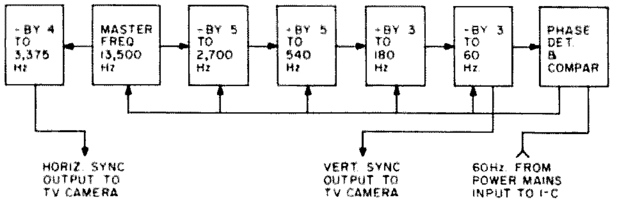

Fig. 1. The sync-generator countdown frequency-divider chain.

My profession is electronics-concepts design engineering, but I was caught in the aerospace layoffs of 1969 and have not been active in it since then. This means I am not up on the newest devices and technology, and accordingly will not submit any schematics.

The most interesting things about this proposal are that:

- The entire channel, video and sound combined, can be fitted into a bandwidth of only 500 kHz.
- The video and sound signals are generated independently, each crystal-controlled, both just above 10 MHz.
- Using simple SSB techniques (but no balanced modulator), the lower vestigial video sideband is completely filtered out, like an SSB signal, while retaining the carrier (for the present, but some day . . .?).
- The signal is now heterodyned from just above 10 MHz upward in frequency to the region between 51 and 54 MHz, where the maximum video modulating frequency will be less than one percent of the final transmitting carrier frequency, as with good engineering practice.
- The scanning standards will be: 225 lines per frame, 4:1 interlace, 15 frames per second, 60 fields per second, 56.25 lines per field.

The horizontal deflection frequency will be 3,375 Hz, and the vertical deflection frequency will be 60 Hz. The synchronizing pulses for the TV camera are generated by solid-state frequency divider-comparators and a phase-locked loop. The master frequency for the countdown (frequency-dividing) sequence will be 13,500 Hz.

To obtain the horizontal sync pulses, some of the master-frequency oscillator output goes to a divide-by-four device, output, 3,375 Hz. To obtain the vertical sync pulses, some of the master-frequency oscillator output (13,500 Hz) goes to a series of divide-by devices (see Fig. 1) resulting in an output of 60 Hz. This sync generator will provide the camera's modified horizontal and vertical sweep oscillator/amplifiers with the complex sync necessary to scan a 225-line, 4:1 interlace raster on the camera's vidicon image tube.

If the usual practice of ATVers is to be the case, this system will work fine, as there will be no discernible flicker if the motion in the image is not excessively rapid. We ATVers who use vidicon TV cameras know better than to either pan the camera quickly or go suddenly from a bright to a

dimly-illuminated scene, as we get smear in the image. The reduced horizontal scan rate will increase the vidicon's light sensitivity due to the photoelectric/photon-charge-storage principle, so an ordinary table lamp should suffice to light up the shack.

You might ask, why use only 225 lines in the image? Commercial television uses 525 lines; wouldn't the picture have less than half the sharpness, resolution, and detail of standard TV? Believe it or not, unless you have a huge screen and are almost sitting on the set, you probably won't even notice the difference. Have you seen how sharp the picture is on a 14" surveillance-camera monitor TV screen, or how crisp the detail is on your living room TV set when the kids are playing with the TV game? Those security systems and the TV games have one thing in common: The images are non-interlaced, and provide an image of only 262.5 lines on a security monitor or on any TV set.

I'm sure you're all wondering by now how a TV set can receive both a 525-line *and* 262.5-line image! Did you know that when your TV set is not receiving a signal, it is scanning only 262.5 lines on the screen? Whether or not you're receiving a signal, an interlaced signal or a non-interlaced signal, the TV set's scan oscillators don't change frequency. The 2:1 interlace system used in commercial television allows twice the number of scanning lines (and, therefore, vertical image detail) to be scanned by the TV camera than its scan-system oscillators, actually operating at no difference in frequency, would normally scan.

Whether the camera is scanning 262.5 lines or 525 lines, the maximum video frequency in the camera output is exactly the same. A 525-line non-interlaced picture would require a horizontal deflection frequency of twice that used for an interlaced system, and the maximum video frequency also would be twice that of an interlaced system. As for the difference between the 262.5-line picture which was discussed earlier and a 225-line picture, the difference amounts to only 37.5 lines—slightly noticeable, yes, but only if you had a 262.5-line picture being displayed on another TV set of the same screen size alongside.

In practice, a 14" screen is about the largest practical size for a 225-line TV system, and at a viewing distance of eight feet, no line structure can be resolved by the eye. The 4:1 interlace system outlined in this proposal consists of transmitting four coarse-scan fields, each consisting of 56.25 lines, in 1/15 of a second, to form a complete frame of 225 interlaced scanning lines.

The requirements for designing a 4:1 interlace system are as follows: The master frequency must end in a zero, and each divider stage downward in frequency must also end in a zero, all the way down to the mains-power frequency. The vertical scanning frequency must be the same as and lock to the mains-power frequency. The horizontal scanning frequency must be 1/4th of the master frequency, and end in the whole number five. The total number of lines comprising a frame, when divided by four, must end in the decimal .25 in the lines-per-field count.

Only a very limited number of different 4:1 interlace line-count systems which are mathematically possible are practical for a television system of this kind, and far fewer can be constructed to work, much less work reliably, if a relatively high frequency must be divided to a far lower frequency in just one device. This is because of these three big problems to be solved: stability, obtainability, and cost.

The following is for a 225-line-per-frame system with a 3×4 aspect ratio: The horizontal deflection frequency of 3,375 Hz is derived by multiplying the rate of frames per second (15) times the line count per frame (225). If the line-per-frame count is divided by four, we get the line-per-field count of 56.25, as four of these interleaved fields are scanned consecutively to form one complete frame. The usable lines and portions thereof for the image with any line-count or aspect-ratio scan system are approximately and on the average only 5/6ths of the total lines scanned, due to loss of lines during vertical retrace time, vertical and horizontal overscan on the camera image tube, and other scanning efficiency factors.

To calculate the maximum video frequency which will be produced by a television system, we first consider the aspect ratio (the ratio of height to width). In America, we use an aspect ratio of three units high to four units wide, or 3×4. Converting the 225-lines per frame to picture elements (pixels), we have 225 pixels vertically. As we have a 3×4 aspect ratio, 225 pixels is therefore only 3/4ths of what must be the horizontal pixel count; it follows that the horizontal pixel count is 300. The total number of pixels per frame, then, is 67,500, and multiplied times 15 frames per second is 1,012,500.

We must now divide this large number by 2, as at this point it must be understood that the maximum video frequency consists of alternate black and white squares on each scanning line, a black and white pair equaling one full cycle. When the video signal is closely examined, however, it is found that only the black (or only the white) squares count as the maximum measured video frequency. Therefore, 1,012,500 cycles divided by 2 is 506,250, and as we only have 5/6th efficiency, it follows that the maximum video frequency is 421,875 Hz.

For the sake of making things slightly easier, divide the product of total pixels times "rep-rate" by 2.4. (1.012,500 divided by 2.4 is 421,875.) Using the same system to calculate the maxium video frequency of a conventional commercial TV camera, 525 pixels × 700 pixels is 367, 500 pixels × 30 frames/second is 11,025,000 divided by 2.4 is 4,593,750 Hz.

In commercial practice, a filter limits the maximum video frequency to 4,000,000 Hz. As this 225-line system is incompatible with commercial television standards, it must be pointed out that commercial vacuum-tube TV camera and TV sets can be modified easily to a 225-line system, and what's more, I'll tell you just how to do it, too!

To begin with, the vertical deflection circuits in both TV cameras and TV sets aren't touched at all, as both systems are locked to 60 Hz. The TV camera conversion, first of all, must have the solid-state sync-generator board installed within, along with its power source. The horizontal-sweep circuitry will have to be modified from a frequency of 15,750 Hz to 3,375 Hz. If the vidicon won't fully scan horizontally, either more energy is required or the associated deflection coil hasn't enough inductance to give a good reactive load at this much lower deflection frequency.

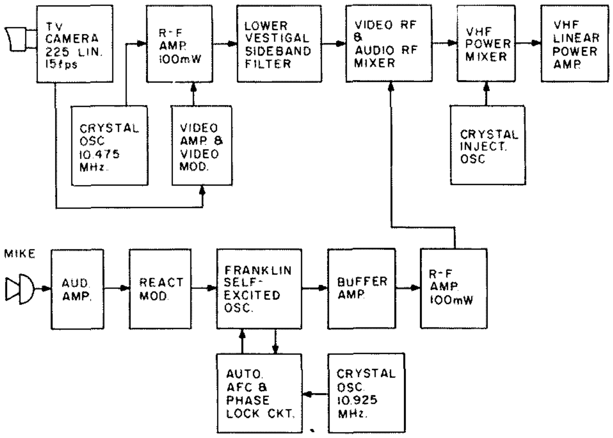

Fig. 2. The rf-generator video and audio-exciter chain.

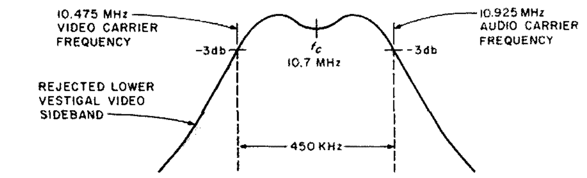

Fig. 3. The over-coupled, double-humped-response curve of the modified 10.7-MHz i-f transformer used in the output/filter circuit of the video-modulated rf amplifier.

Instead of the high-impedance horizontal-sweep tube, a silicon PNP transistor may have to be used, as its output impedance is low, and at 3,375 Hz it will be "looking into" a load which will be closer to a correct impedance match.

The receiver conversion will be fun. The horizontal-oscillator/amplifier circuit will continue to provide the picture tube with high voltage, but that's all. The afc circuit will be disconnected from both the horizontal oscillator and the horizontal-output transformer, and the horizontal deflection coils will be disconnected from the same transformer. A solid-state horizontal-oscillator/amplifier circuit will be built using the latest state-of-the-art phase-locked-loop technology to "lock the sync" even under adverse conditions of heavy QRM.

As with the TV camera, a silicon PNP transistor will likely be required to directly drive the horizontal-deflection coils. The metal case of the transistor will be grounded directly to the metal chassis of the TV set (and remember, the transistor's case is the collector) and the emitter will be connected to the sawtooth-scan side of the horizontal-deflection coils. The other end of the same coils will go to the plus side of the transistor's power supply. Since both the horizontal sweep frequency and the circuit impedances are now much lower than before, the diode damper normally required in the horizontal-output circuit should not be needed. Of course, the one in the high voltage power supply will naturally remain, as it is part of the "bootstrap" power supply associated with the high-voltage circuit to the picture tube.

An electron-beam squelching circuit will have to be added to put a dc voltage on the picture tube's electrode which blanks out the vertical retrace lines, because when no signal is being received to cause a fully 4:1 interlaced raster to appear on the screen, the free-running deflection circuits in the modified TV receiver will be scanning only 56.25 lines on the picture tube. This much-reduced scan of only one field will be intensely bright and will permanently damage the phosphorescent coating on the face of the picture tube with ugly brown horizontal streaks from which little or no useful light will come. Remember, 3,375-Hz horizontal-scan frequency divided by 60 Hz vertical-scan frequency equals 56.25 lines on the picture tube!

Now, on to the signal circuits. The TV set's tuner must have the swamping resistors removed to narrow down the band-pass to around 500 kHz. The channel 2 coils will be our concern here, as the signal coils will be centered between 51 and 54 MHz, say, 52.5 MHz. The oscillator will be modified to tune this range, but 23 MHz above. Why 23 MHz? Only the older TV sets had an i-f that low; all modern TV sets use 40-MHz i-f amplifiers! Well, first of all, the modern i-fs are twice as broad as we need, so they'll have to go—and be replaced with some Miller (or other) bifilar-wound 20-MHz i-f transformers, with best Q at around 23 MHz. All of the swamping resistors associated with the former i-f transformers are to be removed, of course. All of the i-fs will be tuned to the same frequency, not only for best gain, but with three i-f stages—optimum bandwidth, too. At the output of the last i-f stage, the bandpass should be around 500 kHz at −3 dB.

If it is desired to use an intercarrier sound-recovery system, it will operate on a frequency of 450 kHz, as this is the heterodyne difference frequency between the picture and sound carrier frequencies. 455 kHz i-f transformers will tune down here easily. The sound system is NBFM with plus and minus 5-kHz deviation. Another way to recover the sound is by using a low-band FM communications receiver made to tune below 30 MHz to the region between 22 and 24 MHz. The local oscillator should be converted from crystal control to self-excited, with the tuning control on the front panel. An afc circuit should be added to prevent drifting off center frequency.

Now we get to the *piece de resistance*, the rf generator. A block diagram is shown in Fig. 2. The video circuit will consist of a crystal-controlled oscillator driving a very low-powered amplifier with an output below 100 mW. This amplifier will be grid- or cathode-modulated by a video amplifier/modulator, supplied with composite negative-going video and sync by the modified TV camera. The output of the video-modulated amplifier will pass through a lower vestigial video-sideband filter composed of a large 10.7-MHz FM i-f transformer with overcoupled primary and secondary windings; this is in order to slightly broaden the bandpass and form the characteristic double-humped response curve.

Other components of the filter include a tunable 10.7-MHz series-T rejection trap, and a few crystals—in order to put a deep, wide notch just below the video-carrier frequency so that the lower vestigial video sideband will be completely filtered out. The video-carrier crystal oscillator will operate at a frequency of 10.475 MHz. The audio-carrier crystal oscillator will operate at a frequency of 10.925 MHz. These two frequencies are 450 kHz apart; both are sym-

metrically on opposite sides of the 10.7-MHz center frequency of the i-f transformer, and both, therefore, are the same number of dBs down on the transformer's response curve.

The FM audio signal's rf does not pass through the same i-f transformer used in the output/filter circuit of the video-modulated rf amplifier, but it will pass through a similar transformer in the output of the video rf/audio rf mixer. The 10.925-MHz FM audio generator will have one crystal oscillator and one afc phase-locked loop self-excited oscillator, both operating on the same frequency. The time constant of the afc/phase-lock circuit will allow for FM carrier deviation.

Now comes the rest of the answer to the question I'm sure all of you are asking by now, which is: Why does he keep harping on six meters? Doesn't he know that the FCC would never allow "that sort of thing," and hasn't he heard about the "national band-apportionment plan"? Well, I'll tell you, at the risk of sounding like some sort of rebel.

First of all, about FCC—how many of you can remember back when we could do anything we wanted to do on those ultra-shortwave bands? I do! As for this so-called national band-appointment plan, how many of you out there really agree wholeheartedly with how two meters and now 220 have been and are being chopped up into neat little slices for all of those open and closed machines?

Where are those "wide open spaces" we knew in the 40s and 50s where we had megacycles to burn? I know, I know—progress! OK, fine. Two things I know: A long time ago, I read somewhere that no one has a monopoly or right to any "personal" frequency in the "ham bands"—and I've got a box full of crystals for six and two meters and I guess a lot of them must fall across repeater-band edges and outputs!

'Nuff said? I think so, too, so let's get back to business. By now, at least a few of you must be wanting to say, Hey! How can a country with a different mains-power frequency than ours send us a picture with a 50-Hz vertical-deflection frequency and some cockamamie horizontal frequency and we receive it?

That's easy! All you have to do is remember that your TV set doesn't care what it gets—just design enough latitude into your horizontal and vertical hold controls and their phase-locked-loop circuits, and you can reach out and hold on to the "man in the moon"!

Next question: How about color? Thought you'd never ask!

Let's get black and white off the ground first (!) but, since you won't get any sleep unless I tell you, here goes. Yes, of course, the present American or European systems can be converted to work with my system. The TV receiver should have many adjustments (like a scope) so that any scan system, type, and polarity of sync or modulation can be received. Incidentally, I've got another, even narrower-band system of real TV which I can tell you about. It would fit into an FM channel. Of course, it wouldn't have nearly the definition or quality of what I'm offering you here. However, I'll give you one more hint. It would be like slow scan, but real TV. Cheerio! ■

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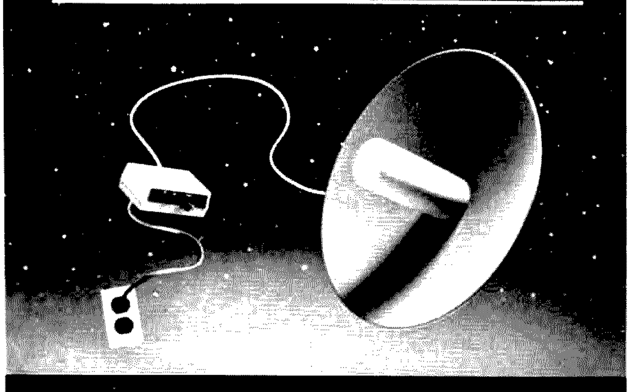

The Saturn V is a deep fringe microwave receiver for homeowners that are outside of the service area of local pay TV stations (i.e., HBO, Showtime) It is normally used within line of sight of a transmitting tower in a 50 mile range and is simply attached to your TV antenna mast. This unit is completely ready to install including all cable and mounting hardware. It is designed to be installed by the homeowner

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The Forgetful Autodialer Puzzle

Even Sherlock couldn't figure out how to make an autodialer that reprograms with no hardware changes. Elementary, says dear Batie.

Howard F. Batie W7BBX
12002 Cheviot Drive
Herndon VA 22070

Photo A.

Among some autodialer designs for 2-meter mobile autopatch use, a common limitation has been a lack of programming flexibility.[1,2,3] Although it is much easier to design and implement a diode-logic or PROM scheme for storing phone numbers, changing or adding a telephone number can be quite inconvenient for hard-wired systems or PROM-based designs. In this design, programming is done directly from the tone-encoder keyboard and allows programming of up to eight phone numbers. Numbers which are not programmed can be dialed directly from the keyboard in the normal manner.

The primary disadvantage of a RAM-based design is the requirement to continuously power the RAM to overcome its volatility. However, when you consider that an ample power source is available at both places in which an autodialer has a real application (your car and the shack), the disadvantage is more than offset by the ability to reprogram the memories very quickly and easily. Since the circuit described here has a total continuous current drain of only about 45 mA from a 12–15-volt source, it may be connected directly to the car battery without fear of running it down, since cars usually do not sit idle for weeks at a time. If complete disconnection is necessary, each phone number can be reprogrammed as quickly as the phone number can be manually dialed.

The RAM used was carefully selected after considering all available CMOS and bipolar memories; the logic support circuitry was then designed to meet the needs of the RAM. The most important constraints were that the RAM have bidirectional input/output lines and that these lines be tri-state. These requirements were necessary in order to significantly reduce the circuit complexity and cost while still permitting the keyboard to be used manually without affecting the stored phone numbers. Of secondary importance, it was desired that the RAM

be organized 8 bits wide to allow direct interface with the seven data lines of a 3×4 keyboard matrix. The RAM selected was the Texas Instruments TMS 4036 since it met all of these requirements.

Description

Fig. 1 shows the complete autodialer schematic; connections to the transceiver are shown in Fig. 2. The autodialer memory holds up to eight numbers of up to seven digits each (* and # count as digits); therefore, the number actually stored may be either a standard 7-digit telephone number or an autopatch access code of from 1 to 7 digits in length. The total number of phone numbers in memory is a function of the RAM organization, in this case 64×8. With selection of a different RAM, more or fewer telephone numbers could be stored. For example, if the RAM organization were 128×8, sixteen phone numbers could be stored. Eight 8-bit words are required to completely store each 7-digit telephone number.

Inclusion of D2 and D3 drops the voltage supplied to the RAM from +5.0 volts down to about +3.5 volts. This decreases the current required by the entire autodialer from 65 mA to about 40-45 mA. Reliable data retention is maintained with this RAM as long as the Vcc pin remains above +2.8 volts dc.

In addition to direct programming from the encoder keyboard, other features of the autodialer include a speed control to vary the rate of readout, an onboard audio amplifier to allow you to hear the tones sent to the transceiver, a visual indication to aid in both programming and readout, and a minimum number of controls. The autodialer may also be used as a "standard" tone encoder to manually dial

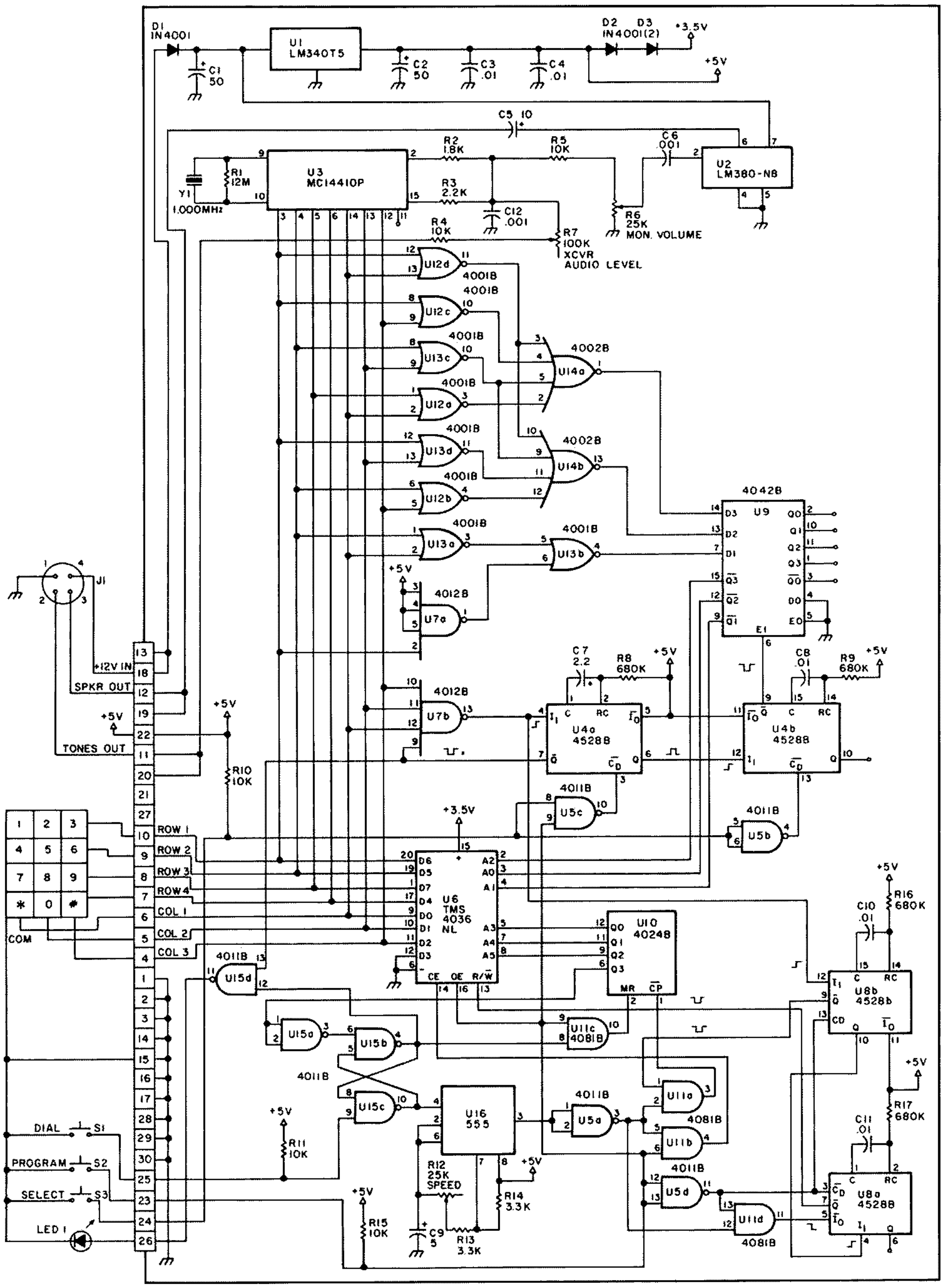

Fig. 1. Schematic diagram.

phone numbers or access codes which are not programmed directly into the memories.

Operation

Selection of one of the eight stored phone numbers is accomplished by depressing the appropriate keyboard digit (1-8) while holding down the SELECT push-button, S3. This action latches the logic state of three RAM address lines (A0, A1, and A2), and is used to select the desired phone number location for either autodial readout or programming. The selected phone number will then be available until a new one is selected; neither manual operation of the keyboard nor autodialing the stored phone number will alter the selection of the phone number.

To program the autodialer, the phone number digits are keyed in on the tone encoder keyboard with the PROGRAM push-button, S2, held down. This action routes the U8b output pulse produced by each keyboard digit depression to the clock input of the counter, U10. When each digit key is depressed, LED1 will light for about half a second; when it goes out,

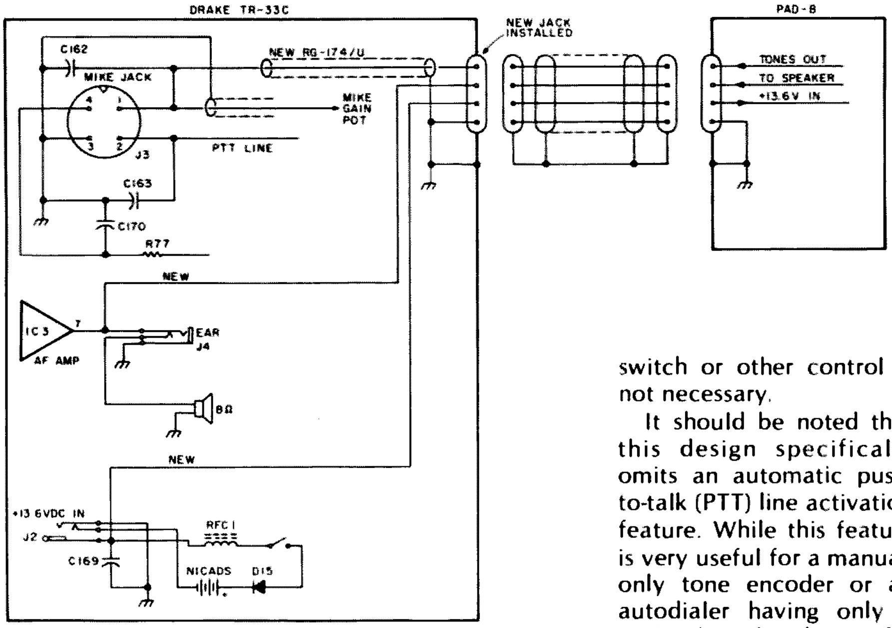

Fig. 2. Typical transceiver connection detail.

that digit has been programmed in and the next digit may be programmed. If only four digits are to be programmed (as in an access code), they are keyed in in the same manner.

Then, after the last digit has been entered, tap the DIAL push-button, S1, while keeping the PROGRAM button down. This activates the clock and steps the address counter, U10, through the remaining memory addresses for the selected phone number. Whatever information may have been stored previously in the latter part of the 8-digit memory segment is automatically erased. The LED will light up while the clock cycles through the unused digits; when it goes out (or when all the digits have been entered into the memory), release the PROGRAM push-button, and the memory is ready to be autodialed.

To read out (autodial) a phone number, simply select the phone number you want and press the DIAL push-button, S1. LED1 will light up during the autodialing sequence; when it goes out, the number has been completely autodialed.

In the manual mode, the tri-state memory data lines are always in the high-impedance OFF state; the keyboard activates the tone encoder, U3, and the encoder tones are fed directly to the transmitter mike input. Since the autodialer is always ready to dial a phone number manually (except when programming or during autodial readout), a separate manual/autodial switch or other control is not necessary.

It should be noted that this design specifically omits an automatic push-to-talk (PTT) line activation feature. While this feature is very useful for a manual-only tone encoder or an autodialer having only a PROM-based scheme for storage of phone numbers, incorporation into a keyboard-programmable autodialer based on a RAM design is actually undesirable. In a ROM-based scheme, the manual keyboard is used only for dialing unprogrammed numbers; however, in a keyboard-programmable RAM-based scheme such as this one, the keyboard serves two additional functions—selection of the phone number to be autodialed and programming of the actual digits. This also eliminates panel clutter by making additional controls unnecessary. Inclusion of the automatic PTT feature on a keyboard-programmable autodialer would activate the transmitter when selecting or programming a phone number. This is undesirable and was avoided, allowing off-the-air phone number selection, programming, and autodial readout monitoring. The microphone PTT switch is used in the normal manner to key the transceiver for both speaking and for autodialing.

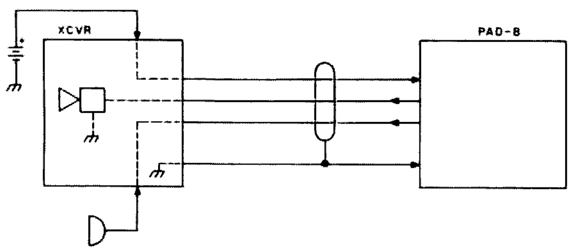

Fig. 3. Connection as shown for Fig. 2. Power is derived from transceiver and transceiver speaker is used for monitor.

Construction

A conscious effort was made to keep the overall size of the finished autodialer to the minimum necessary, so that installation in the car would not be hampered by a bulky cabinet. A large and expensive multideck rotary switch for phone number selection was eliminated from an earlier design, as was an internal monitor speaker. The final PC board design and layout now incorporates keyboard-selection of the phone numbers and still retains the on-board audio amplifier to permit monitoring the encoder tones in the speaker of your transceiver.

The requirement for bulky panel controls in an earlier project[4] has been eliminated by incorporating the panel control functions within the logic design. The result is a very compact unit which retains all the necessary features. A standard LMB enclosure (CR-531) was chosen, based on its small size and neat appearance, and the PC board was laid out to conform to it.

The PC board itself measures 2½" × 5¼" (6.35 cm × 13.34 cm), is of top-quality commercial-grade G-10/FR-4 material, is double-sided with plated-through holes, and contains all of the components required except the three panel push-buttons, the input/output jack, and the LED. Connection to all panel controls is eased by providing all required logic and power signals to a central location on the PC board; a ribbon cable can then be used to interconnect the PC board with the panel controls. All panel, signal, and panel-control lines are also available at the dual, 15-pin edge-connector fingers on the PC board (0.156"/3.96 mm spacing). By laying out the PC board in this fashion, maximum flexibility is afforded for selection of any convenient-sized cabinet or, if desired, the panel controls can be remoted entirely from the autodialer PC board through an edge connector.

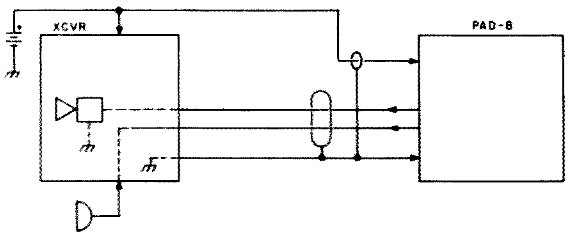

Fig. 4. Autodialer power is derived directly from car battery; transceiver speaker is used for monitor.

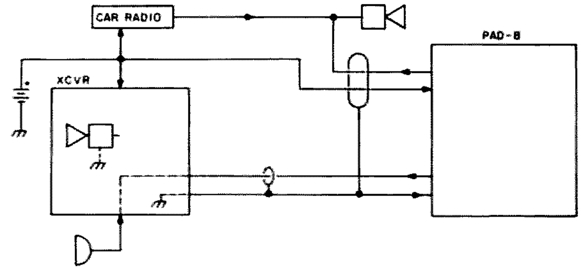

Fig. 5. Autodialer power is derived directly from car battery; car radio speaker is used for monitor.

Installation and Adjustment

Autodialer interconnections to your 2-meter transceiver include the +13.6-volt supply line, tone encoder output, and the audio amplifier output; these should be shielded between the autodialer and transceiver as shown in Fig. 2. The TONE jack on the rear of my Drake TR-33C was replaced with an audio DIN jack. Although a six-pin jack was used (for possible future access to other parts of the transceiver), only the three lines mentioned above plus ground are required by the autodialer.

The supply line can be run to a +13.6-volt source separate from the transceiver, if desired, permitting use of a standard 2-wire shielded mike case between the autodialer and transceiver. The autodialer tone-encoder output is extended through a short piece of RG-174/U to the transceiver microphone jack; the coax shield need not be grounded at the mike-jack end. The audio amplifier, U2, is connected directly to the transceiver speaker; normal transceiver audio is not affected and this arrangement eliminates the need for a separate speaker. The wire to the speaker inside the transceiver cabinet need not be shielded. The tone encoder output can be interfaced directly with either low-impedance microphone inputs (e.g., TR-33C) or with high-impedance inputs (e.g., the Heath HW-2036A).

Only three adjustments are necessary for proper operation of the autodialer. The speed is set by R12 to give a total autodial duration of about one second for all seven digits. The tone encoder output level into the transceiver microphone input is adjustable by R7. If a deviation meter is available, the tone-encoder output may be set to yield a deviation of about 4.5 kHz when any keyboard digit is held down.

Alternatively, the level may be adjusted by ear with the help of another operator on the repeater to a point which gives reliable autopatch access and dialing operation but which does not sound distorted (over deviated). The last adjustment is to set the audio-amplifier output level to give a comfortable and undistorted speaker volume under road conditions. R7 is the trimmer which does this. If the external audio monitor is not desired, R5, R6, C5, C6, and U2 can be eliminated altogether.

Final Notes

The addition of the autodialer described here has made a great improvement in the ease and enjoyment of using the local autopatch repeaters and has certainly decreased the risk of becoming a potential traffic statistic while trying to dial a phone number. Further, the ability to rapidly and conveniently program or reprogram phone numbers in the memories is greatly appreciated, especially when access codes are changed periodically. In addition, performance of the autodialer has been absolutely flawless throughout three very cold winters and hot summers, and I'm looking forward to many more years of enjoyable repeater autopatch use with this autodialer.

The printed-circuit board for this project and a 10-page illustrated step-by-step assembly manual are available from me for $10.00 postpaid in the US. I'll be happy to answer questions about the autodialer, but please include an SASE. ■

References

1. Crawford, John, "An Automatic Dialer for Deluxe Mobile," *73*, January, 1976.
2. Lloyd, Bob, "Mobile Autodialer," *73*, June, 1976.
3. McEwan, Don, "A No-Hands Telephone Dialer," *73*, January, 1977.
4. Batie, Howard, "A Programmable Contest Keyer," *Ham Radio*, April, 1976.

Parts List, PAD-8

C1—50-uF, 16-V tantalum	Y1—1.000 MHz crystal
C2—50-uF, 16-V tantalum	
C3—.01-uF, 16-V disc ceramic	LMB CR-531 cabinet
C4—.01-uF, 16-V disc ceramic	
C5—10-uF, 10-V tantalum	Digitran KL-0054 keyboard
C6—.001-uF, 16-V disc ceramic	
C7—2.2-uF, 10-V tantalum	IC Sockets:
C8—.01-uF, 16-V disc ceramic	8 pin—2
C9—4.7-uF, 10-V tantalum	14 pin—8
C10—.01-uF, 16-V disc ceramic	16 pin—4
C11—.01-uF, 16-V disc ceramic	20 pin—1
C12—.001-uF, 16-V disc ceramic	
	#4 Hardware:
D1-D3—1N4001 Si rectifier	¾" bolts—4
	¼" bolts—4
J1—MAS-4/MAB-4 (two)	Nuts—16
	Lockwashers—16
LED—MV5023 or equivalent	
	8" 12-conductor ribbon cable
S1-S3—SPST mom. push-button (normally open)	
U1—LM340T5, uA7805, etc. (TO-220 case)	
U2—LM380 (8-pin) Do not substitute	
U3—MC1441OP Do not substitute	
U4—MC14528B, CD4528B, etc.	
U5—MC14011B, CD4011B, etc.	R1—12 meg, ¼ W
U6—TMS 4036NL Do not substitute	R2—1.8k, ¼ W
U7—MC14012B, CD4012B, etc.	R3—2.2k, ¼ W
U8—MC14528B, CD4528B, etc.	R4, R5—10k, ¼ W
U9—MC14042B, CD4042B, etc.	R6—25k PC trimmer
U10—MC14024B, CD4024B, etc.	R7—100k PC trimmer
U11—MC14081B, CD4081B, etc.	R8, R9—680k, ¼ W
U12—MC14001B, CD4001B, etc.	R10, R11—10k, ¼ W
U13—MC14001B, CD4001B, etc.	R12—25k PC trimmer
U14—MC14002B, CD4002B, etc.	R13, R14—3.3k, ¼ W
U15—MC14011B, CD4011B, etc.	R15—10k, ¼ W
U16—NE555V, LM555, etc.	R16, R17—680k, ¼ W

Don Carmody W1FLP
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My Own Silver Mine

For W1FLP, reclaiming silver from photographic fixer is cheap, easy, and profitable. King Midas should have had it so good.

I recently purchased a brand spanking new Azden 2m rig. As I was installing it in the mobile, I came to the realization that my total cost was $2.50—yes, that is correct—two dollars and fifty cents! No, it was not "hot!" I paid a local dealer full list price.

Knowing that many brother hams are also amateur photographers, I thought they might have an interest in how to obtain goodies for the shack at a relatively low cost. The secret is in silver reclamation.

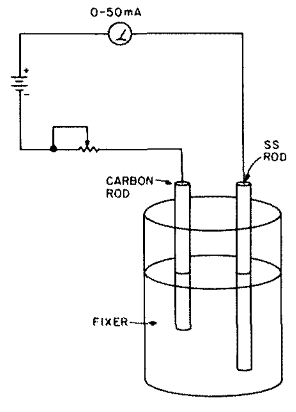

Fig. 1. Typical electrolysis circuit.

Silver reclamation is generally thought to require expensive capital equipment and in large photo labs it does, but for the amateur, the equipment can be very simple. How simple is determined by the amount of silver-saturated solution you have, how rapidly you obtain it, and how fast you want to reclaim it.

The silver-saturated solution referred to is the photographic fixer in every darkroom. The process of fixing photographic film removes the unexposed silver crystals from the film. This silver remains in solution in the fixer. The more film processed, the more silver in solution.

With the price of silver what it is, it doesn't take much math to find the "break-even" point at which investment in capital equipment is desirable.

For hams, using their innate ability to scavenge junk boxes to produce working apparatus, there is an inexpensive, easy method to reclaim impressive amounts of silver at very low cost.

The method I use is electrolysis. Basically, it is accomplished by passing a current (dc) through the solution, thereby "plating" out the silver. Industrial concerns use large containers with large currents and constant circulation of the solution.

I will not get into the math required to determine the current and voltages; the important parameter is the current density required to reclaim 90% to 98% pure silver. The current density needed is determined by the amount of silver in solution, the surface area of the electrodes, and the level of circulation of the solution. A typical electrolysis circuit is shown in Fig. 1.

Any dc supply can be used; regulation is not required. A simple half-wave rectifier without filtering will do fine.

The simple system I use is a 1.5-V alkaline battery, a potentiometer, a 0-50 mA dc meter, a stainless steel rod, and a carbon rod. The 1.5-V battery and the pot can be replaced by any available power supply, with an increase in the cost of silver recovery.

When a dc current is passed through the solution, the silver is plated out onto the stainless steel rod.

It is important to monitor this plating process until you arrive at the correct dc current (current density) for your individual setup. The plated silver should appear white to light cream-colored. If it appears dark cream to brown, the current density is too high. A darker color means that higher amounts of contaminants are being plated out.

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GUY N2CJW

Reduce the current. The color changes can be seen in seconds, so if it has not been dark for more than a few minutes, no harm has been done.

High current densities without circulation of the solution will result in lowered purity of the plated-out silver plus a chemical change in the fixer that will reduce the amount of silver you can reclaim.

When the silver has built up to a thickness of between 1/8 inch to 1/4 inch, remove the stainless steel bar holding the silver, rinse it in warm water, and let it dry.

To remove the silver, spread out a plastic or paper sheet, strike the plating sharply with a screwdriver, and it will crack. Simply chip off the plating until it is all removed. Return the stainless steel bar to the silver mine and continue.

Of course, this mine is not bottomless. The fixer solution will eventually become so low in silver content that it must be replaced with fresh solution. Fresh solution, in this case, means solution that has been used to process film and is no longer useful for fixing film because it is saturated with silver.

There are many methods to determine the useful plating life, i.e., silver content, of the fixer. The easiest but least accurate is the color of the solution. When it turns the color of medium strength tea, replace it. The more accurate method is to use the Kodak Silver Estimating Test Papers, cat. no. 1965466. When dipped in the solution, this test paper will turn from its normal yellow to some shade of brown. The darker the color, the higher the silver content remaining in solution. There is a color comparison chart on the back of the Kodak folder. I generally discard the fixer at a remaining silver level of 1 gram/liter.

To set up this simple silver mine, I used a carbon rod from a discarded D-cell battery, a 6-inch stainless steel rod, a 1-lb. plastic margarine container, and a battery, pot, and meter as previously described.

With no agitation of the solution, I maintain a current of 5 mA. I have been plating out approximately 3 ounces troy of silver per month. I am blessed with the availability of 12 gallons of fixer every 12 weeks that has a silver content of approximately 10 grams/liter. The amount of silver you recover per liter will depend upon its starting silver content, i.e., how much film has been processed through it and the average image content of the film.

The effect of the film image on silver content is that a very dark image has most of the silver left in the film. Conversely, a light image has had most of the silver removed. The Kodak test papers can be used to determine this silver content and, barring the probable contamination of the fixer with other chemicals, can be used as a guide to the useful life of the fixer.

The above method requires monitoring but twice daily and fixer replacement when required. If you have plenty of fixer and/or want a faster recovery rate, simply provide a means of gentle agitation. I have successfully used an old clock motor with a plastic shaft with a ½-inch by 2-inch paddle connected to the sweep second-hand shaft immersed in the fixer. This has yielded about an ounce a week. Larger electrodes, higher currents, greater agitation, and larger solution containers will of course increase the recovery rate.

So why throw good money down the drain? Dig into that silver mine and buy some more ham gear. ■

✓See List of Advertisers on page 114

Fun-Equipment Revisited

Here are higher-band versions of the ever-popular Fun-Mitter and Fun-Amp. They are based on the Fun-Philosophy: cheap and simple.

Mark Oman WA0RBR
528 Deines Court
Ft. Collins CO 80525

Home-brewing is alive and well! I reached this conclusion following the response to the publication of my series of "Fun" home-brew gear.[1-4] Response to the simple, low-cost home-brew units has been great, indicating that hams are still building at least some of their own gear. From nearly-Novices to long-time Extras, hams have built the Fun rigs and have discovered that building is easy, fun, and very rewarding.

Many requests have been received asking for different band coverage of the Fun-Mitter and its companions. This article is the result of those requests. It describes a simple CW transmitter for 15 or 20 meters operating off 24 volts and modification of the 20-Watt Fun-Amp for operation on the same bands.

The Fun-Ceiver and Fun-Oscillator are not included in this article on modifications due to instability problems at higher frequencies. Frequency stability is of prime importance with today's rigs and it is just too difficult to obtain the type of results desired on the higher frequencies and still maintain the objectives of the gear.

This second version of the Fun-Mitter is a five-Watt-output, crystal-controlled CW transmitter that uses either low-cost FT243 crystals at one-third the operating frequency or HC6U fundamental crystals on the operating frequency. If the variable crystal oscillator (vxo) capacitor is installed (C option), the frequency can be varied by as much as 10 kHz from the crystal frequency, using HC6U crystals.

This coverage allows enough flexibility to provide plenty of frequencies with only a few crystals. Crystals are cheap, easy to obtain, reliable, and very stable. They make simple transmitters easy for all of us to build!

Philosophy

An early objective with the Fun-Mitter and Fun-Amp was to design simple gear that was easy to build with parts that could be obtained from Radio Shack. The Mark II versions of these rigs follow the same objective with only the crystal and its socket not being found at Radio Shack. Other objectives: costs of less than $25 each, no tuning adjustments, and same size PC boards (2¼" × 3").

These objectives are continued in the higher-band versions. A twenty-meter transmitter and amplifier can easily be built in an afternoon and put on the air without adjustments. (The reader is strongly urged to review the articles on the Fun-Mitter and Fun-Amp for detailed construction and design descriptions.)

Circuit

The circuits remain unchanged from the original designs. The resonant circuit and filter values, however, must be changed to allow operation on the higher frequencies. Radio Shack rf chokes and disc ceramic capacitors again were used.

The Fun-Mitter schematic is reproduced in Fig. 1. The Pierce oscillator operates on the operating frequency using either third overtone or fundamental crystals. (A third overtone is simply three times the value marked on the crystal.) For example, to operate the transmitter on 14.060 MHz, either a 14.060-MHz fundamental crystal can be used or a 4.383-MHz crystal can be operated on its third overtone. (This allows the use of cheaper FT243 crystals in the Fun-Mitter.) Also, on fifteen meters many of the same crystals used for forty meters, when operating on their third overtone, will provide the frequency coverage desired.

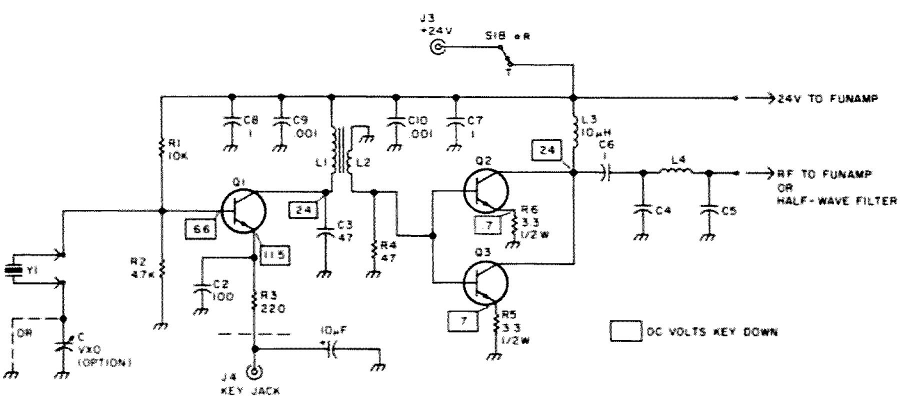


Fig. 1. Schematic of 15/20-meter Fun-Mitter. Reference designators remain the same as in the original Fun-Mitter article in order to match the parts locator for the PC board. Capacitance values less than 1 are in uF.

Fundamental mode crystals in an HC6U holder do, however, have the advantage of more frequency range when used with the vxo capacitor (C option). I have had several HC6U crystals, however, that do not provide a stable, clean oscil-

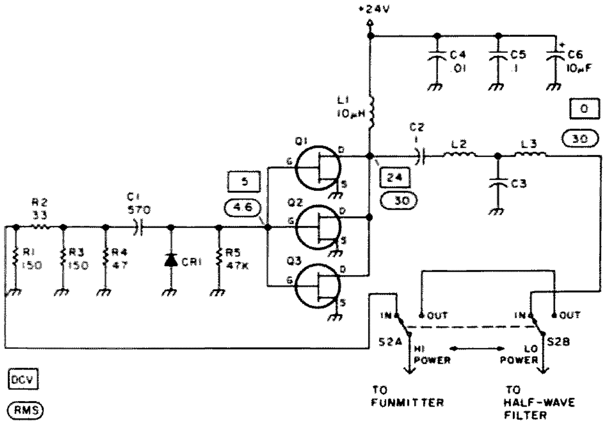
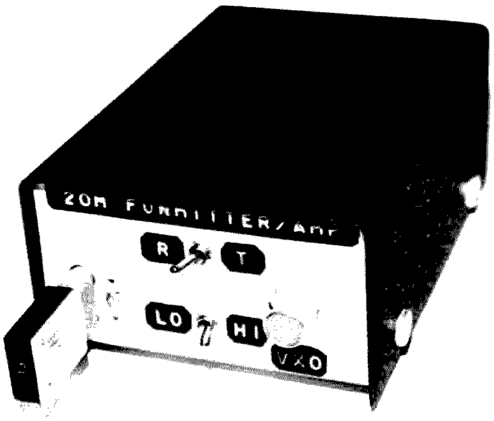


Fig. 2. Schematic of 15/20-meter Fun-Amp.



lator signal, probably due to the higher-than-normal power used in the Fun-Mitter oscillator stage. Although the FT243 will have a range of only approximately 1 kHz with the vxo, it will provide better and more reliable operation. (FT243 4.3- or 7-MHz crystals for use on twenty or fifteen third overtone will not oscillate on exactly three times the marked frequency. Depending on the crystal, they may be as much as 10 kHz lower than the marked frequency. Keep this in mind when ordering.)

L1 and C3 determine the resonant frequency of the oscillator. If L1 is constructed correctly, the oscillator should oscillate with no adjustments. A three-turn winding (L2) over L1 operates as a transformer to match the collector impedance of Q1 to the base impedance of Q2, Q3 and provide drive. Q2 and Q3 operate in parallel as a class C amplifier which provides good efficiency.

These 2N3866 transistors, Q2 and Q3, are being pushed to their limits in the Fun-Mitter circuit. Under some load conditions, some hams have discovered that Q2 and Q3 can be destroyed. To avoid this, either reduce the supply voltage to 20 to 22 volts or increase the value of R5 and R6 to 4 to 5 Ohms. Also, the 2N3866 part can be replaced with the much more rugged 2N3553. The only other components needing change are C4, C5, and L4 which, together, comprise a pi-network filter. Component values are given in the Parts Lists.

The Fun-Amp schematic is reproduced in Fig. 2. Using the Fun-Amp on other frequencies is even easier than using the Fun-Mitter on other frequencies. Only L2, L3, and C3 need to be modified. The input circuit remains completely un-

Photo A. Front view of twenty-meter version of Fun-Mitter/Fun-Amp.

Parts Lists

Fun-Mitter—Fig. 1

C1-C10	Ceramic disc	272-xxx
C3	20m—47 pF	
	15m—47 pF	
C4,C5	20m—220 pF	
	15m—160 pF (2 220 in series, 1 47 in parallel)	
C option	Broadcast variable (any small variable with maximum capacitance of 100 to 300 pF will work)	
J3	Phono jack	274-386
J4	Phone jack	274-252
L1	20m—20 turns removed	273-101
	15m—24 turns removed	273-101
L2	3 turns wound over Q1 end of L1	
L3	10 µH	273-101
L4	20m—25 turns removed	273-101
	15m—27 turns removed	273-101
Q1	RS-2009	276-2009
Q2,Q3	RS-2038	276-2038
R1-R4	¼ Watt	271-1xxx
R5, R6	Each is three 10 Ω, ½ W 271-001 in parallel	
S1	DPDT toggle	275-1546
Y1	Crystal—FT243, HC6U	

Fun-Amp—Fig. 2

C1-C5	Ceramic disc	272-xxx
C1	570 pF (470 and 100 in par.)	
C3	20m—250 pF (2 47 pF in series, 1 220 in parallel)	
	15m—160 pF (2 220 pF in series, 1 47 pF in parallel)	
C6	10 µF, 35 V dc	272-1013
CR1	1N914 small signal silicon	276-1122
L1	10 µH	273-101
L2	20m—26 turns removed	273-101
	15m—28 turns removed	273-101
L3	20m—24 turns removed	273-101
	15m—26 turns removed	273-101
Q1-Q3	VN67AF VMOS FET	276-2071
R1,R3	150Ω, ½ W	271-013
R2	33Ω, ½ W	271-007
R4	47Ω, ½ W	271-009
R5	47kΩ, ¼ W	271-1342
S2	DPDT toggle	275-1546
	TO-220 heat sink (3)	276-1363
	Case	270-252
	Hardware	64-3012
		64-3019
	Wire	
	Coax	

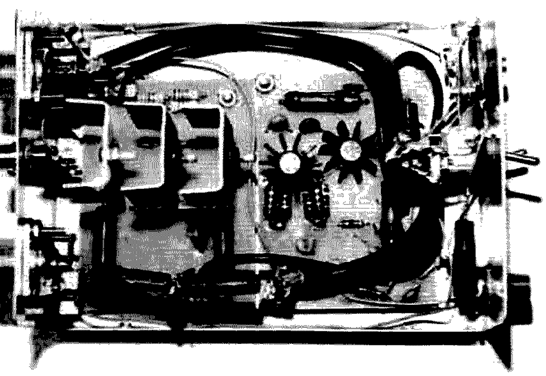


Photo B. *Inside view of twenty-meter version of Fun-Mitter/Fun-Amp. The coil shown connected between the crystal and C (optional) does not exist in the final version of the Fun-Mitter.*

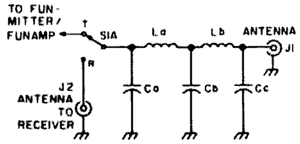


Fig. 3. Half-wave filter for 15/20-meter Fun-Mitter/Fun-Amp. The filter reduces any harmonic radiation to below acceptable levels. It is wired using point-to-point wiring between the antenna connector and S1. The filter provides receiver filtering by placing it before the receiver antenna connector. Values are as follows: use 273-101 10 uH rf choke with turns removed; 272-xxx series ceramic caps.

	20m	15m
Ca	220	150 (100 & 47 in parallel)
Cb	440 (2 220 in parallel)	320 (100 & 220 in parallel)
Cc	220	150 (100 & 47 in parallel)
La	26 turns removed	28 turns removed
Lb	26 turns removed	28 turns removed

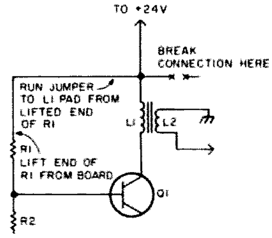


Fig. 4. Modification to allow "spotting" of transmitter (use when using PC pattern from the February, 1981, 73).

changed. This circuit operates very well at 15 and 20 meters due to the excellent frequency characteristics of Q1-Q3. A detailed circuit description is given in the Fun-Amp article.

Two additions have been made to the higher-frequency versions of the transmitter and amp. Fig. 3 shows a half-wave harmonic filter which reduces harmonic radiation. Also, a 10-μF capacitor (272-1013) has been added at the key jack (J4) to shape the keyed waveform and eliminate any key clicks.

Construction

Even though the Fun-Amp and Fun-Mitter are "goof-proof" projects, care and thought must be put into their construction. Although the fifteen- and twenty-meter versions are as simple as the earlier models, it might be helpful to review some pitfalls to watch for.

For best results, use of a PC board is strongly recommended.[5] Refer to the earlier articles for the patterns and component locators. The 2¼" by 3" format shown in Photo B is small enough to allow mounting flexibility. I would suggest that this format be followed. Combining several bands, amplifier, transmitter, etc., on one board can lead to problems, particularly if you are inexperienced in homebrew.

Before building, develop a plan as to how you will load the boards, assemble the unit, and test. After the plan is developed, proceed carefully. Most problems are due to misloaded parts, poorly soldered connections (rosin-core solder is a must!), faulty components, and hasty build-and-test. Most of these problems can be avoided by developing a plan and carefully and thoughtfully following it.

Radio Shack rf chokes are used as inductors by removing turns as necessary. Fifteen- and twenty-meter circuits require less inductance and, therefore, the coils will have fewer turns. In constructing the coils, be sure that the exact number of turns is removed and that insulation is scraped from the end of the wire that will be resoldered to the coil form. The three-turn Fun-Mitter coil (L2) that is wound over L1 should be wound in the same direction as the turns of L1. Also, wind it over the end of L1 that is mounted nearest Q1. The excess wire cut off when the turns are removed is excellent for wiring L2. Refer to Photo B for a view of the coils.

It is best to construct a single band in one box rather than combining bands. This is slightly more costly due to duplication of some parts, but it eliminates switching problems completely.

An advantageous modification to the Fun-Mitter is to allow a "spotting" function. This is helpful when finding your frequency on your receiver without transmitting on the air. This is accomplished by continuously applying 24 V to the oscillator stage. To do this, break the connection between L1 and L3, then connect L1 directly to 24 V. Also, one end of R1 is removed from the circuit board and a wire from it run to the 24-V side of L1. With this modification, pressing the key will produce a note in the receiver with the send/receive switch set to receive. See Fig. 4 for details of the modification.

Crystals can be obtained very easily. After deciding on either FT243 third overtone or HC6U fundamental, both crystals and sockets can be ordered from a supplier such as CW Crystals or Jan Crystals.[6]

Adjustment

Adjusting the high-frequency Fun-Mitter and Fun-Amp is just as easy as with the low-band versions. Again by thinking carefully through the process, the rig can be set up without problems in a short time.

If possible, find a VOM to use at this stage. Although not absolutely necessary, it is much more helpful and educational to see what is happening during tune-up. Begin by ensuring that you do indeed have a 24-V source (either lantern batteries or the Fun-Mitter power supply). Measure the voltage. With +24 V disconnected, measure the resistance at the voltage-input connector to ensure that no shorts exist to ground (use Ohms scale).

It is essential that a dummy load be connected to the antenna connector at all times during tune-up. For the Fun-Mitter/Fun-Amp combination, a dummy load capable of dissipating 20 Watts will be needed. Without a load, the transistors will be destroyed quickly.

The final step in tune-up is to attach an ammeter and begin testing! Connect an ammeter capable of measuring at least 1.5 Amps in series in the +24 line going to the gear. Set the T/R switch (S1) to "transmit." With the Fun-Amp switched

out, the meter should read around 300 mA with the key pressed. Switching the Fun-Amp in should produce a reading of around 1.2 Amps with the key down, indicating a power input of around 30 Watts.

As can be seen, there are no adjustments to be made. This is one of the beauties of the gear. After building the units carefully, they should work the first time with no adjustments!

If trouble is encountered, check the following:

1. Isolate the problem to a stage—Fun-Mitter, Fun-Amp; if Fun-Mitter, does oscillator work?
2. Measure voltages at collectors and drains of transistors with T/R switch in T position (should read 24 V).
3. Check for wiring errors.
4. Check soldering.

Operating

The thrill of home-brew construction comes in the actual operation. Making contacts with gear you built yourself is fun! The high-frequency Fun-Mitter and Fun-Amp easily will produce worldwide contacts. Twenty Watts on 15 or 20 meters can bring in contacts from all continents easily.

With the capability of 15- through 80-meter operation with the Fun gear, WAS, WAC, and DXCC are all within reach. Good luck! ■

References

1. "The Fun-Mitter—A Goof-Proof Rf Project," *73*, February, 1981.
2. "The Fun-Ceiver," *73*, July, 1981.
3. "The Fun-Oscillator," *73*, February, 1982.
4. "The Fun-Amp," *73*, May, 1982.
5. PC boards may be obtained from the author for $7.00 ppd. each. (For both originals and modified.)
6. CW Crystals, 570 N. Buffalo St., Marshfield MO 65106; Jan Crystals, 2400 Crystal Drive, Ft. Myers FL 33906.

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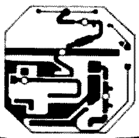

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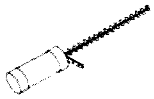

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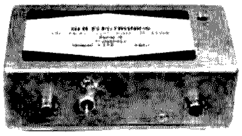

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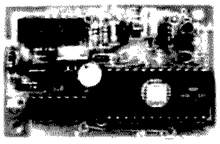

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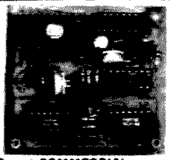

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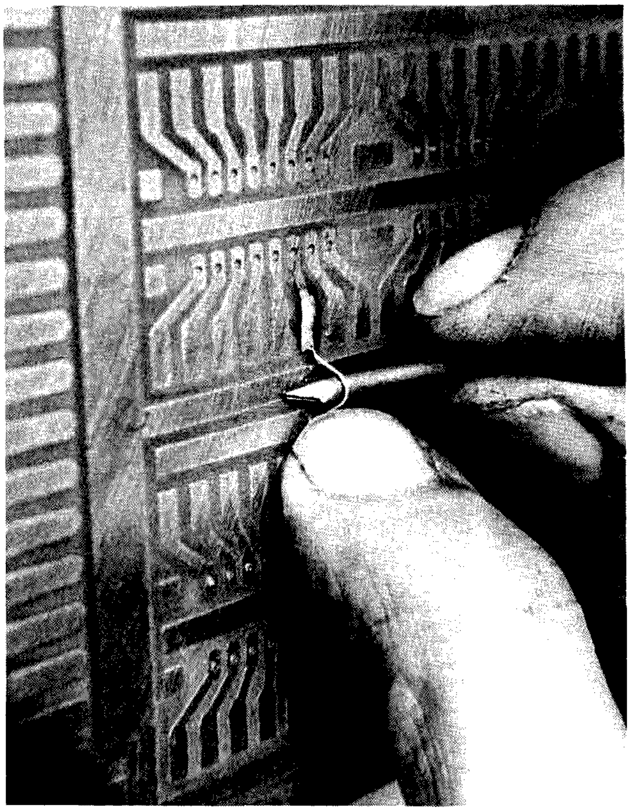
There used to be two styles of prototypes—rat's nest and cramped. Now there is a third style—simple.

There are at least a dozen different boards on the market intended for prototyping and one-of-a-kind construction projects. Most that I have used in my ham activities, in the classes at Los Angeles Access, and professionally have either been lacking in flexibility and ease of construction or are difficult to circuit trace.

Of the commonly-available types, the wire-wrap board, for example, is extremely difficult to circuit trace, especially when the component density reaches a certain point. This is complicated by the fact that components must be placed in IC header plugs.

The widely-used perfboard-type with general-purpose foil pads is much too cramped, lacks definite locations for ICs, is too difficult to circuit trace, and is prone to solder bridges.

The third common type, consisting of many small squares, works reasonably well for small projects. However, it becomes entirely too large for bigger circuits. It also lacks definite locations for components, especially ICs.



Forming a short jumper from bare wire using a small round tool and the end of your finger.

The board shown here solves many of the problems by combining a number of the good features of all systems into one, all contained on a standard 4½"×6½" 22-pin edge-connect card. The connector may be cut off easily if it is not used.

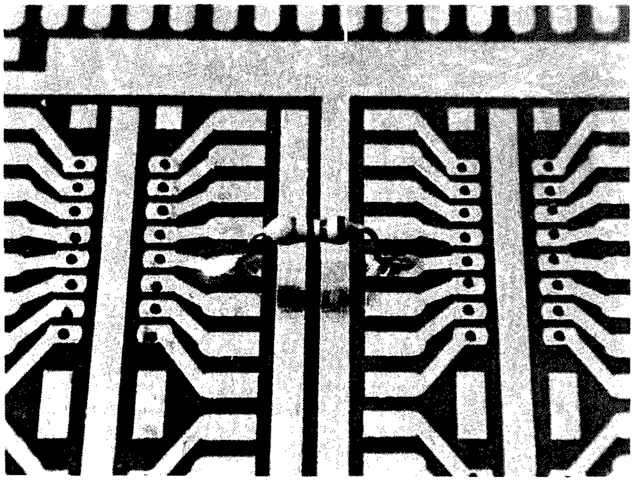
The basic features of the board are sixteen 16-pin DIP patterns for small ICs and one 40-pin pattern for larger ICs such as microprocessors, UARTs, etc. Alternately, the larger pattern will accommodate two additional 16-pin ICs.

Two continuous power rails run throughout the board and are available on both sides of all IC patterns. There is also a set of pads and a foil area for a 3-terminal tab-type regulator. On the opposite end from the edge connector are a number of small pads for switches or indicator LEDs.

Locating Components

Components may be mounted on either side of the board. In some cases, #60 holes will have to be drilled in the plain pads for this. For experimenting, however, all components including the ICs are best placed on the foil side. This leaves the entire circuit in view without turning the board over. In this way, the circuit is much easier to visualize.

For more permanent projects, some of the larger components and the ICs are best placed on the non-foil side. Buses of many wires are also better on the back to keep them out of the way during testing and repair. Resistors, small capacitors, and most interconnecting wires should be on the foil side.



A component properly formed and soldered to the board.

Attaching Components

The biggest mistake most first-time users of the board make is looping components too high. Keep everything as tight against the board as possible. All components should be preformed, with leads kept as short as possible. After soldering, give the component or wire a gentle bend back and forth to relieve lead stress. This is important, especially when connecting another component to the same spot, as it will prevent the first component from moving when the solder is remelted.

Do not connect components in midair. Even if you have to tie one end of a component to an unused pad and complete the connection with a piece of wire, the final result will be much neater and less likely to be damaged by subsequent handling. By the same token, it is wise to use the same technique to avoid crossing components over ICs. If you have to replace the IC at a later date, it will be much easier if you do not have to remove other components.

For long interconnections, use insulated wire. For close or adjacent pads, bare tinned wire is best. To jump over a pad or rail, form the bare wire as you install it. Using a long piece, solder one end first. After the solder hardens, bend the long end up at about a 45° angle. Next place a small round tool, like a common nail, on the pad to be jumpered. It will be easy, then, to bend the wire down over the nail into contact with the pad to which it is to be soldered. Clip the end with small diagonal cutters and then solder.

I recommend wire-wrap wire for use on the board. It is available in inexpensive small rolls at most electronic parts stores. It has solid conductor and heat-proof insulation. Stranded wire or wire with ordinary PVC plastic insulation is very hard to work with. You also may need to buy a little stripping tool—ordinary strippers often work poorly on wire-wrap wire.

Plan Your Work

It is quite a temptation, because of the ease of construction using the board, to simply grab components, wire, and solder and to begin building without planning. Even if you are doing original design work, give the layout of the board some preliminary thought. I find it invaluable to literally draw out the project in pencil. The main benefit is in reducing the number of "across-the-board" wires. It's not possible to eliminate them all, but a little planning reduces the number and makes the final board much neater and easier to repair in the future.

Conclusion

For original design work, for student use, and for producing permanent repeater control systems, the board has become very popular in my local group. Personally, I like it best for "one-of-a-kind" projects that appear in ham magazines. Many articles do not contain board layouts. The board has provided a very satisfactory and quick means to build such projects. It also greatly facilitates modification of published circuits to one's own needs in a form that is genuinely permanent.

The prototype board is available commercially from W6ELECTRONICS, PO Box 5515, Pasadena CA 91107, for $6.95 (California residents add 6% sales tax). For home construction, a photographic negative is available for $4.95. The board is made of G-10 glass epoxy, drilled, and rosin-coated. ■

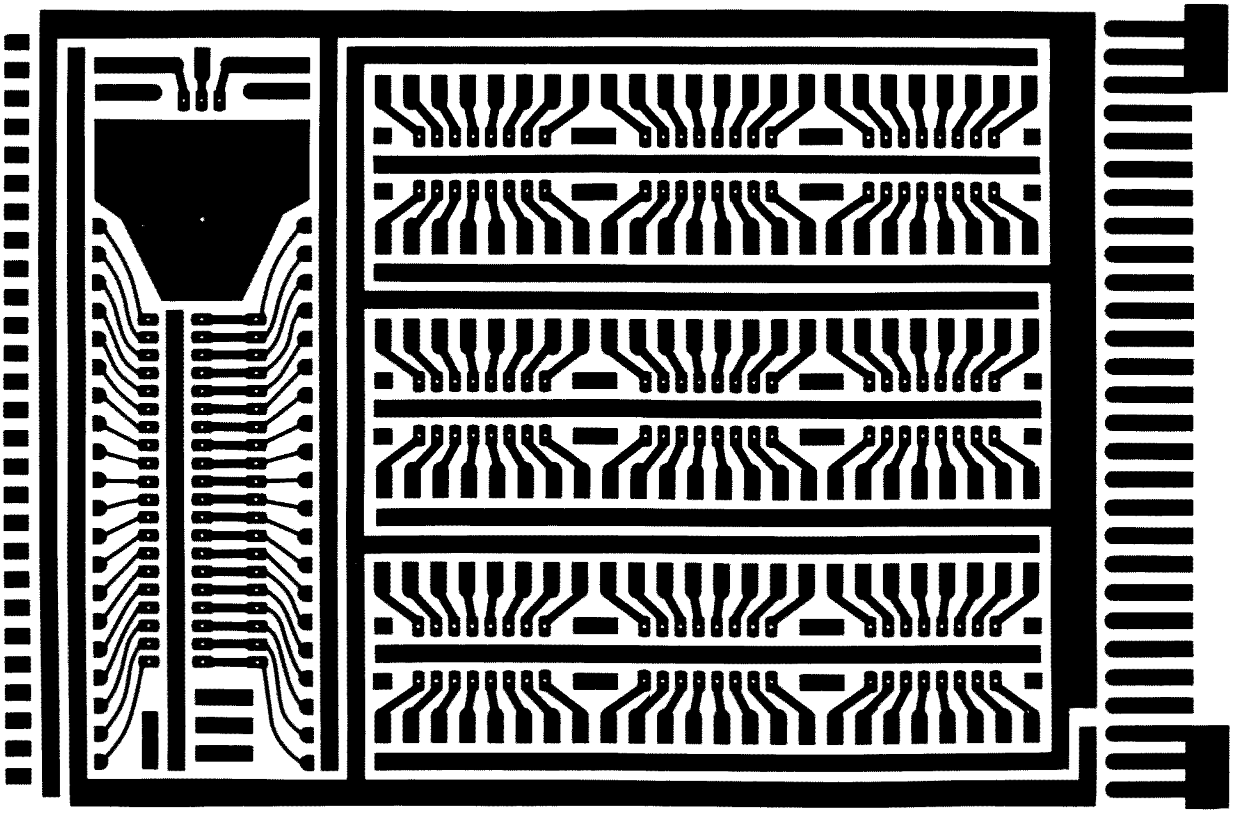


Fig. 1. The better prototyping board.

Beating the Untraceable Buzz

Man-made interference doesn't have to destroy reception. Not when you use W1GV's buzz-beating antennas.

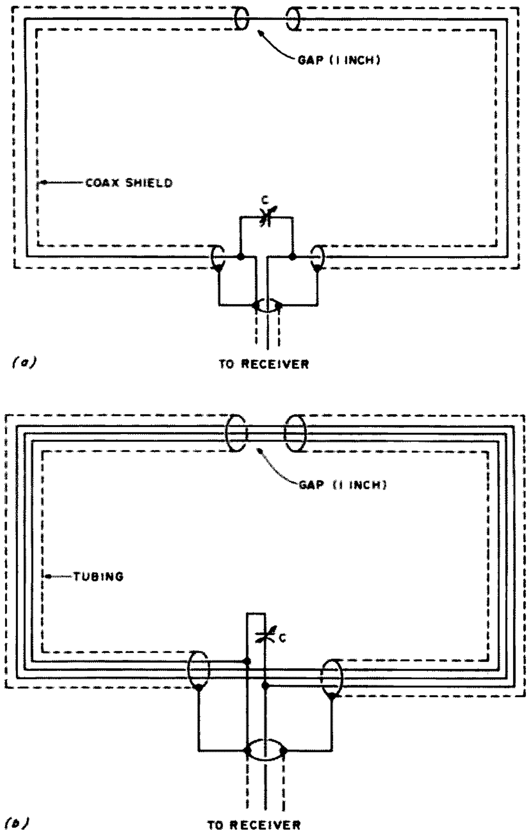


Fig. 1. Two versions of the shielded loop. (a) A single-turn version may be constructed using tubing and heavy wire or by using coaxial cable. The value of C will have to be determined by experimentation, although a 365-pF receiving-type variable usually will suffice. (b) A multi-turn loop is shown. Circumference of the loop should be about 0.15 wavelength in either case, although it may be considerably less if a preamplifier is used. See text.

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You've just moved into a new apartment or a new house for rent and the landlord has given his okay to your putting up a four-band trap vertical on the roof. (Miracles do happen!) So you blithely install your new station console, trying to improve the layout still further over what you had the last time; you painstakingly solder every PL-259 onto the interconnecting cables. You ground your equipment with a bus bar of 1/4-inch copper tubing running to a cold-water pipe only three feet away. You install 20 radials on the roof for each band (80 in all, and with the best stranded No. 16 wire). Finally, everything is ready to go.

Frequency MHz	Circumference Feet	Meters
1.8	78	(24)
3.5	40	(12)
7	20	(6.1)
10	14	(4.3)
14	10	(3.1)
18	8	(2.4)
21	7	(2.0)
24	6	(1.8)
28	5	(1.5)

Table 1. Circumference of a shielded loop for various frequencies. These circumferences represent 0.15 wavelength for the indicated bands. If a preamplifier is used, the loop may be used at frequencies below that where it is 0.15 wavelength.

You turn on the receiver. A solid installation, this, you proudly think to yourself. Not a DX killer, to be sure, but it's well built and there should be plenty of good hamming ahead. The S-meter reads a steady S9 + 20. You turn up the volume: ZZZZZZ! Up and down the band you tune. The noise limiter does no good; the pulses must be too broad. ZZZZZZ! So much for 20 meters.

Switch to 40. Peak up the preselector. ZZZZZZ! S9 + 30. Damn. Switch to 15. Peak it up. ZZZZZZ! Only S9. Oh, great! Why even try 10? Why make yourself depressed needlessly?

The Search Begins

The next step, of course, is to switch off everything

in the place except the rig. Thwack! Thwack! Thwack! One circuit breaker after another. And from the shack, several rooms away, you can hear the receiver with the volume up to 3:00: ZZZZZZZ—it stops! Your heart leaps. Whoops, that was the shack. Thwack! ZZZZZZZ...

The XYL shouts, "Will you turn that thing down and stop fussing with the lights? I'm trying to watch TV and iron!"

All your clocks were set to WWV from your watch, which you had to set at a friend's QTH because you can't even hear WWV at yours. Now all the clocks are out of whack since you played with the breakers.

You run all over the yard, using a little, plastic 6-transistor AM radio your Aunt Jenny gave you for Christmas back in '65 and you've hardly used for anything until now. Some places the noise is louder, some places softer. But there is no logical pattern. It's everywhere, but it's centered nowhere.

You try to DF (direction find) using the ferrite loopstick in the little radio. There is a sharp null in the direction of either the elm tree out front, or else 180 degrees opposite, from somewhere under the driveway. Move into the backyard. It's either coming from the rising full moon or else from the base of the swing set.

No power transformers of any consequence in the area. The noise is constant, around the clock. You get up at 5:00 am: ZZZZZZ! You come home for lunch (actually, instead of lunch). ZZZZZZ! Your stomach growls.

You'll never get rid of it.

You Could Search More

Oh, yes, eventually, if you search long and hard enough, you'll find it. Maybe it's an electric blanket in a neighbor's house. But, then, who uses an electric blanket for 24 hours out of every day? A refrigerator? Maybe, but they don't run continuously, unless... unless there is not enough of that coolant stuff in them. Hmmm.

It's not a street lamp starter, since it happens during the day. A fluorescent lamp starter, maybe? Well, who leaves a fluorescent lamp on for 24 hours a day? You might snoop around the neighborhood at 4:00 am or so and see if anybody has any fluorescents on. But, no, you might get arrested or mugged or something.

Maybe it's a thermostat mechanism. God help you.

What Can You Do?

Although I've made light of all this, it's not exactly funny when it happens. And sometimes you just will not, by any reasonable means, be able to locate and/or eliminate a source of man-made noise. If it's somebody's refrigerator without coolant, maybe it will burn up some day. A noisy fluorescent light starter will eventually fail and have to be replaced. Lot of good that does you now.

The situation is not hopeless, though. Noise has different characteristics than signals. There are ways of getting your antenna system to favor those single-frequency signals that you *want* to hear, while discouraging that wide-band hash that you *can't stand* to hear.

There are basically three methods of doing this. You can use them in combination if necessary. They will almost always provide significant improvement. These methods are: 1) Shielded-loop antennas; 2) High-Q antennas; 3) Noise-cancelling antennas. Let's look at these one by one.

Incidentally, these antennas are for receiving only. If you have a transceiver, some sort of switching device, such as a relay, will have to be used. These antennas will all prove quite lousy for transmitting.

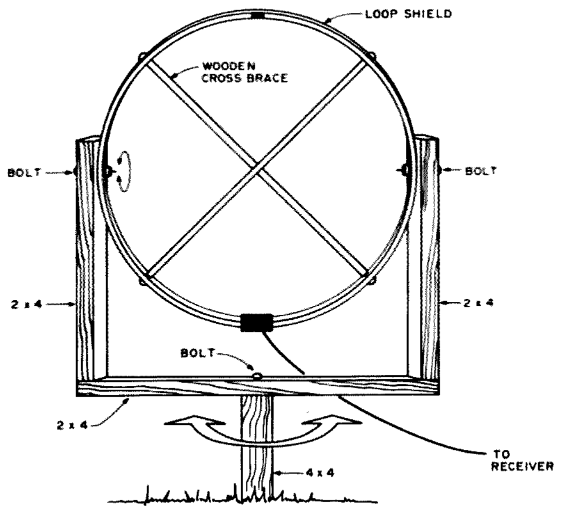

Fig. 2. A method of azimuth/elevation mounting that allows the shielded loop to be pointed towards the focal direction of a noise source. This kind of mount is practical only up to a certain size—about an 8-foot-diameter loop. The loop shield should be constructed from copper tubing if this kind of mounting is used.

The Shielded Loop

Fig. 1 shows two types of shielded-loop antennas. Fig. 1(a) is a schematic diagram of a single-turn loop, which may be constructed from coaxial cable. The loop is tuned to resonance by capacitor C, which may be a common 365-pF receiving-type variable available at most Radio Shack stores. It may be necessary to parallel this capacitor with a 330-pF fixed capacitor if resonance cannot be obtained with the variable by itself.

The loop should have an overall circumference of about 0.15 wavelength. Essentially, it is a single-band affair. If used on a band much lower than where it is 0.15 wavelength, the antenna will not pick up signals very well. If used on a much higher frequency, the antenna will pick up more noise. Nevertheless, you can probably get away with using it at half the design frequency and still get fair results. The loop may be placed on an "X" brace made out of wooden dowels or 2 by 4s, taped to an inside closet wall, or even put up in a tree.

The "shielding" of the loop obviously is not complete. Actually, it is electrostatic (Faraday) shielding, which shorts out the electric component of the signal while letting the magnetic part pass. For some reason, man-made noise seems to be transmitted mostly by capacitive coupling, as an electric field. But signals have both a magnetic and electric component. The result is that the noise gets attenuated more than the signals.

At Fig. 1(b), we have a multi-turn shielded antenna. The overall physical circumference should still be 0.15 wavelength. The shield may be constructed out of copper or aluminum tubing. The loop should have four to six turns; too many turns will lower the Q of the antenna and this will adversely affect its noise per-

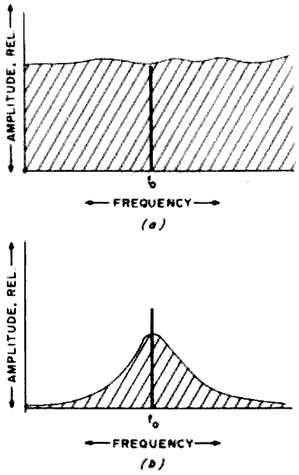

Fig. 3. Effect of increasing the Q of an antenna system. (a) The antenna system has essentially no selectivity. The signal, at frequency f_0, is buried in the noise. (b) A selective circuit is used in the antenna system. The total amount of noise (area under the curve) is smaller and this results in fewer high-order mixing products, which actually reduces the noise level at f_0. But the signal level remains unchanged, improving the signal-to-noise ratio.

formance. (Part of the noise attenuation of the shielded loop is the result of its high Q, which we will discuss later.) Several turns, however, provide for more "sensitivity" than just one. One word of warning: It is a physical contortion of considerable difficulty to find a way to get several turns through the tubing without a good deal of cussing and high blood pressure.

Table 1 gives the circumference of an 0.15-wavelength loop at various frequencies. The loop may be a square, pentagon, hexagon, octagon, or perfect circle. The circle is geometrically best. A long, skinny rectangle will not work too well. You should try to get the largest possible area for the circumference allowed, and keep it all in the same plane.

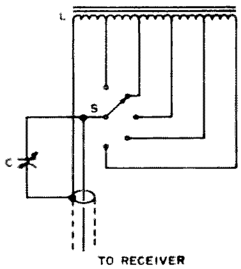

Fig. 4. A ferrite loopstick antenna with multiple taps. The taps should be chosen so that C may be adjusted for resonance on each band used. See text for discussion of inductance values.

A shielded loop does have a directional pattern. The antenna will respond to signals in any direction except right along the axis. There is a sharp null in the line of the axis. The null is so sharp that signals propagated via the sky wave will never fall into it because of their multipath nature. Local signals might possibly fall into the null; just move the antenna a little and they'll come up. Of course, the noise can be nulled out if the antenna is oriented just right. This will provide even more attenuation to an already weakened foe.

Nulling It Out

The noise that is causing you so much frustration may originate in a single device, but it is probably being transmitted all over the place by the ac power lines. Therefore, it may be coming from all around. However, noise will always have a *focal direction*. Mathematically, all the noise combines in such a way that it may be considered to be coming from one single direction. (It's sort of like gravity. Even parts of the Earth that aren't straight under you are pulling at you, but it all averages out to a straight down force.) This axiom holds true as long as it's only one fluorescent light, thermostat, or elm tree that is responsible. If there are two independent culprits, each one will have its own focal direction, and you won't be able to null them both out at once. But chances are that there is only one source of noise. (It is just too horrible to even consider that there might be more!)

Fig. 2 shows a method of mounting a shielded loop so that its null can be pointed in any direction. The focal direction might even be straight overhead, so the antenna must be capable of pointing in the vertical as well as the horizontal plane. The XYL won't let you put such a contraption in the living room? Well, try the attic or the backyard, then. Or even the roof.

It may take some time to find the focal direction of the noise, since the antenna null is so sharp. But once you've found it, there may be as much as a 20-dB drop in the noise level—and this is in addition to the improvement that results from the electrostatic shielding. Now you should be able to hear some signals. Let that guy's refrigerator run until it burns itself out.

High-Q Antennas: The Ferrite Loopstick

Man-made noise differs in another way from signals. The signal you want to hear is never more than 3 kHz wide on the HF bands (unless you want to listen to AM shortwave music broadcasts, which take up about 10 kHz). The noise, however, is hundreds or even thousands of kHz wide.

The higher the Q (the narrower the bandwidth) of the antenna system, the smaller the total amount of noise that gets into the receiver. But that little 3-kHz signal will all be passed. This effect is shown in Fig. 3. The less total noise that gets to the receiver front end, the less noise that will appear within that 3-kHz signal "window," since there will be a lower level of high-order mixing products. Thus, the signal-to-noise ratio will be better.

The shielded-loop antenna, discussed earlier, has a fairly high Q. It can be maximized by using a single turn of very heavy wire inside a piece of tubing, or else by using RG-8/U coaxial cable for the loop section. A preamplifier with rf tuning may be added at the receiver input with any antenna in order to increase the Q. There are several commercially made units available. Ameco Equipment Company (12033 Otsego Street, North Hollywood CA 91607) makes one called the PT-2 that tunes 160 through 6 meters.

An antenna with very high Q can be constructed using a ferrite rod. Just wind several turns of enameled copper wire on the ferrite core from the antenna in Aunt Jenny's at-last-useful AM transistor job. Ferrite sticks are available commercially from Amidon Associates (275 Hillside Avenue, Williston Park NY 11596). The coil should be tuned to resonance using a variable capacitor. Fig. 4 shows a multiband ferrite antenna system with multiple taps.

The exact number of turns that will provide resonance on the desired band using a 365-pF variable capacitor at C will have to be found by trial and error, unless there is data included showing inductance vs. number of turns for your particular stick. Table 2 shows the values of inductance that will provide resonance with 200 pF of capacitance (about the middle of the range of a 365-pF variable) at various frequencies.

A ferrite antenna, complete with azimuth/elevation mount and a built-in

Frequency MHz	Inductance μH
1.8	39
3.5	10
7	2.6
10	1.3
14	0.65
18	0.39
21	0.29
24	0.22
28	0.16

Table 2. Inductance required to resonate with 200 pF of capacitance (the middle range of a 365-pF variable) at various frequencies. This data may be used in conjunction with data provided with commercially available ferrite rods, for the purpose of making a ferrite loopstick antenna.

preamplifier, is available from Palomar Engineers (Box 455, Escondido CA 92025) at the time of writing.

The ferrite loopstick is not electrostatically shielded, but it does tend to favor inductive coupling over capacitive. It is easier to work with mechanically, especially at lower frequencies. Simply orient the loopstick until a null occurs in the noise background. The null will be very sharp.

Need this last comment be made? Let's not take any chances. Don't try using a toroid core for this antenna. It won't work.

Noise-Cancelling Antennas

There's still another characteristic of noise that makes it different from signals. Oddly enough, this is the very resemblance of noise to a signal, with a unique focal direction. You hear the noise on the same frequency as a given signal; the noise may be thought of as a local signal. As such, using two antennas to combine the noise in opposite phase, the noise can be "cancelled out."

Fig. 5 illustrates one such system. The spacing between the two inductively-loaded vertical dipoles need not be very great, but it should be as large as practical without exceeding a quarter wavelength. The elements themselves may be very short. In fact, shortening them increases the Q, which will add to the noise-reducing effectiveness.

One antenna is fed 180 degrees out of phase with respect to the other. The easiest way to do this is to make the phasing lines the same length, but feed one of the antennas upside down with respect to the other. That is, if one antenna has the feedline center conductor going to the top section, the other antenna should have its feedline going to the bottom. In the plane equidistant from the two antennas, phase cancellation will occur. This is a vertically-oriented plane, and by rotating the entire system through 180 degrees, any focal direction can be put into the null plane.

It is possible, but not likely, that a signal will arrive from a direction that lies in the same plane as the noise, once the noise has been cancelled out. Sky-wave signals, since they arrive from a varying direction (ionospheric shift), may fade more if this happens. Local signals will be attenuated considerably.

This particular kind of antenna is mentioned here to illustrate the third way that signals can be distinguished from noise. As described, it will not work as well as the shielded loop or the ferrite antenna. But this scheme could conceivably be used with *two* shielded loops or ferrite antennas! Actually, pointing these two types of antennas at the focal direction of the noise is a means of phase cancellation. But even more cancellation could be obtained by using two such antennas, both pointed at the focal direction of the noise and then combined so that the small amount of remaining noise from each antenna arrives at the receiver in opposing phase.

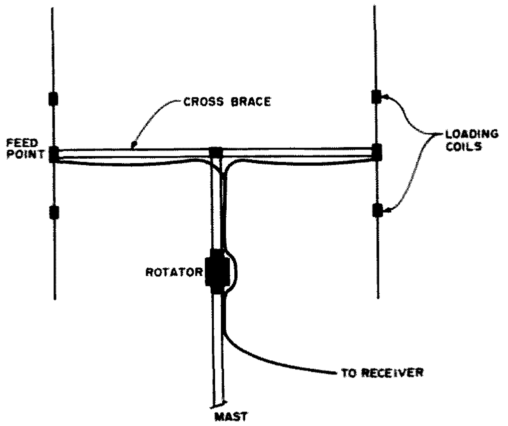

Fig. 5. Using two antennas to obtain phase cancellation of the noise. This particular system uses two inductively-loaded vertical dipoles. This system is illustrated primarily to demonstrate the third difference between signals and noise; this antenna by itself will not work as well as a shielded loop or a ferrite antenna.

Which One?

In a noisy environment, probably the best choice is the shielded loop. Using a selective preamplifier, one shielded loop can be used on several bands; it should be constructed for the highest band used. On lower frequencies, the value of capacitor C will have to be increased by paralleling it with fixed capacitors. The preamplifier will allow reception on lower bands because of its gain.

Perhaps there is no good place to put a shielded loop with azimuth/elevation mounting, and you can't get enough noise attenuation unless the antenna can be oriented towards the focal direction of the noise. Then, the next best choice is the ferrite loopstick. It can be put right at the operating desk! The ferrite antenna will probably not be quite as effective as a shielded loop. The null will not be as well defined (though still quite sharp) and its discrimination against electrostatic coupling will not be quite as good. But it can still be used to advantage.

Conclusion

Noise differs from signals in three ways: 1) Noise is transferred mostly by electrostatic coupling, but signals are transferred by electromagnetic fields; 2) Noise is broadbanded, but signals occupy only a small part of the spectrum; 3) Noise has a unique and usually constant focal direction at a given frequency, and it will usually be in a different focal direction than desired signals. These three differences are taken advantage of by: 1) Faraday shielding; 2) High-Q antenna circuits; 3) Phase cancellation.

These three methods of dealing with noise may be used individually or in combination. A shielded loop with azimuth/elevation mounting takes advantage of all three of the differences between signals and noise. It has electrostatic shielding, has a high Q, and may be oriented to null out the noise. A ferrite loop can be used when the shielded loop is impractical because of space limitations, either in reality or in the imagination of an XYL or landlord.

Good luck! Carry on the search for the noise source by all means. But at least get on the air in the meantime.■

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The Care and Feeding of Optoelectronics

There are many ways to make these devices earn their keep. Here is one.

Can you really see which way the wind is blowing with optoelectronics?

The answer to that question is yes—with a little help from you.

The subject of this article is General Electric's H21A1 photo-coupler interrupter module. This module has two components: an infrared LED light source called the emitter, and a photo transistor called the detector.

I think you are safe in believing this so far, because I just read it in an optoelectronics manual.

The H21A1 module has a gap in its housing. The emitter is mounted on one side of the gap and the detector on the other. You may think someone planned it that way because now, if you want to, you can make this little black thing do something to earn its keep. For instance, if you pass something opaque through the gap, you will interrupt the output of the emitter. Do you think that's why GE calls it a photo-coupler interrupter module?

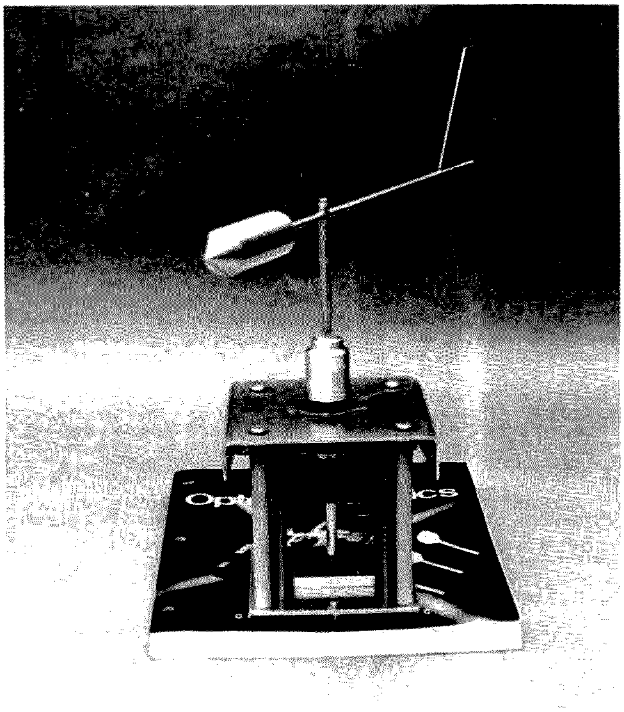


Photo A. Wind-direction indicator with the weather cover removed.

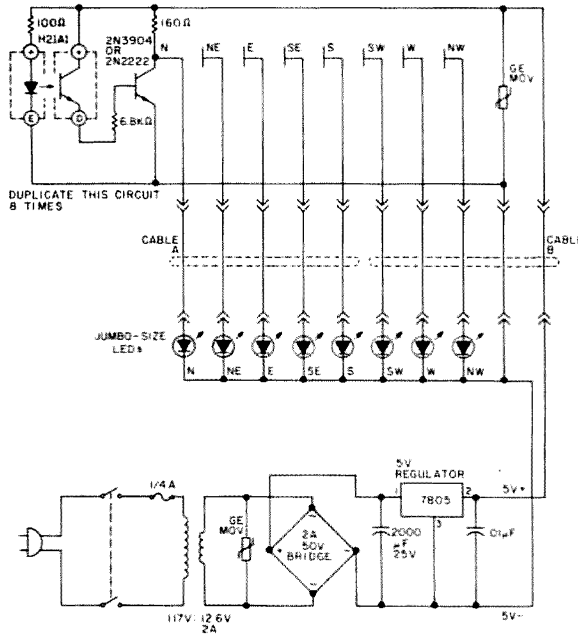


Fig. 1. The H21A1, detector side, is not shown physically correctly drawn here—look on top of the device for the correct pinout. All resistors are 1/4 Watt; capacitors are μF.

The interrupter module is just one of many types of photo couplers. To mention a few, the reflector module could be used somewhat like the interrupter module except that the light source must be bounced off a reflective surface and back to the detector. There are discrete emitter and detector units, and also a whole family of optocouplers in which the emitter and detector are sealed into one cube with no way of anything getting between them, which offer as high as 4000-volts isolation between the input and the output. I have mentioned but a few that are available (most of them cheap). And that brings me to the reason for my taking your time while you read this.

My purpose is to tell you how I used an interrupter-type module in a project and to get you interested enough to think about using optoelectronics in *your* next project. The more you know about them the more jobs you will see that they can do for you.

I sort of hinted at the beginning that I know how to make the H21A1 (actually, 8 of them) tell which way the wind is blowing, so I better get to it. The construction part is a mix of electronics and mechanics. The device, in case you haven't guessed, is a wind-direction indicator.

As you can see in the photos, there are some machined parts used on the model. Don't let this scare you; in almost every case, there is an alternative way to fabricate the same part with hand tools. I will suggest ways as we go along. On the other hand, the fellow with a lathe or machine shop could have a good time developing this project even further. The model pictured here has been perfected only to the point that it works reliably in all weather experienced here in Pennsylvania, and it should continue to work for many years. That is to say, don't be afraid to use the ideas and hardware available to you.

The most important points to remember when planning your construction are that (1) the bearing friction should be low enough so that a gentle breeze will have enough force on the tail of the vane to keep it headed into the wind, (2) you must devise a way of mounting it to your tower or pole, and (3) when it's all finished you must have some means of weather-sealing it.

Photo A shows the wind-direction indicator fully assembled except for the weather cover. The vane boom is 3/16 × 12-inches-long aircraft aluminum rod. (I might mention at this time that all parts were made from T3 aluminum.) The tail is 1/16 × 6 inches and has just about 13 square inches of surface. The vane boom is mounted to the axle or vertical shaft 2/3 of the length of the boom in front of the tail, or 1/3 of the way back of the nose. So, to balance this boom, the nose must be proportionately heavier than the tail. The nose is 1 × 3 inches long and is threaded onto the boom. A 1/16-inch slit has been milled into the boom to accept the tail, but a flat surface filed on the boom with the tail screwed to it would be just as good. The nose could be epoxied to the boom if there is no threading tool available.

The axle or vertical shaft is a 1/4 × 9-inch rod with a a 3/16-inch hole drilled in it near the top to accept the vane boom. A hole was drilled and tapped into the end of the shaft down through the vane boom and on into the shaft another half inch to secure the boom to the shaft.

Photo B is an exploded view. It shows the next component on the way down the shaft—the top bearing weather seal. This rotates with the shaft and, together with a piece of pipe that is epoxied to the top support frame, prevents the elements from getting into the bearing.

The top support frame is 4-7/16 inches deep (as viewed in Photo B) and 4-5/8 inches wide. It provides a mounting surface in the back and was formed from 1/8-inch stock. The back two corners were welded for strength. The inner bear-

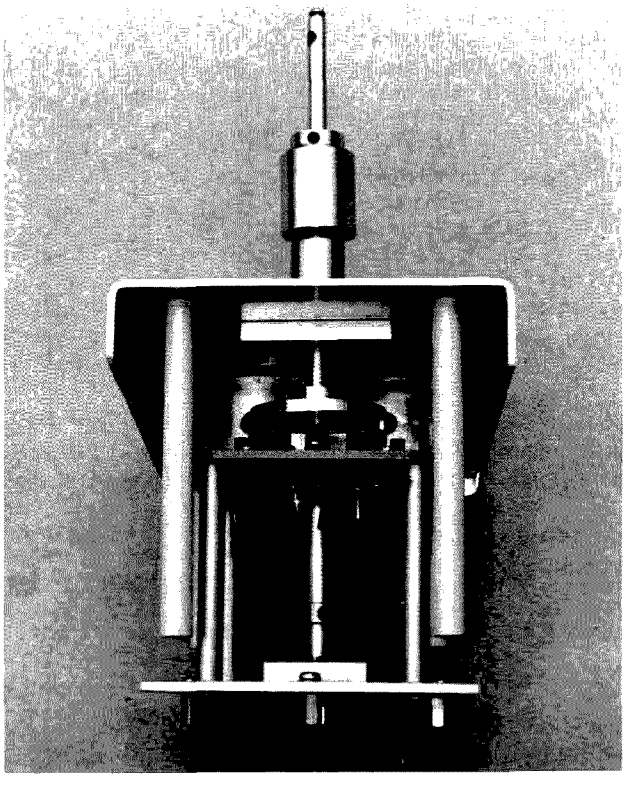


Photo B. An exploded view with the vane boom removed.

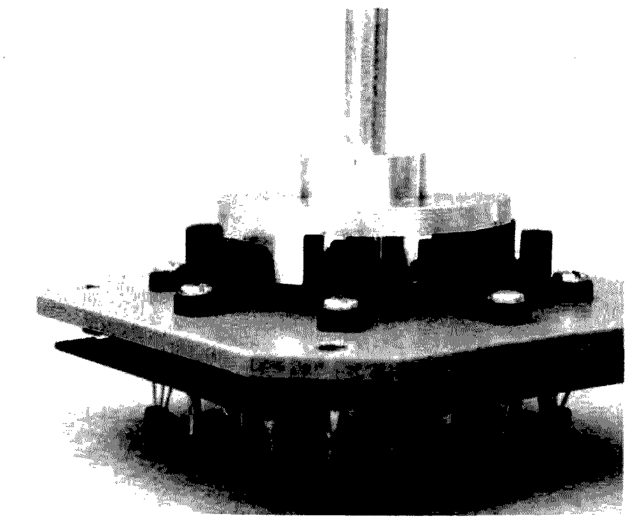


Photo C. A view of the H21A1s mounted on their fiberglass substrate and the disc interrupter tab rotating through the H21A1 gap. Mounted underneath is the PC board with the rest of the circuit components.

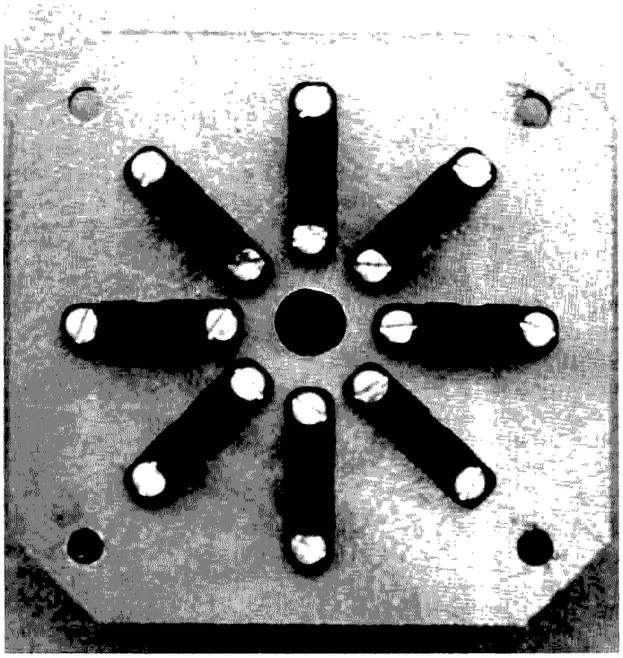


Photo D. The eight H21A1s in a 1-11/16" circle (measured to the center of the gap).

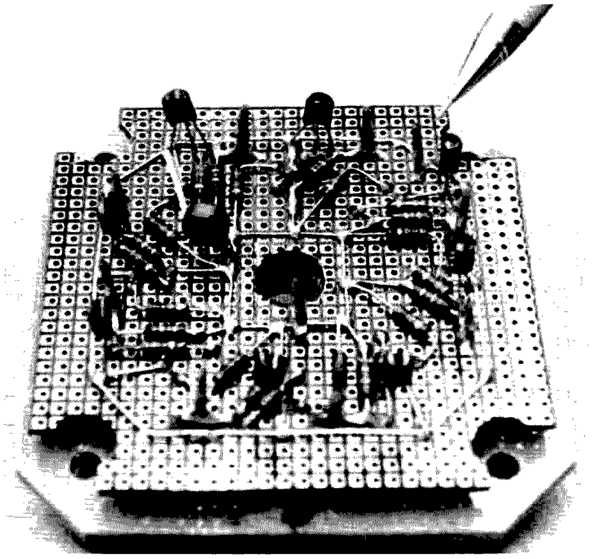


Photo E. The electronic components mounted on what we call a "do all" PC board. The pencil is pointed at one of the ten pins used to terminate the cable coming from the readout LEDs in the shack. The component at 10:00 o'clock near the shaft hole that looks like an overweight disc capacitor is the MOV.

ing seal is 3/4-inch i.d. conduit 1-1/8 inches high. The outer bearing seal is 5/8-inches i.d. × 1-3/8 inches high.

The next component down the shaft is the top bearing. I used ball bearings pressed into a bearing block to facilitate mounting and alignment, but a neat hole in a hunk of brass would be just as good. It would then be smart to use a brass or steel shaft, because brass and aluminum don't get along, especially out in the weather.

The next component down the shaft is the disc interrupter. It rotates with the shaft and is the component that actually tells the optoelectronics interrupter module which way the wind is blowing. (More about that later.) The disc interrupter used in this model was machined from a piece of solid round stock. As seen in Photo C, it is merely a disc with a collar and set screw to secure it to the shaft, and with a right angle tab on it. An easier way to make the disc would be to use the top portion of a small soup can and epoxy a collar to the top to secure it to the shaft. My disc-interrupter tab runs in a 1-11/16-inch circle and is 3/8-inch deep. The width of the tab is cut so that it covers two interrupter modules. (More about that later.) The H21A1's gap is 3/32-inch wide so I made the tab 1/16-inch thick.

Photo D is a top view of the heart of the whole thing, the eight H21A1 interrupter modules mounted in their circle on a piece of fiberglass epoxy board 1/8-inch thick × 3-1/4 inches square. This would have been a perfect situation in which to design and etch a printed circuit board. At the time, however, I did not have on hand PC board material thick enough to do the job. I think it should be at least 1/8-inch-thick stock to get the thermal and mechanical stability needed.

As you can see in Photo E, I used a piece of Radio Shack "do all" board. The leads from the H21A1s were stuck through the board and soldered first, to set the spacing between the two boards. Then the positive bus (near the center of the board) and the negative bus (around the outside of the board) were put down. After that, it's just as the schematic shows. The pencil in Photo E is pointing to the terminal pin on the negative bus. There are 10 pins on the board; two are for power (+5 V and −5 V), and the other eight are the direction signals that are being sent down to the wind direction LED readout in the shack. The male pins on the board will mate with female pins on the end of the cable going to the shack.

I tried various methods of reducing the number of conductors needed in the interconnection cable, BCD, etc., but when the smoke cleared (get it?), two runs of inexpensive 5-conductor TV-antenna rotor wire were found to work fine.

The eight H21A1s are spaced every 45° around the circle. Consequently, with the eight LEDs placed on the compass rose in the shack, you are able to determine if the wind is out of the north, northeast, east, southeast, south, southwest, west, or northwest merely by observing the LEDs. However, by making the disc interrupter tab wide enough to cover two adjacent interrupter modules, two LEDs are lit. So, for example, if the south and the southeast LEDs are lit, we can assume that the wind is out of the south-southeast, or approximately 157°. Obviously, more H21A1s could be added to increase the resolution. At this point, some method of reducing the number of cable conductors between the aerial unit and the readout panel would be necessary.

The electronic theory is super simple. When the disc interrupter tab interrupts the emitter light source, the photo transistor turns off, turning the 2N3904 off, hence allowing the appropriate LED to light.

Any 5-volt power supply that can deliver at least 500 mA continuously will work. The General Electric MOV is for transient voltage-spike protection. I used the

V47ZA7 because I had them; a better choice could be made.

So far, there has been no need for rf suppression, but that is not to say you may not need to add a bypass capacitor or two.

The next to last thing on the shaft is the 1/4-inch collar. It is secured to the shaft with a set screw and rests on top of the lower bearing. It prevents the shaft from falling through. As you can see in Photo B, the collar is not in place because this is an exploded view.

Photo F shows an exploded view with the 3-3/4-inch spacer screws removed from the bottom plate. You also can see the four small 3/4-inch spacers on the bottom of the bottom bearing plate. These spacers will be used to secure the weather cover.

All of the spacers could be substituted for with all-thread rod, and then you would use the nuts to adjust your spacing. The bottom bearing and bearing block are identical to the top bearing and bearing block.

The weather cover is nothing more than a five-sided box that slides up over the lower bearing plate and butts against a cork gasket glued to the bottom side of the top support frame (gasket or cover not pictured). A fruit or soup can of the proper size also would work for a weather cover.

After the machine was fully assembled and tested, I disassembled it so that I could wash all the metal parts with dishwashing detergent. Then everything was sprayed with clear Krylon™, including the electronics board but excluding the H21A1 board.

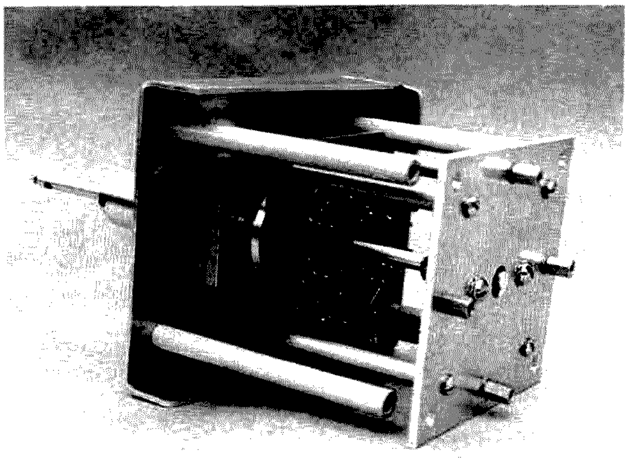


Photo F. An exploded view from the front looking up at the wind-direction indicator.

Photo G is a view of the wind-direction readout panel with its eight LEDs, etc. On a sub-panel on the rear, the power-supply components and cable terminal blocks are located. On the right is the companion meter that I hope in the near future will indicate wind velocity (not ac Amps). My plans for this meter as they stand now are to perfect a 4-inch cup anemometer to the point that it will indicate wind velocity with the additional feature of generating 7 to 10 Watts to be used to light a small lamp or to charge the HT battery.

Tune-up of this little gem is pot pie. Just mount it in the air on whatever structure you plan to use. Point the nose of the wind vane north and by using the set screw in the disc interrupter collar, clamp the tab so it is centered through the H21A1 that you have designated north. Be sure the vane still rotates freely. Secure the weather cover in place, then go down to the shack, turn the power supply on, and watch the LEDs blink. It is that simple. Of course, you knew it was going to work before you put it in the air. Hi, hi!

A word about finding parts and materials. If you can't get the H21A1s locally, see Reference 1. I found a shop in my area where I can buy a foot of this and an inch of that, plus getting some good advice to boot. I found this shop by talking to a fellow who is building an experimental aircraft. They use the same types of material. Perhaps you can find an experimental aircraft club in your area, or you can get your material where I got mine. See Reference 2.

I would be very remiss if I did not implicate my collaborators in this project: Fred Jones K3CVM,

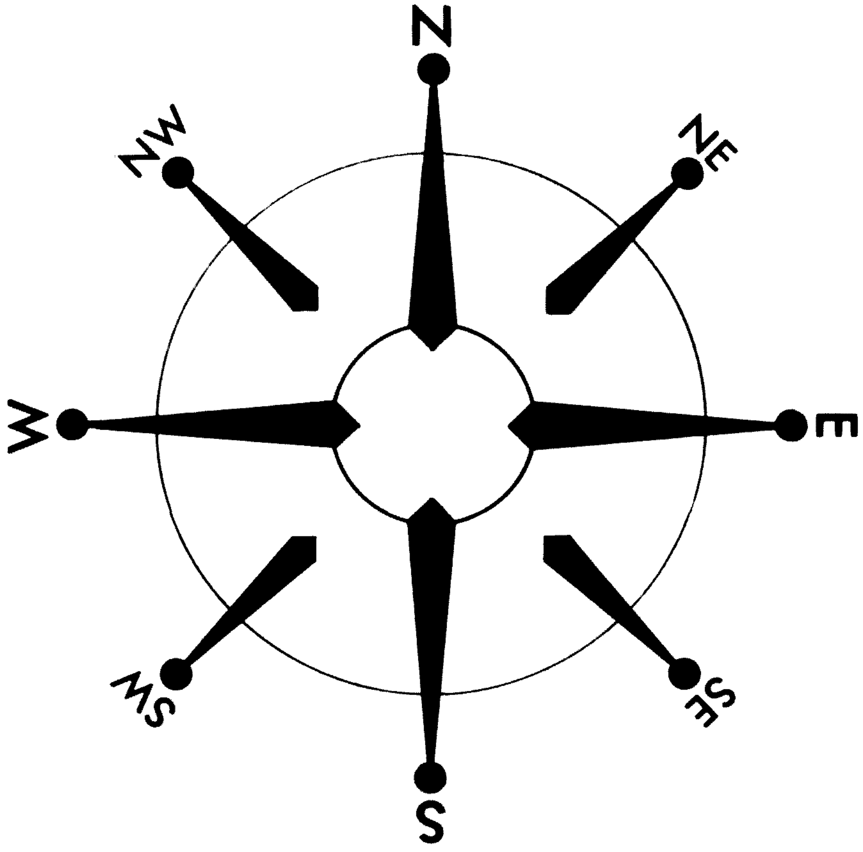


Fig. 2. Here is your ready-to-use compass rose!

International Success Story: The BBC

From its battery of transmitters, the BBC fires a daily salvo of news and entertainment around the world. No commercials, either.

Roger N. Peterson
25 Orchard Lane
New Canaan CT 06840

Ask just about any shortwave radio listener or look at the most recent listener-preference studies on international broadcasters, and you'll get the same answer. The British Broadcasting Corporation (BBC) ranks number one.

Bush House, home of the BBC's External Services, in The Strand, London. (All photos BBC copyright.)

There are a number of reasons for this popularity ranking, and I was turning them over in my mind as I walked down The Strand in London on a sunny day on my way to the BBC headquarters in Bush House, near Fleet Street. Some cynics say that the only reason for BBC popularity is that it is on the air more often and on more places on the dial than any other international broadcaster.

There is some truth to this, although the facts are not quite as above. The BBC ranks only fifth among international broadcasters for the amount of time on the air, per week. The USSR is first, followed by the US (Voice of America plus Radio Free Europe), the Republic of China (Radio Peking), and West Germany (Deutsche Welle). However, from the standpoint of pro-

grams in English that can be heard here in North America, the BBC does indeed lead all the others. You can hear the BBC round-the-clock in the US and Canada, and this beats such big North American broadcasters as the Voice of America, AFRTS (US Armed Forces Radio), and the popular CBC Northern Service in Canada.

It also is true that BBC programs are often "all over the dial" on your receiver. During many hours of the day, you can pick up their broadcasts on three, four, or even more different frequencies. This is because of its unusually strong transmission facilities—79 transmitters, 47 of them in four different locations in Britain and 32 in eight overseas relay stations, including the US, Canada, and the Caribbean. At certain hours, the Russians offer even more frequencies to the US listener, but only the BBC provides this multiband reception for most of the twenty-four hours.

While these technical advantages give the BBC a big boost over competition, they are not the only reasons for its popularity among listeners. The great reputation for world news coverage makes the BBC unique among international broadcasters. The BBC broadcasts more than 250 news programs a day from its headquarters in London. They are all prepared in an ultra-modern newsroom with electronic readout aids of all kinds, and with a staff that numbers over 100. It may be the world's largest newsroom and, at this writing, certainly the most modern as it was completed just over a year ago.

News is fed into this giant news machine by BBC correspondents from all over the world and by the international news agencies. Another important source is the famous BBC Monitoring Service. This BBC Division, located at Caversham Park, some 50 miles from London, provides round-the-clock reports on the contents of selected broadcasts from foreign radio stations. This supplements the agencies' and foreign correspondents' reports.

The BBC Monitoring Service provides a *Summary of World Broadcasts* every day and, in addition to sending

The control room at Bush House, London, home of the BBC External Services. World Service programs are broadcast 24 hours a day from these facilities in English and 38 other languages.

A GUIDE TO BBC WORLD NEWS BROADCASTS

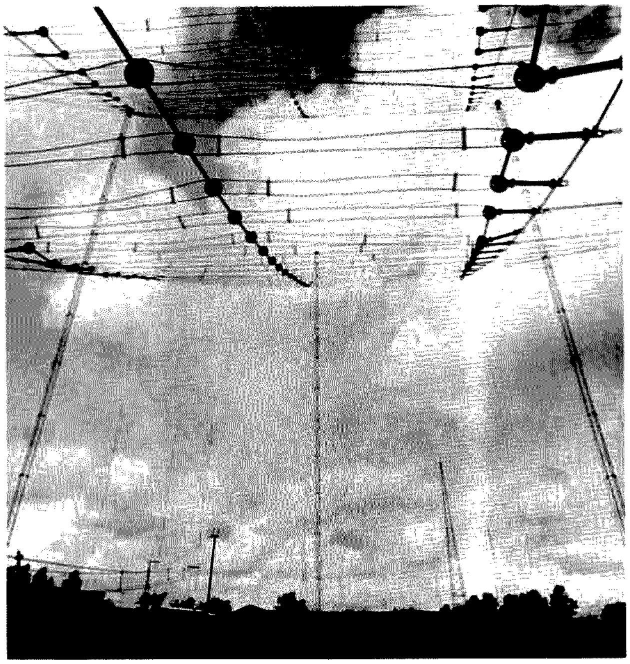
Time (GMT)	Best Frequencies (MHz)
0000, 0200, and 0300	5.975, 6.12, 6.175, 7.325, 11.750, 15.260
0400, 0500, and 0600	5.975, 6.175, 9.510, 15.070
0700	6.175, 9.510, 15.070
0800 and 0900	9.510, 15.070
1100 and 1300	6.195, 9.510, 11.775, 15.070
1600 and 1700	15.070, 15.260, 17.830, 21.710
1800	15.070, 21.71
2000	6.175, 15.070
2300	5.975, 6.175, 7.325, 15.070

BBC AND THE FALKLAND ISLANDS CRISIS

BBC is at its best reporting on significant news events, and the Falkland Islands crisis certainly was a good example. First of all, the regular news broadcasts generally were an hour or so ahead of the wire services or what your local radio or TV station reported. You heard it first on BBC if you tuned it in. Second, BBC has special programs to deal with current newsworthy events, and the Falkland situation was no exception. On May 2, right after the air attack on the Argentine-held airfields on the Islands, the BBC preempted one of its most popular programs, Letter From America, for an interview with several military experts.

These special programs generally come right after major news programs such as their 1100, 2000, 0000, and 0200 GMT broadcasts, but they can come at any time, as the BBC thinks nothing of interrupting regular programs for something special.

Finally, the BBC has always had a special weekly broadcast to the Falklands on Sunday afternoon from 2209 to 2245 GMT on 9.915 and 12.040 MHz. I heard the one right after the Argentine invasion on April 4, and it was excellent. It included a message from the British Foreign Secretary, a review of British press opinions, and even special messages to relatives. The program was very easy to receive in the Northeast, where I reside. Check it out at the above times and frequencies.



A view of the antenna farm for the BBC's broadcasts to North America. The signal is loud and strong to the US.

it to the BBC News Staff, supplies it on a subscription basis to other governments, news agencies and newspapers, universities, research institutes, industrial and commercial organizations, and private individuals.

World news can be heard in North America seventeen times a day (see box). In addition, back-up programs on the world events are offered daily. Some of the most popular of these (as of last year) are:

- *Outlook*—an up-to-the-minute look at people, events, and opinions together with the latest UK news, sports, and weather.
- *Twenty-Four Hours*—analysis of the main news of the day plus reviews of the British press.
- *The World Today*—examines thoroughly one topical aspect of the international scene.
- *Commentary*—background to the news from a wide range of specialists.
- *Radio Newsreel*—news of events as they happen, and dispatches from BBC correspondents all over the world.
- *New About Britain.*
- *British Press Review*—Survey of editorial opinion in the press.
- *Financial News*—including news of commodity prices and significant moves in currency and stock markets.

In addition to these daily reports, the BBC also offers a number of weekly review-type programs on current events and special interest subjects. Among the most popular:

- *Financial Review*—a look back at the financial week.
- *Business Matters*—a weekly survey of commercial and financial news.
- *From Our Own Correspondent*—BBC reporters comment on the background to the news.
- *From the Weeklies*—a review of the British weekly press.
- *Listening Post*—a weekly survey of comment from radio stations around the world.

While the BBC has no rival for its extensive coverage of news, it also leads the way in many other types of programs—sport, drama, light entertainment, and music. These can be divided into two categories—monthly features and regular programs.

A typical month will have anywhere from 12 to 16 feature programs. These range from general interest to special interest subjects. Some are only for the "intellectuals," and others are for the "common man." In June, for example, the Queen's Birthday Parade (better known as "Trooping the Colours") is broadcast from London with all the music and pageantry you would expect. The BBC also has had weekly programs called " The Poetry of Europe," "The Movie Moguls," and "Medical Hypnosis."

Music is an important part of BBC programming. In fact, no other international broadcaster comes close to providing the number of musical programs—both classical and "Pops"—as does the BBC. Every month there are eight or nine special programs making their bows. Regular music programs include "Concert Hall," "Talking about Music," and a long-time BBC favorite, "The Pleasure's Yours," where Gordon Clyde plays classical requests. Another, "Classical Record Review," reports on new releases.

Classical music is not the only thing that the BBC provides listeners who dig instruments and vocal sounds. For the rock devotee, there is the weekly "John Peel" show where the host selects tracks from a newly released album and singles from the progressive rock scene in London. "Jazz for the Asking" is a popular weekly request show, and "Top Twenty" lets you listen to all the big hits. "Terry Wogan's Album Time" is a weekly show for those people who like the easy-listening kind of music, and there are many more of the same on the BBC every week.

Another area where BBC programming leads the way is in drama. There are four regular weekly features plus specials for the particular month. Total air time per week for this type of show is about 16 hours. A regular drama program is "Thirty Minute Theater." This often shows plays by such famous writers as Dorothy L. Sayers, Terrence Rattigan, and Oscar Wilde.

"Play of the Week," "Radio Theater," and "Short Story" are other regular drama programs.

SOME POPULAR BBC PROGRAMS
(All Times GMT)

Letter From America (Alistair Cooke)	Sundays 0545, 1115, 1645, 2315
Letterbox	Fridays 1415; Saturdays 2315; Sundays 0515, 2015
Look Ahead (Program Previews)	Daily 0940; weekdays 1943
In The Meantime	Thursdays 2120; Fridays 0150, 1115
Outlook	Weekdays 1900, 1515, 0115 (Tuesday-Saturday)
Anything Goes	Saturdays 1215; Mondays 0330, 0830
Concert Hall	Sundays 1515
Top Twenty (Hit Records)	Wednesdays 1830, 2330; Thursdays 1215
New Ideas	Saturdays 0530, 1015, 2230; Wednesdays 1725
Good Books	Saturdays 2015; Sundays 0215
Jazz For The Asking	Wednesdays 2130

Margaret Howard hosts the very popular "Letterbox" program on the BBC. Hear it on Fridays at 1415, Saturdays at 2315, or Sundays at 0515 and 2015 GMT.

Alistair Cooke is heard every Sunday on the BBC with his popular "Letter From America" program. Listen to it at 0545, 1115, 1645, or 2315 GMT.

Book lovers hear the following programs every week: "Book Choice," "Good Books," and "Paperback Choice." For those interested in science and hobbies, "Discovery" covers advanced developments in science, "New Ideas" gives you news of the latest British products and inventions of particular interest to the home owner and small businessman, "Science in Action" lives up to its name, and "Time Off" is a program devoted to hobbies, pastimes, and entertainment.

Religion is not overlooked at the BBC, either. Services broadcast from famous English cathedrals and churches can be heard on Sundays and Mondays. Two other programs are "Report on Religion," a weekly magazine of religious news and views, and a daily program called "Reflections."

Sports occupy a prominent part of the BBC weekly schedule, but a good many of these broadcasts are "very British indeed"—rugby, cricket, British football—and do not have a great appeal to the average US audience. If you have any British expatriates in your area, you can get them really excited by inviting them over to hear something like England versus Scotland in football.

BBC programs are very carefully researched by surveys and opinion polls. A Listener Panel (of which I am a member) is made up of 88% foreign nationals and 12% British expatriates and is asked to vote on individual programs and/or subjects on a regular basis. Panel voting accounts for the unusual number of drama programs and for the addition of a new business news program ("Financial Review," mentioned above). Over 50% of the panel apparently wanted more business news.

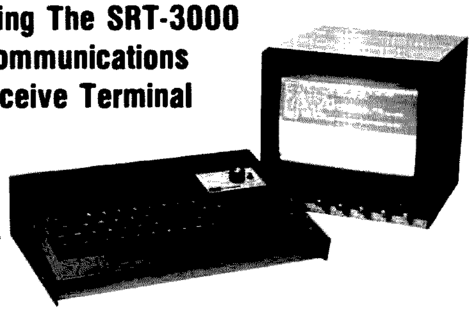
Research indicates that one of the most popular BBC weekly programs is Alistair Cooke's "Letter from America." Back in 1946, the BBC commissioned Cooke to deliver a series of radio talks on the subject of the USA where he had been living and working for more than a decade. The original plan called for thirteen weekly programs, but it has never stopped in all these years. It may well be the longest-running series in radio history. Listen to it on Sundays at 0545, 1115, 1645, or 2315 GMT.

One other BBC program that continues to score high marks is "Letterbox." This is a show where several people simply read letters (often complaints or suggestions for BBC programming) from listeners, and the BBC replies. On the surface, it doesn't sound very fantastic. However, the people on the show are so funny—with British wit and satire—that it has become one of the big BBC hits. Hear it on Fridays at 1415, Saturdays at 2315, and Sundays at 1515 and 2015 GMT.

At this point you might well be thinking about why the British go to all the trouble and expense of providing such a wealth of programs to the shortwave radio listeners of the world. To understand their motives we should examine the basics of the whole BBC foundation.

The letters "BBC" were first used in 1922 when the

Introducing The SRT-3000 RTTY Communications Send-Receive Terminal



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*Introductory prices good thru Feb. 28, 1983.
Optional 9" video monitor shown $149.00.

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787 Briar Lane, Beloit, Wis. 53511
(608) 362-0410

British Broadcasting Company was formed and when regular daily broadcasts began. In those days, the BBC was a commercial organization, but one that operated under a license on conditions which would have prevented it—even if it wanted to—from turning broadcasting into a moneymaker for the shareholders. From the start, it placed the interests of the public above all. The result was that the British developed a genuine public service broadcasting system, paid for by its audience through their receiving licenses. In 1927, the Company became the British Broadcasting Corporation. It is a public corporation constituted by Royal Charter and holding a license from the Minister responsible for broadcasting. Thus the BBC is neither a government department nor a commercial concern.

The External Services, which is what we hear on our shortwave receivers, are an integral part of the BBC, operating under the same charter as the domestic service and sharing the same traditions. Unlike the domestic service (which is financed by annual "listener licenses"), the External Service is paid for by Parliamentary grants-in-aid. The government prescribes the languages which are broadcast and the length of time each is on the air, but editorial control rests with the BBC.

External broadcasting from Great Britain began in 1932 with a service in English. A few years later, the BBC was asked by the government to broadcast in other languages, the first of which was Arabic. During the early days of World War II, the BBC was a constant ray of hope for the people in France and other Nazi-occupied countries. I can well remember, as an airman shot down in France a few weeks before the invasion and hiding in a French farmhouse, listening to the BBC on the family radio. The BBC used to send coded messages to the French underground during those days.

Today, the External Services broadcast to the world in English and 38 other languages for over 100 hours every day. These programs originate mainly from the 52 studios in Bush House in London.

While the British Empire is no longer the world power that it once was and no longer has all those colonies on which "the sun never sets," it still has thousands of citizens and expatriates living abroad. The BBC brings information and entertainment from home and helps them keep their ties to the mother country. This, of course, is a prime objective of BBC broadcasting overseas.

Naturally, the BBC is interested also in presenting its own point of view to citizens of other countries around the world. The BBC estimates that about 75 million adults listen regularly (once a week or more) to its External Services. The English broadcasts are heard by about 25 million.

Like all international shortwave broadcasters, BBC programs and frequencies change from month to month. How can you keep up-to-date with these constant changes? Basically there are two ways to do it—by your radio receiver and by print. The BBC has three programs which will help you keep abreast of things. First is a show called "Look Ahead" which previews programs for each day. "In the Meantime" is a program which tells you what is new in BBC programs. And third, there is a program called "Waveguide" which covers frequency changes, propagation estimates, and other things which help you to keep tuned well to the BBC.

Serious listeners to the BBC will be interested in receiving a monthly copy of "London Calling." This publication is sent airmail from London every month, previewing programs and giving frequency changes so that the listener is right on top of BBC broadcasts a month ahead of time. Unfortunately, this is not a free publication and the cost to subscribers in the US is $13.00 per year. You can get a free sample copy, however, by writing BBC World Service, PO Box 76, Bush House, London WC2B 4PH. Or, to save yourself the cost of an overseas airmail stamp, direct your order to: British Broadcasting Corporation, 630 Fifth Avenue, New York NY 10019. ■

BEST BBC FREQUENCIES FOR NORTH AMERICA

Time (GMT)	Frequencies (MHz)
0000-0230	15.07, 15.26, 11.75, 7.325, 6.175, 6.12, 5.975
0230-0330	11.75, 9.60, 9.51, 7.325, 6.175, 6.12, 5.975
0330-0630	9.51, 6.175, 5.975, 15.07
0630-0730	15.07, 9.51
0915-1100	11.750, 9.740, 15.07
1100-1330	21.55, 15.07, 11.75, 9.51, 6.195
1300-1500	21.71, 15.07
1500-1745	21.71, 17.83, 15.40, 15.26, 15.07
1745-2000	15.07, 9.41, 12.095
2000-2100	21.56, 15.26, 15.07, 6.175
2100-0000	15.26, 15.07, 6.175
2200-0000	15.42, 11.75, 9.59, 9.51, 6.12, 15.07
2300-0000	7.325, 5.975

This chart effective summer, 1982. Some changes will take place in the fall.

Reader Service for facing page ✓5 →

Active-Filter Design Made Easy

Using this BASIC program, if you don't like the design, then scrap it. All you lose is a few seconds.

B. E. Taylor WD4HPC
922 Reaves Street
Jackson MS 39204

There have been many articles on active bandpass filters in the electronics/amateur publications. Most of the articles are recipes, i.e., if you want my performance, duplicate my circuit. The rest have been tutorial articles which are mathematical in nature.[1,2] There is a section on multiple-feedback bandpass (MFB) filter design in the 1979 ARRL *Handbook*,[3] and there are at least two books devoted to active filter design.[4,5]

The equations used in designing the most common type of active bandpass filter—the second-order, MFB filter—can be solved nearly as easily as the name of the filter can be pronounced. The problem is that all of the design parameters and the component values are interdependent. Changing any one can lead to changes in others, which leads to more calculations.

This is just the sort of calculation that is ideally suited for computer evaluation. The program described in

Program listing.

```
10 REM BANDPASS BASIC
20 REM BY B. E. TAYLOR WD4HPC
30 REM FOR SECOND ORDER MULTIPLE FEEDBACK BANDPASS FILTERS
100 R1=0
199 REM INPUT SECTION - OPTIONS FOLLOW
200 PRINT"YOUR CHOICES ARE AS FOLLOWS"
210 PRINT "1 - CHOOSE R1, R3, R5 AND C"
220 PRINT "2 - CHOOSE G, Q, F AND C"
230 PRINT "3 - CHOOSE R1, F, Q AND C"
240 PRINT "4 - SCALE FREQUENCY BY CHANGING CAPACITORS"
250 PRINT "5   SCALE FREQUENCY BY CHANGING RESISTORS"
260 PRINT "6 - SCALE IMPEDANCE OF COMPONENTS"
270 PRINT "7   DO CALCULATIONS FOR CASCADED SECTIONS"
280 INPUT "ENTER THE NUMBER CORRESPONDING TO YOUR CHOICE";M
300 IF M=1 THEN 1000
310 IF M=2 THEN 2000
320 IF M=3 THEN 3000
330 IF M=4 THEN 5000
340 IF M=5 THEN 5300
350 IF M=6 THEN 5600
360 IF M=7 THEN 6000
370 GOTO 280
999 REM DESIGN A FILTER BY SPECIFYING ALL COMPONENTS
1000 INPUT "R1";R1,"R3";R3,"R5";R5,"C";C
1010 C=C*1E-6
1020 G=.5*R5/R1
1030 Q=SQR((R1*R5+R3*R5)/(4*R1*R3))
1040 F=Q/(6.2832*R1*C*G)
1050 GOTO 4000
1999 REM DESIGN A FILTER BY SPECIFYING ALL PARAMETERS AND C
2000 INPUT "G";G,"F";F,"Q";Q,"C";C
2010 W=6.2832*F
2020 C=C*1E-6
2030 R1=Q/(W*G*C)
2040 R5=2*G*R1
2050 R3=R1*R5/(4*Q*Q*R1-R5)
2060 IF 0>R3  THEN PRINT "NOTE - NEGATIVE VALUE OF R3"
2070 GOTO 4000
2999 REM DESIGN BY SPECIFYING INPUT IMPEDANCE, Q,F AND C
3000 INPUT "R1";R1,"Q";Q,"F";F,"C";C
3010 W=6.2832*F
3020 C=C*1E-6
3030 G=Q/(W*R1*C)
3040 R5=2*G*R1
3050 R3=R1*R5/(4*Q*Q*R1-R5)
3060 IF 0>R3 THEN PRINT "NOTE - NEGATIVE VALUE OF R3"
3070 GOTO 4000
3999 REM OUTPUT SECTION FOR ABOVE SEGMENTS
4000 PRINT
4010 PRINT
4020 PRINT "FOR THIS DESIGN"
4030 PRINT "R1=";R1;"OHMS"
4040 PRINT "R3=";R3;"OHMS"
4050 PRINT "R5=";R5;"OHMS"
4060 C1=C*1E6
4070 PRINT "C=";C1;"MICROFARADS"
4080 PRINT "F=";F;"HERTZ"
4090 PRINT "Q=";Q
4100 PRINT "G=";G
4110 PRINT
4120 PRINT
4130 INPUT "DO YOU WISH TO CONTINUE - Y OR N";X$
4140 Y1$="N"
4150 Y2$="Y"
4160 IF X$=Y1$ THEN 9999
4170 IF X$=Y2$ THEN 200
4180 GOTO 4130
4999 REM SCALE FREQUENCY BY CHANGING CAPACITORS
5000 IF R1>0 THEN 5030
5010 PRINT "CANNOT SCALE UNTIL VALUES ARE DETERMINED"
5020 GOTO 200
5030 INPUT "NEW FREQUENCY";F0
5040 C=C*F/F0
5050 F=F0
5060 GOTO 4000
5299 REM SCALE FREQUENCY BY CHANGING RESISTORS
5300 IF R1=0 THEN 5010
5310 INPUT "NEW FREQUENCY";F0
5320 D=F/F0
5330 R1=R1*D
5340 R3=R3*D
5350 R5=R5*D
5360 F=F0
5370 GOTO 4000
5599 REM SCALE IMPEDANCE OF ALL COMPONENTS
5600 IF R1=0 THEN 5010
5610  INPUT "NEW VALUE OF CAPACITOR";C0
5720 D=C0*1E-6/C
5730 C=C0*1E-6
5740 R1=R1/D
5750 R3=R3/D
5760 R5=R5/D
5770 GOTO 4000
5999 REM CASCADE IDENTICAL SECTIONS
6000 INPUT "HOW MANY SECOND ORDER SECTIONS";N
6010 INPUT "Q PER SECTION";Q1,"GAIN PER SECTION";G1
6020 B=2*(EXP(LOG(2)/N)-1)/(Q1*Q1)
6030 W1=.5*B+.5*SQR(B*B-4)
6040 W2=.5*B-.5*SQR(B*B-4)
6050 Q=SQR(W1)-SQR(W2)
6060 Q=1/Q
6070 PRINT "FOR";N;"SECTIONS EACH OF Q=";Q1
6080 PRINT "THE TOTAL Q IS";Q
6090 G=EXP(N*LOG(G1))
6100 PRINT "THE GAIN OF THE SYSTEM IS";G
6110 PRINT
6120 GOTO 4130
9999 END
```

this article was written to allow one to perform computer-aided design of second-order MFB filters.

The circuit diagram of an MFB filter is shown in Fig. 1. The labeling of the components is the same as that used in the program. The equations for performing the design are listed in Table 1. Most general-purpose op amps can be used in the filter.

This program has been written in such a manner as to be as versatile as possible. It should be helpful to the person wishing to design a filter of specified parameters and equally useful to the person who wishes to alter some parameter or component value in an existing MFB filter design. Take note: There are intrinsic limitations on the Q, gain, and center frequency of MFB filters which are not discussed in this article. The reader who is unfamiliar with these limitations should consult one of the references at the end of this article.

The program has seven possibilities for design, as follows:

1) Specify the values for R1, R3, and R5 in Ohms and C in uF. The program will calculate Q, G (the passband gain), and F (the center frequency, in Hz). This segment is useful in checking the parameters of a filter using the values of the available components.

Sample printout.

```
YOUR CHOICES ARE AS FOLLOWS
1 - CHOOSE R1, R3, R5 AND C
2 - CHOOSE G, Q, F AND C
3 - CHOOSE R1, F, Q AND C
4 - SCALE FREQUENCY BY CHANGING CAPACITORS
5 - SCALE FREQUENCY BY CHANGING RESISTORS
6 - SCALE IMPEDANCE OF COMPONENTS
7 - DO CALCULATIONS FOR CASCADED SECTIONS
ENTER THE NUMBER CORRESPONDING TO YOUR CHOICE? 1
R1? 68E3
R3? 4.3E3
R5? 180E3
C? .015


FOR THIS DESIGN
R1= 68000 OHMS
R3= 4300 OHMS
R5= 180000 OHMS
C= .015 MICROFARADS
F= 393.253 HERTZ
Q= 3.3357
G= 1.32353


DO YOU WISH TO CONTINUE - Y OR N? Y
YOUR CHOICES ARE AS FOLLOWS
1 - CHOOSE R1, R3, R5 AND C
2 - CHOOSE G, Q, F AND C
3 - CHOOSE R1, F, Q AND C
4 - SCALE FREQUENCY BY CHANGING CAPACITORS
5 - SCALE FREQUENCY BY CHANGING RESISTORS
6 - SCALE IMPEDANCE OF COMPONENTS
7 - DO CALCULATIONS FOR CASCADED SECTIONS
ENTER THE NUMBER CORRESPONDING TO YOUR CHOICE? 2
G? 1.33
F? 400
Q? 3.0
C? .015


FOR THIS DESIGN
R1= 59832.5 OHMS
R3= 4773.68 OHMS
R5= 159155 OHMS
C= .015 MICROFARADS
F= 400 HERTZ
Q= 3
G= 1.33

DO YOU WISH TO CONTINUE - Y OR N? Y
YOUR CHOICES ARE AS FOLLOWS
1 - CHOOSE R1, R3, R5 AND C
2 - CHOOSE G, Q, F AND C
3 - CHOOSE R1, F, Q AND C
4 - SCALE FREQUENCY BY CHANGING CAPACITORS
5 - SCALE FREQUENCY BY CHANGING RESISTORS
6 - SCALE IMPEDANCE OF COMPONENTS
7 - DO CALCULATIONS FOR CASCADED SECTIONS
ENTER THE NUMBER CORRESPONDING TO YOUR CHOICE? 3
R1? 50E3
Q? 3
F? 400
C? .015


FOR THIS DESIGN
R1= 50000 OHMS
R3= 4849.77 OHMS
R5= 159155 OHMS
C= .015 MICROFARADS
F= 400 HERTZ
Q= 3
G= 1.59155


DO YOU WISH TO CONTINUE - Y OR N? Y
YOUR CHOICES ARE AS FOLLOWS
1 - CHOOSE R1, R3, R5 AND C
2 - CHOOSE G, Q, F AND C
3 - CHOOSE R1, F, Q AND C
4 - SCALE FREQUENCY BY CHANGING CAPACITORS
5 - SCALE FREQUENCY BY CHANGING RESISTORS
6 - SCALE IMPEDANCE OF COMPONENTS
7 - DO CALCULATIONS FOR CASCADED SECTIONS
ENTER THE NUMBER CORRESPONDING TO YOUR CHOICE? 4
NEW FREQUENCY? 600


FOR THIS DESIGN
R1= 50000 OHMS
R3= 4849.77 OHMS
R5= 159155 OHMS
C= .01 MICROFARADS
F= 600 HERTZ
Q= 3
G= 1.59155


DO YOU WISH TO CONTINUE - Y OR N? Y
YOUR CHOICES ARE AS FOLLOWS
1 - CHOOSE R1, R3, R5 AND C
2 - CHOOSE G, Q, F AND C
3 - CHOOSE R1, F, Q AND C
4 - SCALE FREQUENCY BY CHANGING CAPACITORS
5 - SCALE FREQUENCY BY CHANGING RESISTORS
6 - SCALE IMPEDANCE OF COMPONENTS
7 - DO CALCULATIONS FOR CASCADED SECTIONS
ENTER THE NUMBER CORRESPONDING TO YOUR CHOICE? 5
NEW FREQUENCY? 800


FOR THIS DESIGN
R1= 37500 OHMS
R3= 3637.33 OHMS
R5= 119366 OHMS
C= .01 MICROFARADS
F= 800 HERTZ
Q= 3
G= 1.59155


DO YOU WISH TO CONTINUE - Y OR N? Y
YOUR CHOICES ARE AS FOLLOWS
1 - CHOOSE R1, R3, R5 AND C
2 - CHOOSE G, Q, F AND C
3 - CHOOSE R1, F, Q AND C
4 - SCALE FREQUENCY BY CHANGING CAPACITORS
5 - SCALE FREQUENCY BY CHANGING RESISTORS
6 - SCALE IMPEDANCE OF COMPONENTS
7 - DO CALCULATIONS FOR CASCADED SECTIONS
ENTER THE NUMBER CORRESPONDING TO YOUR CHOICE? 6
NEW VALUE OF CAPACITOR? .02


FOR THIS DESIGN
R1= 18750 OHMS
R3= 1818.67 OHMS
R5= 59683 OHMS
C= .02 MICROFARADS
F= 800 HERTZ
Q= 3
G= 1.59155


DO YOU WISH TO CONTINUE - Y OR N? Y
YOUR CHOICES ARE AS FOLLOWS
1 - CHOOSE R1, R3, R5 AND C
2 - CHOOSE G, Q, F AND C
3 - CHOOSE R1, F, Q AND C
4 - SCALE FREQUENCY BY CHANGING CAPACITORS
5 - SCALE FREQUENCY BY CHANGING RESISTORS
6 - SCALE IMPEDANCE OF COMPONENTS
7 - DO CALCULATIONS FOR CASCADED SECTIONS
ENTER THE NUMBER CORRESPONDING TO YOUR CHOICE? 7
HOW MANY SECOND ORDER SECTIONS? 4
Q PER SECTION? 3
GAIN PER SECTION? 1.59
FOR 4 SECTIONS EACH OF Q= 3
THE TOTAL Q IS 6.89688
THE GAIN OF THE SYSTEM IS 6.39129
```

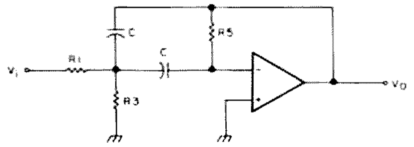

Fig. 1. Schematic of a second-order, multiple-feedback bandpass filter. The notation is the same as that of the program.

$$R1 = \frac{Q}{2\pi FGC}$$

$$R3 = \frac{Q}{2\pi FC(2Q^2 - G)}$$

$$R5 = \frac{Q}{\pi CF}$$

Table 1.

2) Specify the values of G, F, Q, and C. The program will calculate the values of R1, R3, and R5. Since resistors are usually more readily available than capacitors, this portion should be useful when the gain, Q, and center frequency are critical to the proper operation of the device.

3) Specify the values of R1, Q, F, and C. This segment is useful if one is trying to achieve a certain input impedance and the gain is not too critical.

4) This section allows one to change the center frequency of a previously designed filter by changing the value of the capacitors.

5) In this segment, one can change the center frequency by changing the value of the resistors.

6) This segment scales the impedance of the components in an MFB filter while retaining the same F, Q, and G. One chooses the new value for the capacitors and the program calculates the values of the resistors to maintain the same Q, F, and G. This is a useful feature if the desired values of C are not available and substitutes must be used.

7) This section allows one to predict the net Q and G of cascaded identical MFB sections. For example, three sections each of gain 2.0 and Q = 1.0 yield a net gain of 8.0 and a net Q of 1.96. Thus, there is a law of diminishing returns for the Q of cascaded sections. An unrealistic calculation shows that 120 cascaded sections each of Q = 2.0 would yield a net Q of 26.3!

The program has been written so that only the desired sections need be entered into the computer, in case a mass-storage device is not available. The program should run with no difficulty on any computer in which the BASIC has both floating-point arithmetic and string variables. Only minor modification would be needed to run the program on a machine that does not have string variables. This program has been run successfully on an 8K Pet.

To illustrate the use of the program, a sample printout has been included. It should be mentioned that several of the computer-generated designs were built on a breadboard and that the measured performance agreed very well with the theoretically predicted performance. ■

References

1. "Design Your Own Active Filters," H. M. Berlin, *QST*, June, 1977.
2. "Active Bandpass Filters," T. A. Conboy, *Ham Radio*, December, 1977.
3. *The Radio Amateur's Handbook*, Fifty-sixth edition, American Radio Relay League, Newington CT.
4. *The Active Filter Cookbook*, #21168, Howard W. Sams, Indianapolis IN, 1975.
5. *Design of Active Filters, With Experiments*, H. M. Berlin, #21359, Howard W. Sams, Indianapolis IN, 1978.

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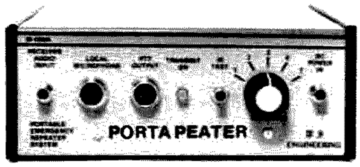

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The Cornerstone of Equipment Failure: Heat Damage

The proper heat sink will preserve transistors. Learn how to keep your circuitry from resembling a core meltdown.

Kenneth H. Shamburger
1413 Glendale
Greenville TX 75401

Heat is a hazard to all electronics projects. Many electronics enthusiasts have experienced the displeasure of watching a prized project destroy itself with heat. Understanding heat transfer and heat-sink selection is necessary to avoid this hazard.

This article explains the fundamentals of heat-sink selection, which are easy to understand and apply. It begins with a review of the ways heat is transferred, explains how to calculate the temperature inside a semiconductor component, provides an example of heat-sink selection, and contributes some hints for interpreting semiconductor and heat-sink thermal specifications.

The Review

"Heat transfer" is more accurate in describing the removal of heat than "heat flow." The word "flow" limits the possibilities we associate with the phenomenon to a single action—such as water flowing. Heat is transferred by *three* mechanisms.

It is transferred by radiation as an electromagnetic wave. The heat transmitted from the sun through the vacuum of space to the Earth is an example of radiation.

Heat is transferred by conduction when two objects are in contact. A soldering iron melts solder by conduction.

Heat is transferred by convection when a fluid medium, such as air, moves across the surface of an object. The air drawn through the radiator of your automobile cools the radiator by convection. When air is blown across an object, it is called *forced* convection. But, the air surrounding a warm object will rise, causing cooler air to replace it without the aid of a fan. When air is allowed to circulate by heating, it is called *natural* convection.

Heat is transferred from semiconductor devices by all three mechanisms, as illustrated by the transistor in Fig. 1. It is radiated from the transistor chip to the case (a) and is conducted to the case where the substrate and case are in contact (b). The heat transferred to the case distributes itself throughout the case by conduction and, then, is transferred to the surrounding air by convection (c). If a heat sink is attached to the transistor, heat is transferred from the transistor case to the heat sink by conduction and to the surrounding air by convection. Also, it is radiated from the case and heat sink to objects nearby.

However, the amount of heat transferred by radiation is a small percentage of the heat transferred by convection. For this reason, the heat transfer equations typically used in heat-sink selection calculate only the heat transferred by natural convection. Similarly, the heat transferred by radiation from the chip to the case does not receive special attention in the calculations. And despite the inaccuracy, convenience makes us think of heat as flowing. These simplifications ease the analysis process.

Not all heat generated in the transistor is transferred to the air. Each segment of

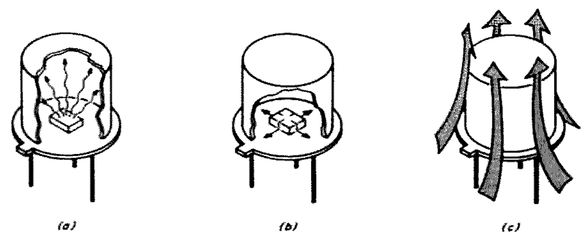

Fig. 1. Heat transfer from a transistor: (a) from chip to case by radiation; (b) from chip to case by conduction; (c) from case to air by convection.

the path between the chip and the air resists heat flow in a manner similar to a resistor resisting current flow. The heat retained in the transistor because of this impedance causes the temperature of the chip to rise. Our goal is to determine the temperature of the transistor chip. The chances of its destruction then can be evaluated.

The Fundamentals

In classical physics, equations have been developed for calculating the amount of heat transferred; they are not complicated. However, their solution depends upon parameters which are difficult to evaluate in practice. For this reason, engineers have devised equations which do not use these parameters, but which make heat flow analogous to electric current flow. In this analogy, a heat source is analogous to a current source, thermal resistance to electrical resistance, and temperature to voltage. The equation relating them is like Ohm's Law and says that *the difference in temperature (voltage drop) across a thermal resistance is equal to the thermal resistance multiplied by the heat (current) flowing through the resistance.* This thermal equivalent to Ohm's Law is expressed by the equation $T = \theta P$.

The symbol θ, with subscripts to indicate the circuit connections, commonly represents thermal resistance. For example, θ_{JC} is the thermal resistance between the transistor chip and its case. (The capital "J", for junction, is used widely to represent the source of heat in semiconductor components.) Values of thermal resistance for semiconductor components and heat sinks are usually obtained from their respective specifications. In an electronic component, heat originates as power dissipated by the device. The thermal analogy carries this into the electrical thermal model by making power, identified by a capital "P," equal to heat. (Sometimes the lowercase "q" is used to represent power because this symbol is used for heat in physics.)

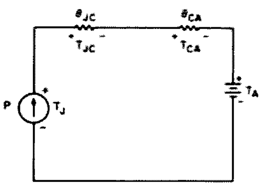

Fig. 2. Thermal circuit for a semiconductor.

The Calculations

Our goal is twofold. First, we must determine the temperature of the semiconductor chip. If this temperature exceeds a safe value, we must determine the thermal specifications for a heat sink which will provide adequate transfer away from the transistor. Using the electrical thermal analogy, the calculations involved in both tasks are similar to electric circuit calculations.

A diagram for the thermal circuit of a transistor is illustrated in Fig. 2. The unique feature of this diagram is the voltage source labeled T_A. This addition does not alter the validity of the model. The properties of the theoretically perfect current source (labeled P) do not allow current to flow backward through it. Since it is the only source of current in the circuit, the current flowing through the circuit equals P. The voltage source is simply a way of representing the temperature of the surrounding air (called the *ambient temperature*). It is convenient to include it so that the ambient temperature appears in Kirchoff's voltage equations for the circuit. Some people, choosing to account for T_A later in the analysis, do not include this source.

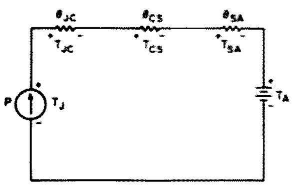

Fig. 3. Thermal circuit for a semiconductor with a heat sink.

A resistor represents the thermal resistance of each segment along the path between the semiconductor junction and the ambient. Each segment can be identified by the letters comprising its subscripts. Beginning at the junction, these are JC for junction-to-case and CA for case-to-ambient.

The thermal analogy for Kirchoff's Voltage Law says that the temperature of a semiconductor chip is equal to the sum of the temperature drops around the remainder of the circuit. This is expressed by the equation $T_J = T_{JC} + T_{CA} + T_A$, where T_J is the semiconductor chip temperature, T_{JC} is the temperature drop across θ_{JC}, T_{CA} is the temperature drop across θ_{CA}, and T_A is the ambient temperature. The values of T_{JC} and T_{CA} can be calculated from the thermal equivalent of Ohm's Law. Substituting these into the above equation, the junction temperature equation becomes $T_J = (\theta_{JC} + \theta_{CA}) P + T_A$.

Many times, a manufacturer specifies a value for θ_{JA}, which is the thermal resistance between the junction and the ambient. θ_{JA} is equal to the sum of θ_{JC} and θ_{CA} and may be used in the preceding equation instead.

A thermal circuit which includes the thermal resistances associated with a heat sink is illustrated in Fig. 3. The case-to-ambient resistance, θ_{CA}, has been replaced by two resistances, the case-to-sink resistance, θ_{CS}, and the sink-to-ambient resistance, θ_{SA}. When these are substituted for θ_{CA}, the equation for the semiconductor junction temperature becomes $T_J = (\theta_{JC} + \theta_{CS} + \theta_{SA})P + T_A$. A heat sink is selected on the basis of its θ_{SA}, which characterizes its ability to transfer heat into the surrounding air. To *determine* the largest value of θ_{SA} that will maintain a safe semiconductor temperature, the equation is solved for θ_{SA}. This yields the following equation: $\theta_{SA} = [(T_J - T_A)/P] - (\theta_{JC} + \theta_{CS})$.

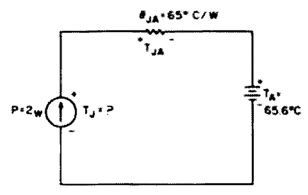

Fig. 4. Thermal circuit for the example without a heat sink.

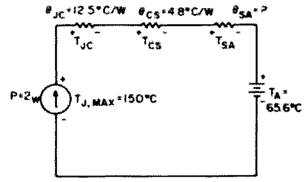

Fig. 5. Thermal circuit for the example with a heat sink.

An Example

Suppose you are designing an audio amplifier. You have estimated the power dissipation of the output transistor at 2 Watts. Having selected a transistor, you determine the relevant parameters from the transistor data sheet. These parameters are the maximum allowable power dissipation (P_{max}), the maximum operating junction temperature ($T_{J,max}$), the junction-to-case thermal resistance (θ_{JC}), and the junction-to-ambient thermal resistance (θ_{JA}). The values you found are listed below.

$P_{max} = 10$ Watts
$T_{J,max} = 150°$ C
$\theta_{JC} = 12.5°$ C/W
$\theta_{JA} = 65°$ C/W

Also, you note that the

Item 3: maximum junction operating temperature.

Item 4: specified thermal resistance θ_{JC}.

Item 6: derating curves for case and ambient temperatures.

Item 1: maximum power dissipation at specified case temperature and derating.
Item 2: maximum power dissipation at specified ambient temperature and derating.

Item 5: specified thermal resistance θ_{JA}.

MAXIMUM RATINGS

Rating	Symbol	2N6034 2N6037	2N6035 2N6038	2N6036 2N6039	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	80	Vdc
Collector-Base Voltage	V_{CB}	40	60	80	Vdc
Emitter-Base Voltage	V_{EB}	← 5.0 →			Vdc
Collector Current – Continuous	I_C	← 4.0 →			Adc
Peak		← 8.0 →			
Base Current	I_B	← 100 →			mAdc
Total Power Dissipation @ T_C = 25°C	P_D	← 40 →			Watts
Derate above 25°C		← 0.32 →			W/°C
Total Power Dissipation @ T_A = 25°C	P_D	← 1.5 →			Watts
Derate above 25°C		← 0.012 →			W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	← -65 to +150 →			°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	3.12	°C/W
Thermal Resistance, Junction to Ambient	θ_{JA}	83.3	°C/W

*Indicates JEDEC Registered Data.

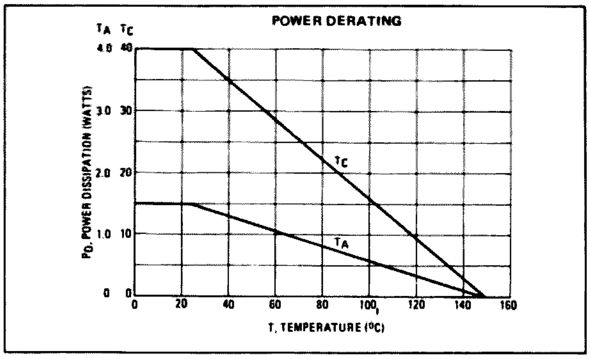

Fig. 6. Semiconductor thermal specifications and parameters.

transistor is in a TO-202 (plastic) case. In addition to these specified parameters, you have ascertained that the temperature of the air surrounding the transistor will not exceed 150° F (65.6° C). Good design practice suggests that you use a value between 10 and 20 percent greater than your estimated value for this temperature, as a safety factor, which you have done. (A diagram of the thermal circuit is shown in Fig. 4.)

Because your first concern is whether your transistor needs a heat sink, you use the value specified for θ_{JA} to calculate T_J as follows:

$T_J = (\theta_{JA})P + T_A$
$T_J = (65)2 + 65.6$
$T_J = 195.6°\ C$

The calculated value of T_J is greater than the specified maximum operating junction temperature ($T_{J,max}$) by 45.6° C.

The next step is to determine the thermal resistance required of the heat sink. This is accomplished by solving the equation for θ_{SA} after substituting the value of $T_{J,max}$ for T_J. However, the value of one other parameter, the case-to-sink thermal resistance, θ_{CS}, must be determined before this equation can be solved. θ_{CS} depends upon the method used to mount the transistor. It usually is provided in a table by heat-sink manufacturers and, occasionally, semiconductor manufacturers. Table 1 lists values of θ_{CS} for some common transistor case types and mounting methods.

After obtaining a value of 4.8° C/W for θ_{CS}, the completed thermal diagram is shown in Fig. 5. θ_{SA} is calculated as follows:

$\theta_{SA} = [(150 - 65.6)/2] - (12.5 + 4.8)$
$\theta_{SA} = 24.9°\ C/W$

A heat sink with a thermal resistance of 24.9° C/W or less will provide adequate heat transfer. A number of small, inexpensive heat sinks with a θ_{SA} of 20° C/W for the TO-202 case style are available. You simply select one which meets your mounting requirements.

Case Style	Metal-to-Metal Dry	Metal-to-Metal Lubricated	Insulated Dry	Insulated Lubricated
TO-3	0.5	0.1	1.3	0.36
TO-66	1.5	0.5	2.3	0.9
TO-83	—	0.1	—	—
TO-94	—	0.1	—	—
TO-126	2.0	1.3	4.3	3.3
TO-127	1.6	0.8	2.6	1.8
TO-202	1.3	0.9	4.8	2.0
TO-220	1.2	1.0	3.4	1.6

Table 1. Case-to-sink thermal resistance in °C/W.

The Semiconductor Specs

Except for saying that they are found in the manufacturers' data sheets, details of how the values for thermal resistances are obtained have not been discussed. Yet determining these values from the specifications sometimes requires skill. Familiarity with the types of data most likely to appear in the data sheet is necessary to success. With the aid of the data sheet appearing in Fig. 6, this data and its interpretation are described in the following paragraphs.

The data sheet in Fig. 6. was chosen to illustrate common methods of specifying semiconductor thermal specifications for two reasons. First, all of the specifications are labeled clearly and are arranged into a single, logical area of the specification. This is not true of all semiconductor data sheets. Often, thermal specifications, particularly for linear integrated circuits, are placed in notes. (The entire data sheet should be read before concluding that they have been

omitted.) The second reason for selecting the data sheet shown in Fig. 6 was that it contained all of the data relating to thermal specification. A typical data sheet will provide only a portion.

Thermal resistance is specified by direct specification, by derating, and by thermal-related parameters. A manufacturer uses direct specification when he tabulates thermal resistance in data sheets. The designer simply inserts the specified values into his thermal equations. Items 4 and 5 of Fig. 6 illustrate direct specifications.

A derating specifies how quickly the maximum power dissipation must be decreased as the case or ambient temperature increases. A derating may be given by statement (illustrated by items 1 and 2) or by curve (illustrated by item 6). A numeric value for thermal resistance is needed for the thermal analysis. The technique for determining a number from this kind of specification is more easily explained using an example.

The derating (item 1) indicates that the 2N6034 has a maximum power dissipation of 40 Watts at a case temperature of 25° C. It also indicates that this should be derated at 0.32 W/°C above 25° C. The derating is assumed to be linear above the specified temperature unless otherwise specified. This means that for every degree increase in case temperature, the dissipated power must be decreased by 0.32 Watts.

An examination of the electrical thermal model in Fig. 2 causes us to conclude that the power has to be decreased because junction-to-case thermal resistance is limiting heat flow from the device. Furthermore, the rate at which the power must be decreased as the temperature increases is related to the value of this thermal resistance. Actually, *the rate of derating is the reciprocal of the thermal resistance.* Thus, the junction-to-case thermal resistance for the 2N6034 can be calculated:

$\Theta_{JC} = 1/0.32$

$\Theta_{JC} = 3.125°$ C/W

The same technique can be applied to determine the junction-to-ambient thermal resistance from the derating in item 2.

The type of thermal resistance specified is indicated by the location of the specified temperature. The subscript attached to the temperature symbol identifies this location.

Frequently, a manufacturer will provide a derating curve, such as the one illustrated in Fig. 7, which provides the same information in graphical form. The horizontal axis indicates temperature. In this curve, it is temperature at the case. The vertical axis is the maximum dissipated power allowed at the indicated temperature. To find the thermal resistance from a derating curve, divide the difference in temperature by the difference in dissipated power. From Fig. 7, the temperature changes from 25° C to 150° C, which is 125° C. The change in dissipated power over this temperature range is from 40 Watts to 0 Watts, a difference of 40 Watts. Thus, Θ_{JC} is calculated by dividing 125 by 40.

$\Theta_{JC} = 125/40$

$\Theta_{JC} = 3.215°$ C/W

Notice (in item 6 of Fig. 6) that Motorola gave a derating curve for both case and ambient temperatures. Each curve is labeled with the appropriate temperature.

A manufacturer may not specify either a thermal resistance or a derating. However, a knowledgeable designer can determine a derating specification from other specifications and calculate the thermal resistance from this derating.

The key to determining a derating curve for a semi-

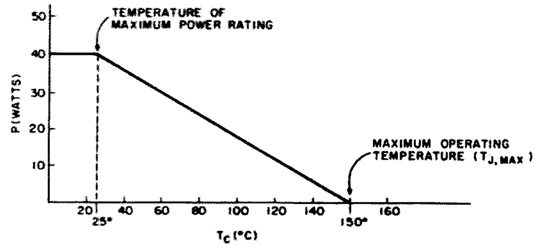

Fig. 7. Transistor power derating curve.

conductor is to find two points of the curve above the temperature where it begins to slope downward. Among other parameters, the derating curve specifies the temperature above which the device can no longer be operated, that is, $T_{J,max}$ (see Fig. 7). At this temperature, the power must be zero. This is equivalent to saying that the current must equal zero in the electrical thermal circuit (Fig. 2).

Because no current is flowing in the circuit, no temperature is dropped across either Θ_{JC} or Θ_{CA}. Thus, the maximum operating temperature of the device must equal the maximum operating ambient temperature and the maximum operating case temperature. When the manufacturer specifies $T_{J,max}$, one point on both the ambient and the case temperature derating curves is known. The second point on the derating curve is established as the temperature where the maximum power dissipation is specified.

For example, the following are specified for the 2N6034 (items 1 and 3).

$P_{max} = 40$ Watts@$T_C = 25°$ C

$T_{J,max} = 150°$ C

The fact that this data agrees with the derating curve can be verified by comparing these two points on the derating curve labeled T_C in Fig. 6, item 6. Though Motorola seems to specify P_{max} as part of the derating specification, the appearance is created by the organization of the data sheet. The common practice is to specify that parameter, though no derating is specified.

Typically, the values of thermal resistance calculated from the derating curve and from the power and temperature specifications will agree with the specified thermal resistances within a few percent. Have you calculated Θ_{JA} by the above methods to find how closely they agree to its specified value?

As a designer searches for thermal specifications, he will discover that either Θ_{JA} or Θ_{JC}, but not both, is specified for a number of devices. Also, these specifications will be void of data which allows calculation of the unspecified value. This is true because manufacturers specify the parameters they believe relevant to the use of the device being specified, as they understand its application. In this regard, a device may fall into one of three categories.

It may have a specific function and the designer is not expected to concern himself directly with the power dissipation versus temperature relationship. For example, an SN7400 TTL quad NAND logic gate has a specific function. In this case, the manufacturer specifies the maximum temperature of operation for the device. The designer is expected to limit the ambient temperature to a value such that the specified value is not exceeded.

A device may be designed for use with or without a heat sink. These devices,

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being rated between 0.25 and 5 Watts dissipation without a heat sink, usually are classified as small or intermediate power devices. An example is the 2N6034 Darlington used in the above examples. Both Θ_{JA} and Θ_{JC} are specified for these devices.

Lastly, a device may be classified for use only with a heat sink. These are the high-power devices, such as the 2N3055. The data manuals commonly provide only the data required to determine the heat-sink requirements.

The Heat-Sink Specs

Values of thermal resistance for heat sinks are more easily determined from data sheets than are those for semiconductors. Thermal resistance for a heat sink can be provided by either of two methods. The first is by direct statement, as in the case of semiconductors. The second method is by curve, as illustrated in Fig. 8. The horizontal axis is heat as power dissipated. The vertical axis shows the temperature difference between the heat sink and ambient caused by the heat flow. To find the thermal resistance, simply find the temperature difference caused by the heat flowing in your thermal circuit. Then, divide the temperature difference by that power.

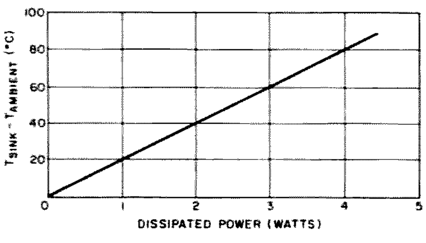

Fig. 8. Heat-sink thermal rating curve.

In the example where we calculated Θ_{SA}, the audio output transistor dissipated 2 Watts. The curve in Fig. 8 shows a temperature difference of 40° C at a 2-Watt power dissipation. Thus, the thermal resistance is:

$\Theta_{SA} = 40/2$

$\Theta_{SA} = 20°\ C/W$

Sometimes, the thermal resistance curve is nonlinear, meaning that Θ_{SA} changes as the dissipated power increases. Thus, it will not be a straight line, as shown in Fig. 8. Usually, it is straight. In either case, this technique determines Θ_{SA} easily.

All manufacturers provide curves with essentially the same data. The only difference is the axis labeling. For example, IERC labels the vertical axis on some of their data sheets "maximum sink temperature rise above ambient (°C)." To avoid confusion, simply remember the thermal equivalent of Ohm's Law: A temperature difference is caused by heat flowing through a thermal resistance.

One other factor must be considered during heat-sink selection. The thermal resistance of a heat sink is specified for a specific physical orientation of the heat sink. (This is true of semiconductors, also.) Except for heat sinks which are designed for special applications, the manufacturer specifies the resistance for *maximum unobstructed natural convection*. To understand the meaning of this, recall that natural convection depends upon heated air rising to be replaced by cooler air. A heat sink operates properly when air can circulate freely across the maximum area of every fin. This means that it should be mounted with its fins vertical. Also, the ends should be kept clear to allow unobstructed entry of air between the fins at the bottom and exit from the top. *Your mounting constraints should always be considered during heat-sink selection.*

Summary

The principles involved in heat-sink selection are now complete. The thermal circuit and its electrical equivalent provide a theoretical model for easy analysis of thermal phenomena. Thermal resistances for an equivalent circuit are determined from the manufacturers' data sheets. Applied to the thermal circuit, Ohm's Law and Kirchoff's Voltage Law, which are understood by those who work with electrical circuits, allow calculation of the semiconductor junction temperature. The calculated temperature is compared to the maximum temperature specified by the manufacturer to determine the necessity of a heat sink. If a heat sink is required, the maximum semiconductor temperature is substituted into the equations to determine the maximum thermal resistance for a heat sink which will limit the junction temperature to a safe value.

Two criteria are used to select a heat sink: Its thermal resistance must be less than the calculated maximum value and its mounting must be consistent with the designer's application. Heat-sink selection using these criteria completes the process.

Acknowledgements

The semiconductor data contained in Fig. 6 was reproduced from page 4-195 of the *Power Device Data Manual,* 1st Edition, copyright 1978 by Motorola Semiconductor Products, Inc., Phoenix, Arizona. Permission to print this portion of the manual was provided by Motorola. ■

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Your January Home-Brew Project

No frills—just a solid $10 SSB exciter for HF. Who says hams don't build anymore?

Promises, promises. How can any SSB exciter be inexpensive when an i-f filter is needed? I have been regaled with plans for inexpensive SSB generators, but the operative paragraph usually describes how the filter was found deep in the bowels of the faithful junk box or bought for a song from an unsuspecting entrepreneur at the last flea market. I have always arrived just as the last treasure has been sold. The promise of an inexpensive exciter eluded me.

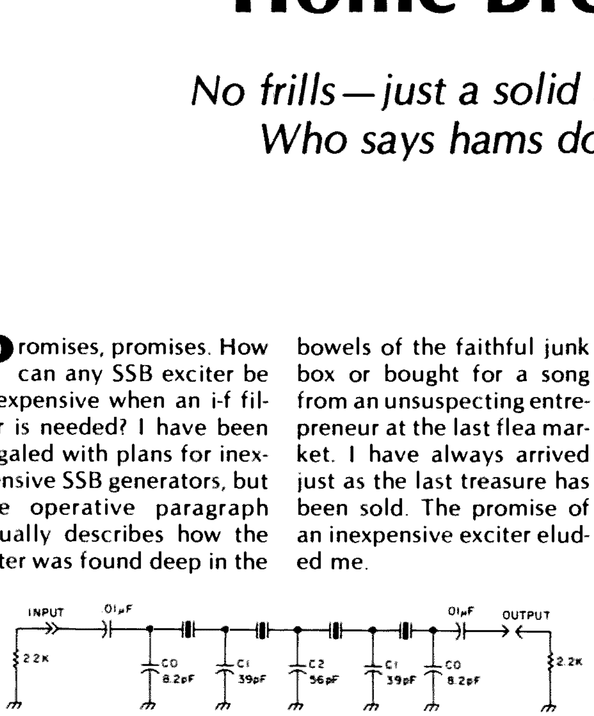
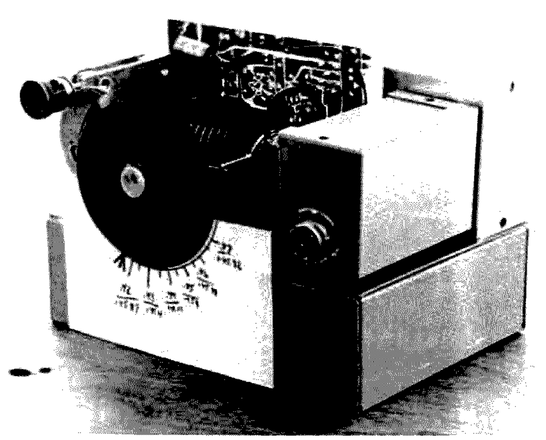


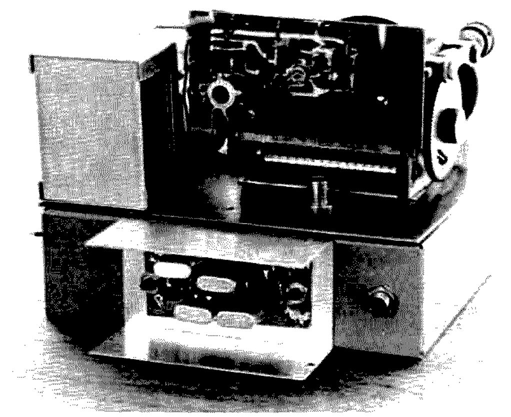
Fig. 1. A 3.58-MHz crystal-lattice SSB i-f filter with an audio bandwidth of 2 kHz and 2.2k input and output impedance.

So what am I offering you? Another inexpensive SSB exciter. This time the operative paragraphs will describe how you can make a very satisfactory crystal i-f filter for less than $10.00 which needs no critical tuning or messy and unpredictable crystal grinding. I will then describe how I used it in a 15-meter exciter.

This simple filter is made using four of the ubiquitous 3.58-MHz television crystals in a ladder configuration as shown in Fig. 1. If all you want is a simple i-f filter, this could be built as described by the schematic and you would be pleasantly impressed by its performance. For those who are innovators and have other crystals which are the same in frequency, there are general design rules for making two-, three-, and four-crystal filters. Fig. 2 gives the normalized capacitance values for these. To find the actual value of



The prototype 15-meter SSB exciter.



The exciter displaying the crystal filter mounted in a minibox for shielding.

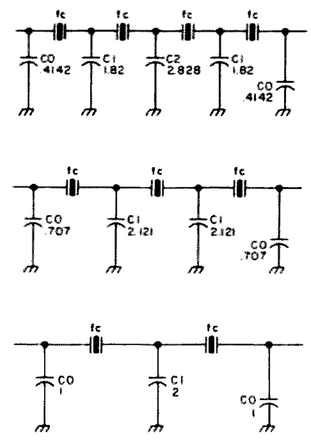


Fig. 2. To find the actual value of the shunt capacitors, multiply the coefficient beside each capacitor by 1/(2πfR), where f is the crystal frequency and R is the filter design impedance.

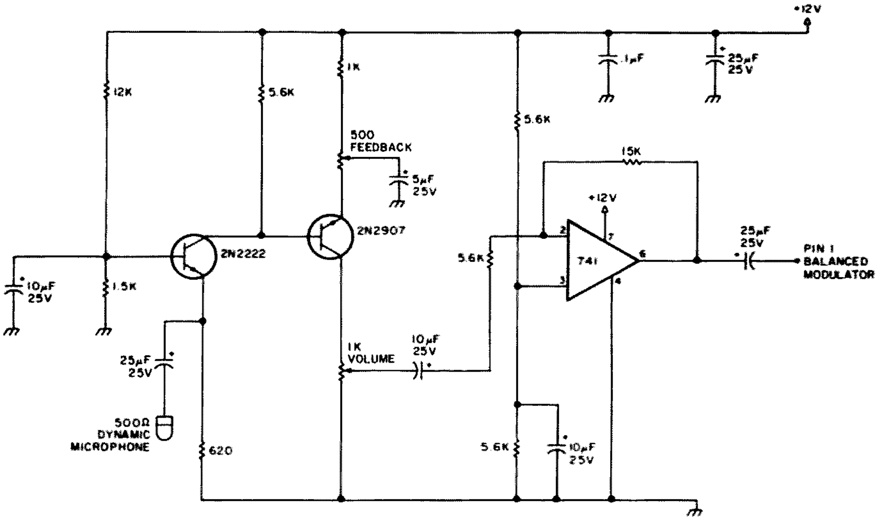


Fig. 3. Microphone amplifier.

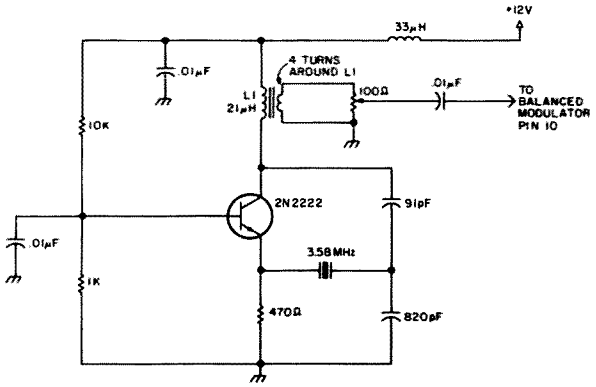


Fig. 4. Carrier oscillator. All resistors are ¼ Watt. L1 could be Miller part 46A225CPC with a 4-turn secondary added, available from Radiokit, Box 411H, Greenville NH 03048.

each capacitor, the coefficient beside each capacitor must be multiplied by 1/(2πfR) where f is the resonant frequency of the crystals in Hertz and R is the design input and output impedance in Ohms. For the suggested filter using the 3.58-MHz crystals, R was chosen to be 2.2k Ohms—thus 1/(2πfR) = 20 pF. C_0 = .4142 × 20 pF = 8.284 pF = 8.2 pF; C_1 = 1.82 × 20 pF = 36.40 pF = 39 pF; C_2 = 2.828 × 20 pF = 56.56 pF = 56 pF.

If the impedance was chosen to be 1.8k Ohms, then C_0 = 10 pF, C_1 = 47 pF, and C_2 = 68 pF. Thus, the impedance which is chosen to work toward is flexible, but there are a few considerations to notice. As the impedance is lowered, the passband of the filter is reduced and the insertion loss will increase. On the other hand, as the impedance is increased, the passband widens but the ripple in the passband also increases. As well, the low capacitance values for higher impedances make stray capacitance more troublesome.

This technique has been used by others to make filters using surplus crystals in the 8-to-12-MHz ranges as well. It was stated that a design impedance of 800 to 1000 Ohms was usable at that frequency for an SSB filter. A design impedance of 1500 Ohms was usable at 5 MHz.

In putting this filter into a circuit, it is imperative that it be properly terminated in its design impedance, both on the input and output. Neglecting this can give a very high passband ripple.

Now, you may think, we have the filter, but there is always a need for carrier-oscillator crystals. Good news! The series resonant frequency of the crystals controls the lower limit of the passband, so one more crystal identical to those used in the crystal filter will allow selection of the upper sideband. How easy can it be?

Listening to OSCAR 8, mode A has whet my appetite for a taste of operating through this satellite. One constraint seems to be that one should have full-duplex capabilities for the most success, but I had no VHF equipment and only one HF transceiver. I built a simple transmitting converter with five Watts output on 2 meters for one-milliwatt input on 15 meters. This gave me VHF capability. I first proposed to excite this with a CW signal; then the idea of a DSB exciter was entertained before I discovered the inexpensive crystal filter just described. I then could proceed with a full SSB exciter with an output power of one milliwatt on 15 meters. The design philosophy was very simple—I used the parts I had easily available to build a basic transmitter without bells and whistles. This was done and I am happy with the results.

Microphone Amplifier

The microphone amplifier described in Fig. 3 must match a low-impedance dynamic microphone to a low-impedance, balanced-modulator input while increasing the microphone output of 2 mV to one volt. The first stage is a common base amplifier to take advantage of the low input impedance and high voltage gain of this configuration. This directly drives a common emitter amplifier with adjustable feedback in the emitter to control the gain of this stage. The output stage is the common 741 operational amplifier, used for its very low output impedance which easily drives the 100-Ohm audio input of the balanced modulator. If you have other microphones, you will need different amplifier circuits than this. Just remember to

use a low-impedance output circuit to successfully drive the balanced modulator.

Carrier Oscillator

The crystal-controlled Colpitts oscillator (Fig. 4) was chosen as the carrier oscillator because it is very easy to get operating and the crystal vibrates in its series resonant mode. The output is terminated in a 100-Ohm variable resistor which allows for the adjustment of the carrier level for best carrier suppression in the balanced modulator. Inductor L1 was found in a Poly Paks assortment and a four-turn secondary was added. Miller part 46A225CPC also could be used for L1.

Balanced Modulator

This is the popular MC1496 double-balanced modulator which, when built with reasonable care, works very well (see Fig. 5). The first one was built on the same PC board as the crystal filter, but the resulting 30-dB carrier suppression was disappointing. With proper shielding of the carrier oscillator and crystal filter, this suppression was increased to a usable 50 dB. The balanced-modulator output is greater than is needed by the carrier mixer and also greater than can be passed by the filter. With this in mind and having a need for a resistive input-filter termination, the balanced modulator is output into a resistive pad, the value of which is chosen to give maximum linear conversion mixer output without limiting while retaining maximum carrier suppression.

Carrier Mixer

The 3.58-MHz single-sideband output of the crystal filter must be converted to the desired 21.5-MHz band to be usable. In order to properly terminate the filter and provide impedance conversion, an FET buffer amplifier is included which drives the 600-Ohm input of the TL442 balanced mixer (Fig. 6). This integrated circuit was chosen as it uses few biasing components and has good carrier suppression without balancing controls. If desired, the MC1496 could be used with equally good results if the TL442 is hard to find.

With this situation in mind, a carrier mixer was built using the easily found MC1496 double-balanced mixer. I had good success with it as well. This mixer circuit, shown in Fig. 7, is almost identical to the balanced modulator. R1, between pins 2 and 3, was made variable, enabling me to set the gain of the stage and thus control the drive to my transmitting converter. The output was made single-ended instead of balanced, so I could use the same tuned circuit as was used for the TL442 mixer. The input drive circuit was made a source follower to properly match the lower input impedance of the new circuit. The SSB drive level into the mixer is adjusted so that the maximum input does not cause the output

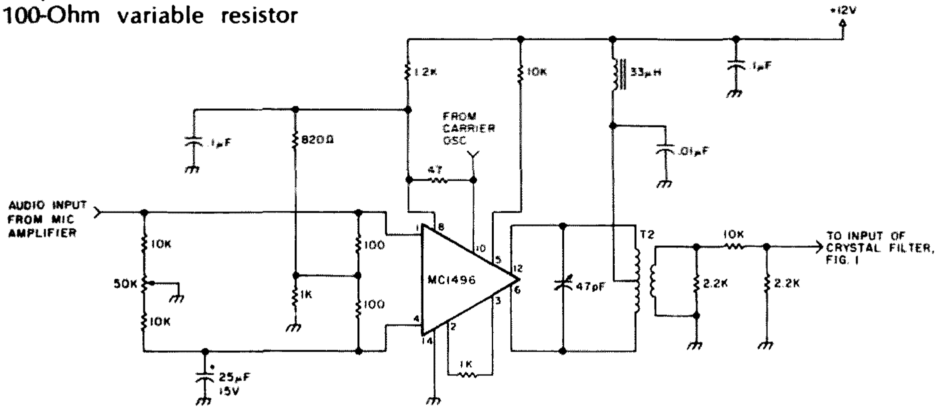


Fig. 5. Balanced modulator. All resistors are ¼ Watt. T2: 42 uH; primary—T50-2—91 turns c-t bifilar wound #34; secondary—30 turns wound over primary.

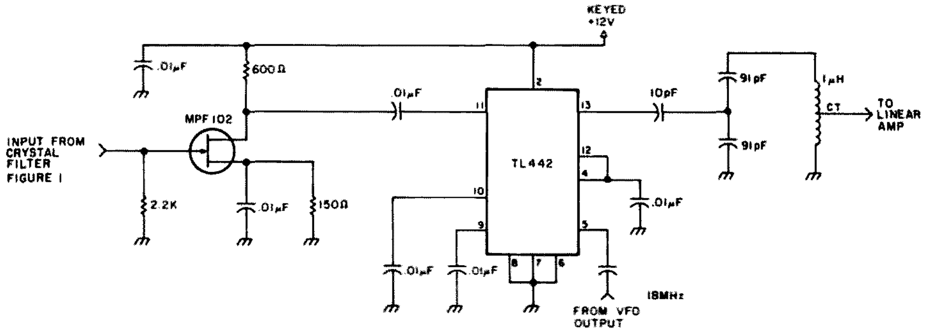


Fig. 6. Carrier mixer.

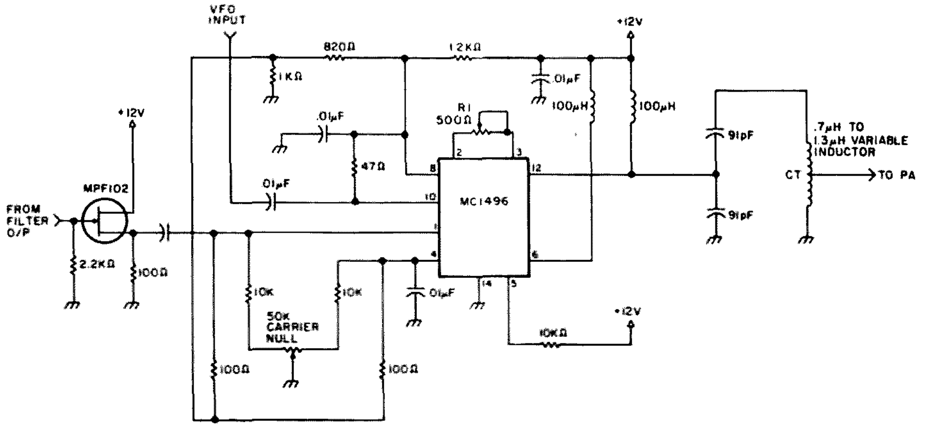


Fig. 7. Carrier mixer using the MC1496 double-balanced mixer.

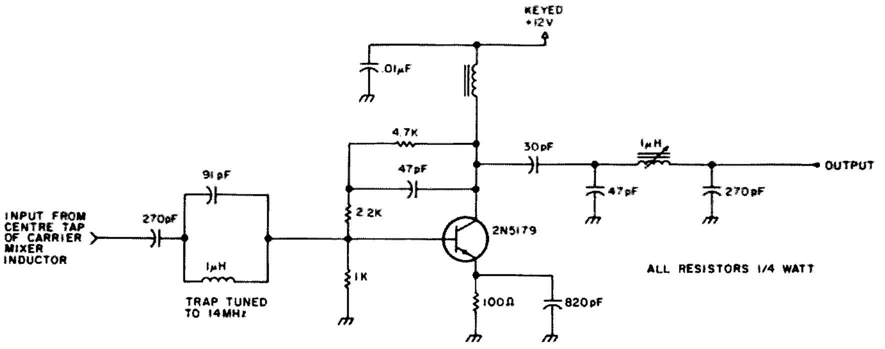


Fig. 8. Linear amplifier.

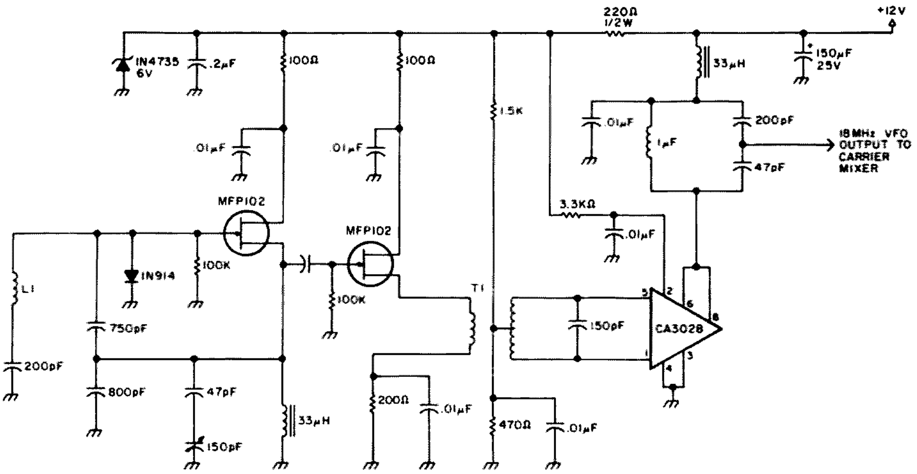


Fig. 9. Vfo. L1: 23 turns of #22 enameled wire close-wound on 3/8″-diameter ceramic form. T1: Primary—25 turns #34 enameled wire on Amidon toroid T25-6; secondary—28 turns center-tapped #34 enameled wire wound over primary.

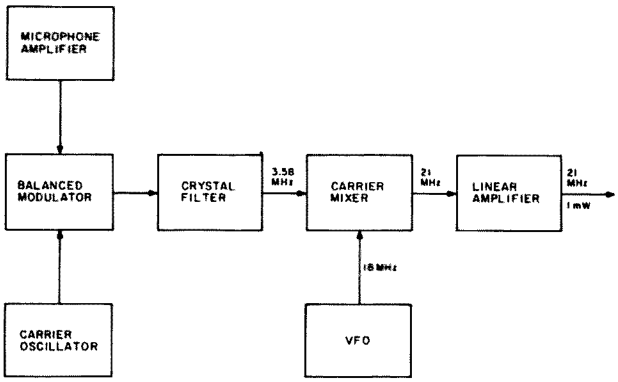


Fig. 10. Block diagram of exciter.

to limit. The output is adjusted by R1 to properly drive the PA stage, and the carrier null potentiometer is adjusted for minimum vfo output. Usually it will be sufficient, in this service, to set the null pot at its midpoint. Carrier suppression is less critical here than in the balanced modulator.

Linear Amplifier

The linear amplifier (Fig. 8) supplies about 1 milliwatt output, sufficient to drive my transmitting converter to full output. An input series trap tuned to 14 MHz was included to reduce the level of the undesired mixer product (probably an unnecessary frill but, having the parts, it was easy to include). If greater output is desired, the collector-base negative feedback could be reduced or more stages of amplification included.

Vfo

The variable frequency oscillator (Fig. 9) is the series-tuned Colpitts or Clapp oscillator driving a push-push doubler to provide an 18-MHz carrier for the conversion mixer. The doubler is made with a CA3028 differential amplifier with its outputs in parallel.

Building Ideas

This exciter was built in the modular configuration which allowed for engineering changes at a whim (also called mistake rectification), and many ideas were tried as I went along. All circuits were put on printed circuit boards as this makes for neat construction. The vfo and carrier oscillator are on single-sided board and the others are on double-sided board. I also put the carrier oscillator and the crystal filter in their own shielded enclosures to reduce the carrier feedthrough, interconnecting the units with RG-174 coaxial cable and audio-cable connectors. A block diagram of my exciter is shown in Fig. 10.

Many parts values may be questioned, and I assure you that I would not argue for their absolute value. My choice has been controlled very much by availability. I had some 1-uH variable inductors bought from Digital Research Corporation of Texas, a bag of assorted inductors and chokes from Poly Paks, some dipped-mica capacitors removed from surplus boards, and assorted resistors.

What I had was used to design circuits that would do the job without my buying every component as a special part. For example, bias circuits can usually be changed if the voltage division provided remains the same. Tuned circuits are flexible because resonance is controlled by both L and C and both can be changed to meet your needs. Amidon Associates can supply a flyer containing a very accurate chart for winding inductors on their various toroid cores if you have a particular capacitor you want to use in a resonant circuit. Bypass capacitors can be chosen from many values which will effectively provide a short to ground for the signal frequency. A command transmitter capacitor was used to provide vfo tuning, but any

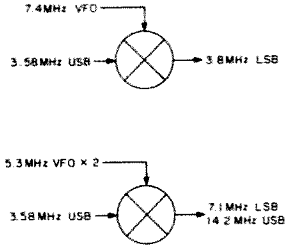


Fig. 11. Suggested conversion schemes for amateur-band exciters.

comparable variable capacitor would do just as well. The transistors used are common, inexpensive, and easily substituted with something you may have on hand.

Ideas

This crystal filter and single-sideband generator could be used in many other ways (see Fig. 11). Using a vfo frequency of 7.3 MHz would give a lower sideband output on 75 meters. Doubling the output of an auxiliary 5-MHz vfo would provide an upper sideband signal on 20 meters or a lower sideband signal on 40 meters. Many refinements are also possible which would make this exciter more versatile, but even without them it is possible to have an exciter with a quality single-sideband filter for very little.

The following parts may not be listed by advertisers, but they usually can supply them:

- MC1496—Godbout Electronics, Jameco Electronics.
- TL442—Active Component Sales Corp., Box 1035, Framingham MA 01701.
- CA3028—Aldelco. ■

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2. Pat Hawker G3VA, "Technical Topics," *Radio Communication*, June, 1977, p. 448.
3. Amidon Associates, 12033 Otsego St., N. Hollywood CA 91607.

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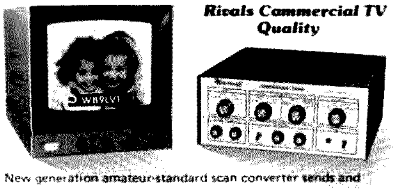

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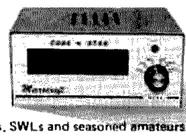

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✓147

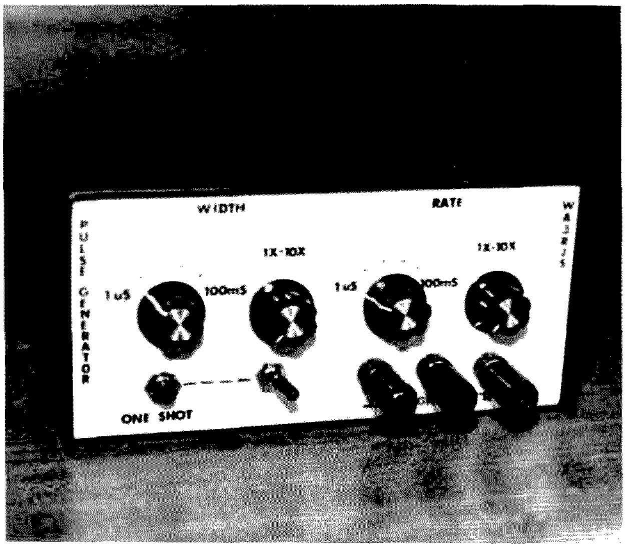
King of the Pulse Generators

One-shot or a train, TTL or CMOS, this generator will fit the bill. It's just what your test bench always wanted.

Ronald A. Miara WA3RJS
8803 Enfield Court, #22
Laurel MD 20708

This handy pulse generator is built around two commonly available under-a-dollar ICs. Both pulse width and repetition rate are continuously variable over six decade ranges from one microsecond to one second. Normal and inverted pulse train outputs are available, and a one-shot feature allows the user to output a single pulse by depressing a front-panel push-button switch. The outputs are TTL and 5-V-dc CMOS compatible.

To operate the generator, the desired repetition rate range is selected with switch S1. (Repetition rate is the time between the occurrence of each pulse and is equal to the reciprocal of the frequency of the pulse train.) The ranges that may be selected by S1 are: 1 µs, 10 µs, 100 µs, 1 ms, 10 ms, and 100 ms. Variable resistor R1 is then used to tune the repetition rate between one and ten times the range value selected by S1. For example, if S1 is set to 10 µs and R1 is set to 1X (fully



Pulse generator.

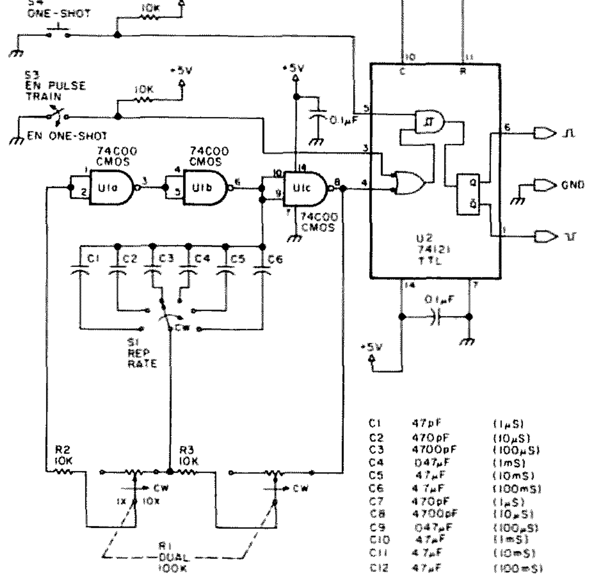


Fig. 1.

counterclockwise), a pulse will occur every 10 μs. R1 may then be tuned up to ten times this value (10X, fully clockwise), in which case a pulse will be output every 100 μs.

Pulse width is similarly set with S2 and R4. S2 selects the same range values as S1, and R4 is used to tune the pulse width from one to ten times the value selected by S1. Pulse widths with duty cycles up to 90% may be set up. (Duty cycle is defined as the ratio of time the pulse is on to the time of a complete cycle, times one hundred. An ordinary square wave would then have a 50% duty cycle since it is on half the time of a complete cycle.)

To use the pulse generator as a one-shot, switch S3 is closed, disabling the output pulse train. Push-button switch S4 is then depressed and released to output a single pulse from U2.

Refer to the schematic (Fig. 1) to understand how the pulse generator works. Three NAND gates in U1 are configured with capacitors C1 through C6, variable resistor R1, and resistors R2 and R3 to form a square-wave oscillator. The frequency of this oscillator determines the repetition rate of the generator. The resistors were chosen to produce repetition rates in convenient decade ranges. The oscillator drives one-shot generator U2. Capacitors C7 through C12, variable resistor R4, and resistors R5 and R6 determine the width of the pulses output from U2. The values of these resistors and capacitors were also chosen to produce pulse widths in decade ranges. Since the oscillator driving U2 causes pulses to be output at a periodic rate, the output of U2 becomes the output of the pulse generator.

Construction of this unit is not critical. Short lead lengths and an all-metal enclosure should be used to ensure a clean and stable pulse-train output. U1 (74C00) should be CMOS, not TTL, to ensure that the oscillator will work. The accuracy of the pulse width and repetition rate depends on the tolerance of the resistors and capacitors used and how carefully the front-panel multiplier controls are labeled (from 1X to 10X). Since I normally use an oscilloscope to set up my pulse generator, I used simple front-panel labeling and rely on the scope for calibration of the pulse train. Simple front-panel labeling also keeps the cabinet size small since less space is required on the front panel. My unit is powered by four penlight batteries which drive a miniature three-terminal +5-V-dc regulator IC (LM309H).

The small size and low cost of this handy pulse generator should make it a nice addition to any ham's workbench. ■

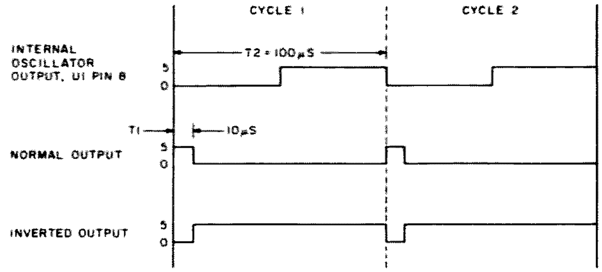


Fig. 2. Pulse generator timing diagram. This shows a pulse train which has a 10-μs pulse width and a 100-μs repetition rate. The duty cycle is equal to 10 μs divided by 100 μs times one hundred percent, which equals 10 percent.

SATELLITES

Late September brought amateur satellite enthusiasts something to cheer about for a change. On the 20th, the University of Surrey amateur scientific satellite (UoSAT) was rescued from oblivion when ground controllers managed to turn its telemetry beacons off for the first time since April. By the time you read this, UoSAT may already be back in full operation.

The trouble with UoSAT (also known as UoSAT-OSCAR 9 or, more simply, UO-9) began when both the 2-meter and 70-cm beacons were accidentally commanded on at the same time. The effect was to desense both receivers aboard the bird, making it impossible for UoSAT to "hear" instructions from the ground. Even the massive 26-dB-gain 2-meter EME array of K1WHS proved insufficient to break through.

After an enormous expenditure of time and effort, the spell was finally broken on 70 cm when the UoSAT salvage team obtained the services of a little-used 150-foot dish antenna at SRI International in California. With a gain at 70 cm of 46 dB and an erp approaching 12 megawatts, the big dish did the trick, though not without practically being rebuilt by the UoSAT gang in the process.

Fortunately, UoSAT seems none the worse for the experience. The satellite, which does not carry communications transponders, continues to send a steady stream of scientific data earthward. In addition to telemetry beacons at 145.825 and 435 MHz, look for HF beacons at 7.05, 14.002, 21.002, and 28.510 MHz. An on-board TV camera may be activated as well.

Ever since the failure of the European Space Agency (ESA) Ariane rocket during its fifth flight (September 9), the date for the launch of AMSAT's Phase IIIB satellite has been anyone's guess. The best bet is now sometime in mid-April, assuming no further problems arise.

Thanks to AMSAT *Satellite Report.*—Jeff DeTray WB8BTH, *73* Staff.

Amateur Satellite Reference Orbits

	OSCAR 8		RS-5		RS-6		RS-7		RS-8		
Date	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
Jan 1	0113	97	0041	38	0008	33	0108	46	0041	36	1
2	0118	98	0036	38	0152	61	0059	45	0038	37	2
3	0122	99	0030	38	0136	59	0049	44	0035	38	3
4	0127	101	0025	39	0121	56	0039	43	0032	39	4
5	0131	102	0020	39	0105	54	0030	42	0030	39	5
6	0135	103	0014	39	0050	52	0020	41	0027	40	6
7	0140	104	0009	39	0035	49	0010	40	0024	41	7
8	0001	79	0004	39	0019	47	0001	39	0021	42	8
9	0006	80	0158	69	0004	45	0150	68	0018	43	9
10	0010	82	0153	70	0147	72	0141	67	0016	44	10
11	0014	83	0147	70	0132	70	0131	67	0013	44	11
12	0019	84	0142	70	0116	67	0121	66	0010	45	12
13	0023	85	0137	70	0101	65	0112	65	0007	46	13
14	0028	86	0131	70	0046	63	0102	64	0004	47	14
15	0032	87	0126	71	0030	60	0053	63	0001	48	15
16	0036	88	0121	71	0015	58	0043	62	0158	79	16
17	0041	90	0115	71	0158	86	0033	61	0156	79	17
18	0045	91	0110	71	0143	83	0024	60	0153	80	18
19	0050	92	0105	71	0127	81	0014	59	0150	81	19
20	0054	93	0059	72	0112	79	0004	59	0147	82	20
21	0059	94	0054	72	0056	76	0154	88	0144	83	21
22	0103	95	0049	72	0041	74	0144	87	0142	84	22
23	0107	96	0043	72	0026	72	0135	86	0139	84	23
24	0112	98	0038	72	0010	69	0125	85	0136	85	24
25	0116	99	0033	72	0154	97	0115	84	0133	86	25
26	0121	100	0027	73	0138	94	0106	83	0130	87	26
27	0125	101	0022	73	0123	92	0056	82	0127	88	27
28	0129	102	0017	73	0107	90	0046	81	0125	88	28
29	0134	103	0011	73	0052	87	0037	81	0122	89	29
30	0138	104	0006	73	0037	85	0027	80	0119	90	30
31	0143	105	0001	74	0021	83	0017	79	0116	91	31
Feb 1	0004	81	0155	104	0006	80	0008	78	0113	92	1
2	0008	82	0149	104	0149	108	0157	107	0111	93	2
3	0013	83	0144	104	0134	106	0148	106	0108	93	3
4	0017	84	0139	104	0118	103	0138	105	0105	94	4
5	0022	85	0133	105	0103	101	0128	104	0102	95	5
6	0026	86	0128	105	0048	99	0119	103	0059	96	6
7	0030	88	0123	105	0032	96	0109	102	0056	97	7
8	0035	89	0117	105	0017	94	0059	102	0054	98	8
9	0039	90	0112	105	0001	92	0050	101	0051	98	9
10	0044	91	0107	106	0145	119	0040	100	0048	99	10
11	0048	92	0101	106	0129	117	0030	99	0045	100	11
12	0052	93	0056	106	0114	114	0021	98	0042	101	12
13	0057	94	0051	106	0059	112	0011	97	0040	102	13
14	0101	96	0045	106	0043	110	0002	96	0037	102	14

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

ZERO-DISTRICT QSO PARTY

Starts: 2000 GMT January 8
Ends: 0200 GMT January 10

Organized by the Mississippi Valley Radio Club. Stations outside of zero district will work zero stations only, zeros may work any station. The same station may be worked once on each band and each mode. However, mobile stations may be worked each time they change counties.

EXCHANGE:

RS(T) and ARRL section. Zero-district stations also must send county.

FREQUENCIES:

3560, 7060, 14060, 21060, 28060, 3900, 7270, 14300, 21370, 28570, 3725, 7125, 21125, and 28125.

SCORING:

Multiply the number of zero-district counties by the number of contacts. Zeros score by adding ARRL sections, zero-district counties, and DXCC countries worked and then multiplying by total contacts.

ENTRIES & AWARDS:

Certificates will be issued to all entrants who submit a log and an SASE. Endorsements will be given for the high score in each ARRL section, DX country, and Novice/Technician Class. Mail logs by February 15th to: WØSI, 3528 W. Columbia, Davenport IA 52804. Include an SASE for log forms or results.

WORLD COMMUNICATION YEAR

Starts: 0001 GMT January 15
Ends: 2400 GMT January 15

On November 19, 1981, the United Nations General Assembly adopted a resolution proclaiming 1983 a "World Communication Year: Development of Communications Infrastructures." The basic objectives of the WCY are: (1) to provide the opportunity for all countries to undertake an in-depth review and analysis of their policies on communications development, and (2) to stimulate the accelerated development of communications infrastructures. The Potomac Valley Radio Club is sponsoring this contest in support of the World Communication Year.

All licensed radio amateurs worldwide are eligible to participate. There will be two categories: single operator and multi-operator. Both categories are mixed-mode. Only stations using one transmitter are eligible for an award. The same station may be worked once on each band. Telephony (including SSTV) and Telegraphy (including RTTY) emissions count as separate bands. No cross-emission contacts are allowed. The main objective is to contact as many other amateurs as possible, anywhere in the world, using 1.8 MHz to 275 GHz, excluding the 10-, 18-, and 24-MHz bands.

EXCHANGE:

All stations will send their ITU region and their ITU zone. For example, the following stations would send the listed exchanges: DL1AA, 128; W1AAA, 208; and JA1AAA, 345.

SCORING:

QSO points are 4 points per QSO outside your ITU region, 2 points if inside your ITU region but outside your zone, and 1 point if inside your ITU zone. The multiplier is the number of ITU zones worked on each band. For final score, multiply the total QSO points for all bands by the total zones worked for all bands.

AWARDS:

A plaque will be awarded to the high-scoring station of each category (single- and multi-operator) in each of the three ITU regions. A certificate will be awarded to the high-scoring entrant of each category in each ITU zone. In addition, a certificate will be awarded to one UHF/microwave station of each ITU zone judged to have displayed the most outstanding achievement. Members of PVRC may not receive awards.

ENTRIES:

All entrants are to use a suitable log form and summary sheet of their choice. Logs should include times in GMT, bands, calls, complete exchange, and QSO points for each QSO. Multipliers should be clearly marked in each log. Cross-check sheets (dupe sheets) are required if more than 200 QSOs are made on any band.

Summary sheets should be a single page and show number of QSOs, QSO points, zone multiplier for each band, and the total score. The summary sheet must contain the entrant's callsign, region, zone, name, and address. Multi-operator stations must list the name and call (if any) of each operator. Entries for the special UHF/microwave award should be indicated on the front of the summary sheet with a description of the basis of the UHF/microwave award written on the back of the summary sheet.

Entries must be postmarked by February 28th and mailed to: PVRC, PO Box 337, Crownsville MD 21032.

Each entrant agrees to be bound by the provisions of the rules, by the regulations of his licensing authority, and by the decisions of the Amateur Radio Activity Awards Committee. An entry may be disqualified if the overall score is reduced by more than two percent. An entry will be disqualified if more than two percent of duplicates are left in the log. A penalty of 8 QSO points will be assessed for each duplicate QSO or for each miscopied callsign or exchange found by the awards committee.

HUNTING LIONS IN THE AIR CONTEST

Starts: 1200 GMT January 15
Ends: 1200 GMT January 16

The contest is sponsored by Lions Club International and coordinated by Lions Club Rio de Janeiro Arpoador, Brazil. Participation in the contest is open to all duly licensed radio operators, Lion and non-Lion. There are two modes: phone and CW. Participation in both modes is allowed but points are counted separately. All amateur stations participating must operate within their licensing regulation. Separate categories will exist for single operators and radio clubs/societies. Multi-operators may participate, but each prefix must be listed on the log.

Use all bands, 80 through 10 meters. Only one QSO with the same station on each band may be counted. Remember that phone and CW are counted separately!

EXCHANGE:

RS(T) and sequential QSO number. When a contact is made with any Lion,

The RaRa Rag

NEWSLETTER OF THE MONTH

Beauty is not just skin deep. At least, not in the winner of this month's newsletter contest, *The RaRa Rag*, published by the Rochester Amateur Radio Association.

The thoroughly professional look of *The Rag* includes typeset and printed text, with even margins on both sides, headlines, cutoff lines, and clean graphics. It is all printed in booklet format on heavy paper.

But the beauty doesn't stop there. *The Rag's* contents go way beyond the usual list of upcoming events, meeting dates, and president's message. One extra feature of the newsletter is "Cop's Corner," which keeps members posted on local street construction and emergency service.

For history buffs, there is "*The RaRa Rag* 20 Years Ago," and to bring the reader up to date, the editors have included news shorts from the *W5YI Report* and other news services. Other features include news of the club's various special interest groups, a fitting forum for what appears to be an exceptionally active club.

Congratulations to Editor Ronald Jakubowski K2RJ and his staff for putting together a club newsletter that reads as good as it looks.

To enter your club's newsletter in our contest, send a copy to: Editorial Offices, *73*, Peterborough NH 03458.

CALENDAR

Jan 1	ARRL Straight Key Night
Jan 8	73 40-Meter Worldwide SSB Championship
Jan 8-9	ARRL QSO Party—CW
Jan 8-10	Zero-District QSO Party
Jan 9	73 80-Meter Worldwide SSB Championship
Jan 9-10	ARRL QSO Party—Phone
Jan 15	World Communication Year Amateur Radio Activity
Jan 15-16	73 160-Meter Worldwide SSB Championship
Jan 15-16	Hunting Lions in the Air Contest
Jan 15-16	QRP CW Contest
Jan 15-16	ARRL VHF Sweepstakes
Jan 22-23	Texas QSO Party
Jan 22-23	North Dakota QSO Party
Jan 29-Feb 6	ARRL Novice Roundup
Feb 5-6	New Hampshire QSO Party
Feb 5-6	South Carolina QSO Party
Feb 19-20	YL ISSB QSO Party—Phone
Feb 19-20	ARRL International DX Contest—CW
Feb 26	RTTY World Championship Contest
Mar 5-6	ARRL International DX Contest—Phone
Mar 12-13	YL ISSB QSO Party—CW
Apr 9-10	CARF Commonwealth Phone Contest
Apr 9-10	ARRL QSO Party—CW
Apr 16-17	ARRL QSO Party—Phone
Jun 11-12	ARRL VHF QSO Party
Jun 25-26	ARRL Field Day
Jul 9-10	IARU Radiosport Championship

VOLUNTEERS NEEDED

How would you like to be on the "inside" of a major amateur-radio contest? Here's your chance!

We're looking for volunteers to become members of the *73* Contest Committee. Anyone with an interest in contesting and a willingness to work hard is welcome. Committee members will help with the following:

1. Contest rules and ethics
2. Forms and correspondence
3. Log checking and scoring
4. Filling out and mailing awards

Heading up the contest committee is KE7C. Please drop him a note (with SASE) and let him know you can help. Write to Bill Gosney KE7C, *73* Contest Committee, 2665 North Busby Road, Oak Harbor WA 98277.

We want YOU on the *73* Contest Team!

Leo, or Lioness, the name of the club contacted should be clearly identified.

SCORING:

QSOs within the same continent count 1 point while those between different continents count 3 points. Score 1 extra bonus point for each QSO with a member of a Lions Club, Leo Club, or Lioness Club and 5 points for a QSO with a member of the Lions Club Rio de Janeiro Arpoador. Contacts between Brazilian stations will count only 2 extra points. Contacts between members of the Arpoador club will not count any bonus points.

AWARDS:

For single-operator entries the Lions Club International will present trophies for first, second, and third place on both modes. Fourth through tenth places will receive plaques. A trophy will be presented to the first-place radio club/society on both modes. In addition, each log sent by participants with a minimum of 5 contacts will receive a special certificate. The contest committee will also select and award the most active Lions Club participating in the contest.

ENTRIES:

Keep a separate log for each mode. Each participant will note in the logs the callsign and information exchanged. Confirmation of contacts will be made by comparing the logs of the participants. Participants should send their logs by air mail not later than 30 days after the contest to: Contest Committee, Hunting Lions in the Air, Lions Club of Rio de Janeiro Arpoador, Rua Souza Lima #149, Apt. 402, 22081 Rio de Janeiro, RJ, Brazil.

MICHIGAN QRP CLUB CW CONTEST

Starts: 1500 GMT January 15 Ends: 1500 GMT January 16

This is a CW-only, all-bands (160-10-meter) QRP contest sponsored by the Michigan QRP Club. The contest is open to all amateurs and all are eligible for awards. General call will be "CQ QRP DE..." Each station will be competing within their own state, province, or country in one of three categories: 1) one Watt or less of output power, 2) five Watts or less of output power, and 3) over five Watts of output power.

EXCHANGE:

RST, QSO number, and power output.

SCORING:

Each contact is worth one QSO point. Multiply total QSO points (all bands) by the number of states, provinces, and countries worked per band for total points. If using emergency power (100% natural and 100% battery) then apply a 1.5 bonus multiplier.

AWARDS:

Certificates will be awarded to the highest-scoring stations in each state, province, or country.

ENTRIES:

Log information must include: full log data with a separate log for each band, name, address, equipment used, and power output. Logs must be received by the contest manager no later than six weeks after the end of the contest. W/VE stations please send an SASE, all others please send 2 IRCs if contest results are desired. Address all entries to: Contest Manager, Michigan QRP Club, 281 Crescent Drive, Portland MI 48875.

THE NORTH DAKOTA QSO PARTY

0000 to 0800 and 1600 to 2400 GMT January 22, 0800 to 1600 GMT January 23

Sponsored again by the Red River Radio Amateurs of Fargo, North Dakota. Work stations once per band and mode.

EXCHANGE:

RS(T) and state, province, country, or North Dakota county. Novices, please indicate Novice status.

FREQUENCIES:

Phone—1835, 3905, 7280, 14295, 21380, 28580.

CW—1810, 3540, 7035, 14035, 21035, 28035.

Novice—3725, 7125, 21125, 28125.

SCORING:

Phone contacts count 10 points, CW 20 points, and RTTY 50 points. North Dakota stations count an additional 100-point bonus for working five Novices. North Dakota stations multiply score by total of states, provinces, and countries worked (max 53).

ENTRIES & AWARDS:

Certificates to state, province, and country winners. Plaque to North Dakota winner and highest scorer outside North Dakota. Mail logs by February 28th to: Bill Snyder WØLHS, Box 2784, Fargo ND 58108-2784. Include a large SASE for results.

TEXAS QSO PARTY

Starts: 0000 GMT January 22 Ends: 2400 GMT January 23

Sponsored by the West Texas Amateur Radio Club of Odessa, Texas. Use all bands and modes. Each station may be worked again upon each county change. Single-operator entries only. CW QSOs must be in CW subbands only.

EXCHANGE:

QSO number (beginning with 001) and state, province, country, or Texas county.

FREQUENCIES:

Novice—3710, 7110, 21110, 28110.

Phone—3940, 7260, 14280, 21370, 28600.

CW—3565, 7065, 14065, 21065, 28065.

SCORING:

All non-Texas stations score points as follows: Phone contact with fixed station in Texas—1 point. CW contact with fixed station in Texas—2 points. Phone contact with mobile station in Texas—5 points. CW contact with mobile station in Texas—7 points. Multiply by the number of Texas counties worked (254 max).

All Texas stations score 1 point per contact on phone, 2 points on CW regardless whether fixed or mobile. Multiply by the number of states, countries, and Canadian provinces worked.

AWARDS:

Plaques to top scores: US, US Novice, DX, Canada, Texas fixed, Texas mobile, Texas Novice. Certificates to top score in each state, country, and province. Certificates also to top 10 Texas stations. Special awards as activity dictates.

ENTRIES:

All logs must be received by March 15th. Mail entries to: WTARC, PO Box 9944, Odessa TX 79762-0041.

RESULTS

THE 1ST ANNUAL 40/80 PHONE CONTEST —A TREMENDOUS SUCCESS—

"Truly unbelievable, it was fantastic, like catchin' fish in a barrel..." Those were the words and phrases echoed by nearly every contestant in *73*'s First Annual 40- and 80-Meter Phone Contest. There is little doubt that this event will remain on the contest calendar for many years to come. We are grateful to those who made it all happen!

After the dust had finally settled, VE5DX became the World 40-Meter Phone Champion for single-operator stations. Congratulations to you Jim, a superb performance. I4YNO and company firmly took the World 40-Meter Championship for the multi-operator category. Fantastic job, fellas!

On 80 Meters, I3MAU is the World Single-Operator Phone Champion, and the group at N9NC tied down the winning score to take the world multi-operator title. Fabulous scores for such a difficult band.

Combining both the 40- and 80-meter contest scores, CN8CO became the 1982 Low-Band Champion for single operators while VE2ZP and crew took top honors in the multi-operator category. Take a look at the scoring summary, to see an impressive job by two top-notch stations.

Who made the most contacts, you ask? Among 40-meter single ops, VE5DX made 972 QSOs, followed by KK9A (856) and W9RE (851). In the 40-meter multi-op standings, N9NB was credited with 1098 QSOs, followed by a distant second, KD4TO, with a demanding 972 contact total. On 80 meters, considering band conditions, the competition was just as fierce. N7DF from Utah tallied 700 QSOs for the single-operator category, while VE5XK accumulated 672 contacts on the band. In the 80-meter multi-operator class, N9NC and crew mustered 793 contacts with VE2ZP (597) and W4CN (564) trailing.

Looking at the combined contest scores for both bands, N7DF turned in 1188 QSOs with 931 QSOs registered by second-place finisher KC4OV in the single-operator category. For multi-ops, VE2ZP recorded 1271 QSOs followed by N4BAA of Florida with 1066 contacts.

Was the band open? Well on 40-meters the following stations turned in 30 or more DX country multipliers: I4YNO (59), I5MPK (44), YV5ANE (44), W9RE (41), N3AMK (40), VE5DX (39), VE2ZP (38), CN8CO (38), JA2BAY (35), LX1JX (35), N4BAA (33), N9NB (31), and KJ9D (31). As expected, the 80-meter DX totals were somewhat less with the following stations scoring 20 or more DX multipliers: I3MAU (58), CN8CO (53), KQ2M (39), DA1RE (34), WB2DHY (30), I5MPK (29), N4BAA (28), KØCS (28), DF9ZP (27), ZF2DX (27), N7DF (24), JA1ELY (22), AK1A (22), and OK1KZ (22).

One of the most interesting aspects of tallying any contest is the opportunity to summarize the equipment used by competing stations. Every year brings new surprises.

Which antenna dominated on which band? Naturally the wire (economy version) array led the pack. Look at the statistics:

40-Meter Antennas		80-Meter Antennas	
Dipole/inverted vees	39.8%	Delta loop	11.1%
Monoband vertical	11.6%	¼-wave sloper	11.1%
Delta loop	9.3%	Full-wave vertical	8.3%
Trap vertical	9.3%	Trap vertical	8.3%
2-element yagi	7.0%	Phased verticals	5.5%
¼-wave sloper	4.6%	3-element wire yagi	5.5%
2-element delta loop	4.6%	Inverted-L	2.7%
2-element wire beam, bobtail curtains, 2-element quads, 3-element yagis, and phased verticals	2.3% each	2-element delta loop	2.7%

Of all the stations that turned in entries, 28% declared that they were running completely "barefoot" while 2% stated that they were running 500 Watts, 15% were running a kilowatt, and a dramatic 55% were radiating two kilos! What were they using as exciters? 39.7% of the contestants claimed to be running Kenwoods, 21.3% were running Yaesu gear, 22.4% were operating Drake equipment, 6.5% were Collins, while the remaining 10.1% were divided amongst Ten-Tec, Icom, Heathkit, Tempo, and yes, even home-brew equipment.

So what does all this add up to?... a debut not to be forgotten, an event full of surprises which left a lasting impression on all who witnessed this two-day extravaganza.

This brings us to the second annual event which is just around the corner. Look for the 40- and 80-meter contest announcement in last month's issue of *73*. This year the event is being split into two separate parts. The World 40-Meter Phone Championship will be held on January 8, while the World 80-Meter Phone Championship event is scheduled for the following day, January 9, 1983. Each promises to become a record breaker in its own right. For all the details, send your SASE directly to the official contest address, attention Billy Maddox, 468 Century Vista Drive, Arnold MD 21012.

So start pruning your antennas. I intend to work each one of you on both bands so mark the dates on your calendar. Get on the band right now and begin telling other amateurs about the contest, especially the DX stations. Pitch in and pass the word! Good luck in the contest.

Continued

40/80-METER CONTEST SOAPBOX

"Glad to take part, even if it was just a little bit. Really enjoyed it!"—N1BMV.
"Lots of fun. Am going to try 80 meters next year."—KA1CDC.
"Super contest. . . I know I'll be back next year!"—WA1ZAM.
"Too many carriers and foreign broadcasts on 40!"—KA2HTH.
"My first contest ever. Really enjoyed it and am looking forward to next year."—WB2IWJ.
"The gang here had a blast."—KF2X.
"Fine contest but I suggest limiting the action to the general portion of the band."—N3AWS.
"Would have liked to have participated more. Look for me again next year."—W3ICM.
"You've got another winner!"—K3IXD.
"Great contest—lots of great contacts were made on the 40 this weekend."—KF3M.
"Hope to get a vfo and increase my multiplier total. Sure enjoyed the contest."—KC3N.
"Enjoyed the contest and, once and for all, recognized the District of Columbia as a separate multiplier!"—W3USS.
"Good propagation at times. Fantastic turnout. Should be a classic event."—N4BAA.
"Great contest with lots of potential as the years go by."—N4UH.
"Had a very good time and worked some new states."—N5AFV.
"TNX for sponsoring this enjoyable contest. Had a great time on 40."—N5CPO.
"Whooee, quite an event!"—KC5NQ.
"Learned a lot about my station. Looking forward to next year."—WB5YWO.
"Better to have the 40-meter test on CW rather than SSB."—N6JM.
"A very good contest. Not much heard during the daytime."—W6YMH.
"Thanks for staging this contest. I enjoyed it immensely. Hope to be back next year to improve the score."—KA7AKQ.
"Where were the VEs? Great stateside turnout!"—N7DF.
"Where were the JAs?"—KB7G.
"Let's do it again next year!"—AK7J.
"Great contest and I'll be back next year!"—K7PGL.
"Fine contest idea, thanks to 73. Lots of activity on the bands. Wish there was more DX on 40."—N8ATR.
"Damn fun despite the tremendous big guns. I'll give it a shot again next year."—KC8GN.
"Very successful debut. Good time of year too! See you next year for sure!"—W8VEN.
"I seem to have scored very well. Lots of good contacts to be had."—KK9A.
"Everyone involved has my congratulations. I wish all contests were this much fun."—KJ9D.
"Surprised at the number of stations on the 40-meter band. Broadcast stations really got fierce! Will try 80-meters next year."—K9FMR.
"Bands were in great shape. Had a great time."—KB9TI.
"Activity and band conditions were excellent. Korea on 15 was a new one for me!"—KØCS.
"Great contest. Nice to work a contest that doesn't take up all weekend. Family-man special!"—WAØIDK.
"Excellent contest. Definitely will be back next year."—KØUK.
"WB4OXZ and I found it rough going on 80. Worth every minute of it though. Had a ball."—C6ADV.
"Definitely should become one of the biggies! Unbelievable participation for a first time event!"—CN8CO.
"Fun contest. I'll tell more Europeans about it."—DL8UI.
"I know why CW is beautiful now—very hard on phone with 50 Watts. There's always next year."—G3WKS.
"My first touch of 40- and 80-meter contesting and I loved it."—H44SH.
"Marvelous contest though conditions weren't the best for me. Am looking forward to next year."—HI8GB.
"Nice contest indeed. We hope to do better next year."—I4YNO.
"Very good contest. Not much activity in JA-land on contest."—JA1FFY.
"Lots of activity on 40-meters but not many Europeans. See you again next year."—LA5YF.
"Good propagation but no Europeans in the contest. Maybe next year it will get more attention."—LX1JX.
"Very good idea to establish this contest. Hope more Europeans hear about it! See you next year."—OK2BLG.
"Thanks for the contest, a very good idea. Enjoyed 80 meters."—OX3ZM.
"Didn't work a single North American station."—PA3AZM.
"Nice contest with good propagation. Wish W/VEs would listen below 3.800 MHz. Very strong in Europe!"—SM4CAN.
"Great contest and is sure to grow as it gets more publicity."—VE1AJJ.
"Thoroughly enjoyed the contest. Very well conceived, very well attended—a definite winner!"—VE2ZP.
"Appreciate the contests. 80 was very difficult with 20+ static. USA stations forget we can only work 3.5-3.7 on phone."—VK5BW.
"Very little activity in Romania. Maybe advertisements will help."—YO4BXX.

W/VE 40-METER SINGLE OPERATOR

Callsign	QTH	QSOs	QSO Pts.	St/Pr.	DX	Total
VE5DX(W)	SASK	972	1192	56	39	113240
W9RE*	IN	851	1084	56	41	105148
N3AMK*	PA	771	1042	55	40	99180
KK9A(-)	IL	856	1093	57	25	87440
KA1XN*	MA	781	802	56	23	63358
WB8JBM*	OH	759	823	56	19	61725
KC4OV*	TN	600	736	67	14	59616
KC5NQ*	TX	663	730	55	18	53290
KC3N(-)	PA	674	872	53	3	48832
N8AKY(-)	MI	441	598	53	21	44252
KF3M	PA	675	829	48	5	43937
WAØIDK*	MN	539	639	51	13	40896
N7DF*	UT	488	547	51	11	38290
KA1CDC(-)	MA	516	661	48	4	34372
KC8JH(-)	OH	400	460	52	20	33120
N8ATR	OH	477	637	45	6	32487
VE2RV*	QU	305	397	55	25	31760
KL7HHX(-)	AK	289	570	40	14	30780
K3MRG	PA	380	551	53		29203
K4HAV(-)	GA	434	535	45	9	28890
WD4IBO	GA	484	570	47	2	27360
K9MWM(-)	CO	468	495	50	5	27225
W1MX(KA1R)	MA	370	444	46	15	27084
K5ZD(-)	TX	353	372	52	10	23064
WBØUFL(-)	IA	286	397	46	10	22052
W3BGN	PA	259	430	42	8	21500
WA8YTM(-)	WV	423	483	34	7	19703
NF4F(-)	TN	348	357	45	5	17850
K7PGL(-)	MT	284	297	42	13	16335
KA4RKD(-)	AL	278	335	44	4	16080
K3IXD(-)	MD	220	259	45	3	15022
WB2THN*	NY	263	266	48	6	14364
NR4S	TN	218	349	38	3	14309
WA2HFI/O	IL	250	269	45	4	13181
WAØTKJ(-)	KS	135	198	35	28	12474
KA9CTM	IL	196	240	46	1	11280
AA4FF(-)	VA	161	189	40	19	11151
W8ANM	OH	196	259	37	4	10619
N4ARO	TN	213	243	39	3	10026
WB9UZR	IL	174	290	32	2	9660
W5PWG	TX	154	184	43	9	9568
KJ7R(-)	ID	161	183	40	11	9333
VE1AJJ*	NB	143	179	42	10	9308
KR8X	OH	262	262	35		9170
AK3J	PA	144	208	38	5	8944
W2FTY(-)	NY	114	162	36	13	7938
N8TN	OH	200	233	32	3	7922
WA4LRO	TN	123	133	38	11	6517
K5UCV	TX	127	164	35	3	6232
W8DN	OH	112	139	41	2	5977
N9AML(-)	IN	107	161	37		5957
KB7G(-)	WA	120	136	37	6	5848
KD4WY(-)	NC	140	157	33		5181
W3ARK	PA	206	206	24		4944
WB5YWO(-)	OK	121	130	35	3	4940
WD8MOV	OH	53	111	24	20	4884
K1NCO(-)	CT	106	165	29		4785
W3ETB	PA	125	167	25	3	4676
WA3JXW	PA	136	136	34		4624
KI7M(-)	OR	89	107	30	13	4601
WB9OBX(-)	WI	157	157	29		4553
WA2HCC(-)	NJ	110	156	25	3	4368
N5CPO	TX	94	118	37		4366
N5CMF	TX	81	97	43		4171
N5AFV	OK	102	119	35		4165
KF1B	CT	77	98	29	13	4116
N4DEF	GA	108	127	29	3	4064
K4FPF	VA	82	111	31	4	3885
N3AWS	PA	93	123	29		3567
W8VEN	WV	96	98	34	1	3430
KJ2N	NJ	63	92	20	16	3312
K3ND	PA	89	99	32	6	3267
W5GVP	TX	80	94	30	4	3196
W3AP	PA	73	100	27	4	3100
W6YMH*	CA	72	81	28	9	2997
K1VUT	MA	94	98	26	4	2940
NØCZO(-)	ND	81	95	29		2755
W4KMS	VA	87	87	29		2523
KJ9R	IL	84	84	30		2520
WB8YEW	OH	78	78	32		2496
KC7EH	OR	52	68	24	12	2312
K8CV	MI	56	63	29	7	2268
KC8P	MI	66	66	32		2112
KC8GN	OH	66	67	30		2010
K8JOS	OH	64	80	25		2000

WA2IFS	NJ	35	59	9	17	1534
NL7D	AK	34	67	20	1	1407
KBØC(-)	MN	51	52	24	1	1300
KA7AKQ	WA	48	49	24	1	1225
K3ZJ(-)	DC	70	70	16		1120
N1ADX	MA	46	91	10		910
WD8OYF	OH	53	53	16		848
WD8MRF	OH	49	82	15		735
WAØWWW	MN	32	32	32		704
W3YA	PA	44	44	15		660
W7ABX(-)	NV	26	30	14	4	540
KB9IT	IL	39	39	11		429
N6JM	CA	19	20	15	1	320
AK7F	WA	10	10	6		60
N2DCH	NY	9	9	7		56

* District champion
(-) State/provincial champion
(W) Contest winner

W/VE 40-METER MULTI-OPERATOR

Callsign	QTH	QSOs	OSO Pts.	St./Pr.	DX	Total
N9NB(W)	IN	1098	1329	54	31	112965
KD4TQ*	KY	972	1208	55	24	95432
VE2ZP*	QUE	704	909	57	36	86355
KJ9D*	IN	681	927	53	31	77868
N4BAA(-)	FL	645	772	53	33	66392
KF2X*	NY	565	774	46	27	58050
N4FKF	KY	303				16069
KA2HTH(-)	NY	267	422	28		11816
W3YA*	PA	44	44	15		660

* District champion
(-) State/provincial champion
(W) Contest winner

DX 40-METER SINGLE OPERATOR

Callsign	QTH	QSOs	OSO Pts.	St./Pr.	DX	Total
YV5ANE(W)	Venezuela	359	732	46	44	65880
CN8CO*	Morocco	361	744	44	38	61008
H44SH*	Solomon Is.	291	581	45	20	37765
LA5YF*	Norway	221	513	37	26	32319
JA2BAY*	Japan	205	390	38	35	28470
HI4AGE*	Dom. Rep.	209	417	45	17	24603
CT4KO*	Portugal	169	350	33	20	18550
YV3BQS	Venezuela	155	312	32	23	17160
VK5BW*	Australia	157	306	21	22	13158
LX1JX*	Luxembourg	119	246	1	35	8856
DL8UI*	West Germany	72	139	19	16	4865
JA1ELY	Japan	68	130	22	15	4810
SM4CAN*	Sweden	23	46	15		690
OK1AGN*	Czechoslovakia	17	50	1	12	650
I4CSP*	Italy	21	38	1	12	494
G3WKS*	England	14	44		6	264
YO9CUF/3*	Romania	18	23		10	230
G5EBA	England	11	22		9	198
JA1FFY	Japan	9	17	3	5	136
PA3AZM*	Netherlands	9	18		6	108
YO4BXX	Romania	10	20		5	100
YO3KWJ	Romania	3	6		3	18

(W) Contest winner
* DX country champion

DX 40-METER MULTI-OPERATOR

Callsign	QTH	QSOs	OSO Pts.	St./Pr.	DX	Total
I4YNO (W)	Italy	672	1400	33	59	128800
I5MPK*	Italy	590	1206	44	45	107334

(W) Contest winner
* DX country champion

W/VE 80-METER SINGLE OPERATOR

Callsign	QTH	QSOs	OSO Pts.	St./Pr.	DX	Total
KQ2M(W)	NY	510	666	52	39	60606
N7DF*	UT	700	739	54	24	57642
KØCS*	MO	552	635	53	28	51435
WB2DHY*	NY	346	545	48	30	42510
VE5XK*	SASK	672	681	54	8	42222
K2SWP(-)	NY	492	530	50	15	34450
KB9MW*	IL	530	570	52	7	33630
N8ATR*	OH	311	326	47	11	32467
NA8T*	CA	373	454	51	19	31850
N8AKY(-)	MI	439	453	50	11	27633
KØUK(-)	CO	407	417	49	7	23352
KC4OV*	TN	331	342	46	10	19152
KC8JH(-)	OH	335	342	46	7	18126
WA1ZAM*	MA	363	367	45	4	17983
KB3ND*	PA	294	305	45	10	16775
KI7M(-)	OR	232	271	53	6	15989
N4ARO(-)	TN	254	259	49	4	13727
AK1A(-)	NH	168	206	41	22	12978
W6TPH(-)	CA	228	240	41	12	12720
KD4XR(-)	AL	244	248	41	3	10912
W4PZV(-)	FL	141	161	46	18	10304
VE1AJJ*	NB	149	178	40	17	10146
W3BGN(-)	PA	152	196	30	19	9702
KA1R(-)	MA	202	209	30	7	7733
KC5LK*	MS	159	161	45	2	7567
WA1TCA(-)	CT	149	154	40	5	6930
W3AP	PA	144	160	38	3	6560
NØZA	CO	112	125	41	11	6500
WA2IFS(-)	NJ	128	133	42	5	6251
KB8WB	OH	119	126	42	7	6174
KK8L	OH	150	150	36		5400
WB2TKB	NY	126	131	36	4	5240
N8TN	OH	153	153	33		5049
W5PWG(-)	TX	114	119	39	3	4996
WAØWWW	MN	118	118	38		4484
KF1B	CT	94	102	35	8	4386
WD6MRF	OH	90	95	37	3	3800
N1SR	MA	90	99	33	5	3762
KR8X	OH	133	133	28		3724
WB8YEW	OH	94	96	37		3552
W8VEN(-)	WV	97	97	34		3298
W8ANM	OH	88	88	36		3168
KJ2N	NJ	87	99	31	6	3069
N1BMV	CT	100	100	27		2700
W1GOM(-)	OK	71	74	32	3	2590
K3ND	PA	71	78	29	5	2516
W4KMS(-)	VA	76	76	31		2356
W3ETB	PA	82	86	25	1	2336
K3ZJ(-)	DC	94	95	22	1	2185
VE1QO*	QUE	74	79	22	5	2133
WD8MOV	OH	55	59	29	2	1829
KB7M(-)	WY	55	55	30		1650
WB2IWJ	NY	72	72	20		1440
W2FTY	NY	47	48	27	1	1344
K1NCD	CT	58	58	22		1276
AK7F(-)	WA	43	45	26	2	1250
WB9OBX(-)	WI	51	51	21		1155
W1LUG	MA	52	52	21		1092
K8CV	MI	40	40	27		1080
WD8OYF	OH	47	47	20		940
KB9IT	IL	43	43	19		817
K4FPF	VA	41	41	19		779
NØCMC(-)	ND	26	26	20		520
W6YMH	CA	28	28	17		476
AK7J(-)	AZ	19	19	16		304
W3ICM(-)	MD	21	22	10	1	242
N2DCH	NY	20	20	11		220
W7ABX(-)	NV	20	20	10		200
NL7D(-)	AK	11	20	3	1	80
KA7AKQ	WA	8	8	3		24

* District
(-) State/provincial
(W) Contest winner

W/VE 80-METER MULTI-OPERATOR

Callsign	QTH	QSOs	OSO Pts.	St./Pr.	DX	Total
N9NC(W)	IN	793	812	54	17	57652
VE2ZP*	QUE	567	597	53	18	42387
N4BAA*	FL	421	456	52	28	36480
W4CN(-)	KY	564	581	50	11	35441
KF2X*	NY	413	432	48	11	25488
AJ1E*	MA	345	369	40	17	21033
N4FKF	KY	212				8692
WBØTCF*	MO	93	118	37		4366
W3YA*	PA	2	2	1		2

* District
(-) State
(W) Contest winner

DX 80-METER SINGLE OPERATOR

Callsign	QTH	QSOs	OSO Pts.	St./Pr.	DX	Total
I3MAU(W)	Italy	507	983	40	58	96334
CN8CO*	Morocco	441	882	23	53	67032
C6ADV*	Bahamas	296	316	52	16	21488
HI8GBG*	Dom. Rep.	149	294	49	9	17052
OK1MSM*	Czechoslovakia	165	320	52		16640
HI8GB	Dom. Rep.	145	284	41	10	14484

DF9ZP*	West Germany	121	239	26	27	12667
ZF2DX*	Grand Cayman	149	178	42	27	12282
OX3ZM*	Greenland	117	234	28	18	10810
YV3BQS*	Venezuela	96	192	35	16	9792
JA1ELY*	Japan	128	216	18	22	8240
DA1RE	West Germany	107	200		34	6800
H44SH*	Solomon Is.	69	137	19	15	5658
8P6KX*	Barbados	78	106	25	17	4452
JH7JGG	Japan	89	159	14	9	3657
OK1KZ	Czechoslovakia	52	89	1	22	2047
OK1AGN	Czechoslovakia	37	73	4	15	1387
SM4CAN*	Sweden	30	60	11	9	1200
OK2BLG	Czechoslovakia	26	51	14	7	1071
I4CSP*	Italy	38	70	1	14	1050
G5EBA*	England	32	62		14	868
DL8UI	West Germany	20	39	7	6	507
YO4BXX*	Romania	21	41		9	369
PA3AZM*	Netherlands	18	36		10	360
DF3AO	West Germany	17	34	6	4	340
JA5AUC	Japan	16	28	7	3	280
VK5BW*	Australia	13	22	1	9	220
JA3HTT	Japan	9	16		6	96
YO3KWJ	Romania	6	11		4	44

* DX country
(W) Contest winner
Check log: YO6LV

DX 80-METER MULTI-OPERATOR

Callsign	QTH	QSOs	QSO Pts.	St./Pr.	DX	Total
I5MPK(W)	Italy	191	376	30	29	22184

(W) Contest winner

W/VE COMBINED 40/80-METER SINGLE OPERATOR

Callsign	QTH	QSOs	QSO Pts.	St./Pr.	DX	Total
N7DF(W)	UT	1188	1286	105	33	180040
KC4OV*	TN	931	1078	113	24	147686
N8AKY*	MI	880	1051	103	32	141885
N8ATR	OH	788	963	92	17	104967
KC8JH	OH	735	802	98	27	100250
W3BGN*	PA	411	628	72	27	62172
N4ARO	TN	467	502	88	7	47690
VE1AJJ*	NB	297	357	82	27	38913
KI7M*	OR	321	378	83	19	38556
W5PWG*	TX	268	303	82	12	28482
W8ANM	OH	284	347	73	4	26719
N8TN	OH	353	386	65	2	25862
KR8X	OH	395	395	53		20935
W3AP	PA	217	260	65	7	18720
KF1B*	CT	171	200	64	21	17000
W2FTY*	NY	161	210	63	14	16170
WA2IFS	NJ	163	192	51	23	14016
KJ2N	NJ	150	191	51	22	13943
W3ETB	PA	207	253	50	4	13662
W8VEN	WV	193	195	68	1	13455
WB8YEW	OH	108	170	53	22	12750
K3ND	PA	160	177	61	11	12744
K1NCD	CT	164	223	51		11373
WAØWWW*	MN	150	150	70		10500
WB9OBX*	WI	208	208	50		10400
W4KMS	VA	163	163	60		9780
WD8MRF	OH	139	177	52	3	9735
K4FPF	VA	123	152	50	4	8208
K8CV	MI	96	103	56	7	6489
K3ZJ	DC	164	165	38	1	6435
W6YMH*	CA	100	109	45	9	5886
WD8OYF	OH	100	100	36		3600
KB9IT	IL	82	82	30		2460
NL7D	AK	45	87	23	2	2175
AK7F	WA	53	55	34	2	1980
KA7AKQ	WA	56	57	27	1	1596
W7ABX	NV	46	50	24	4	1400
N2DCH	NY	29	29	18		522

* District award
(W) Contest winner

W/VE COMBINED 40/80-METER MULTI-OPERATOR

Callsign	QTH	QSOs	QSO Pts.	St./Pr.	DX	Total
VE2ZP(W)	QUE	1271	1506	110	56	249996
N4BAA	FL	1066	1228	105	61	205076
KF2X	NY	978	1206	96	38	161604
W3YA	PA	46	46	16		736

(W) Contest winner

DX COMBINED 40/80-METER SINGLE OPERATOR

Callsign	QTH	QSOs	QSO Pts.	St./Pr.	DX	Total
CN8CO(W)	Morocco	802	1626	67	91	256908
H44SH	Solomon Is.	360	718	64	35	71082
YV3BQS	Venezuela	251	504	67	39	53424
JA1ELY	Japan	196	346	40	37	26642
VK5BW	Australia	170	328	22	31	17384
DL8UI	West Germany	92	178	26	22	8544
OK1AGN	Czechoslovakia	54	123	5	27	3936
SM4CAN	Sweden	53	106	26	9	3710
I4CSP	Italy	59	108	2	26	3024
G5EBA	England	43	84		23	1932
PA3AZM	Netherlands	17	54		16	864
YO4BXX	Romania	31	61		14	854
YO3KWJ	Romania	9	17		7	119

(W) Contest winner

DX COMBINED 40/80-METER MULTI-OPERATOR

Callsign	QTH	QSOs	QSO Pts.	St./Pr.	DX	Total
I5MPK(W)	Italy	781	1582	74	74	234136

KK9A.

From left to right: I4ZNU, I4OUT, I4JMY, and I4YNO.

W9RE AND W8NGO
160-METER WORLD CHAMPIONS

"The most activity ever heard on 160" . . . "Best contest I've ever operated" . . . "An absolute winner!" . . . "Definitely will try again next year." These welcome comments were heard again and again in the wake of 73's 1982 "top-band" event. "Wrapped up my Worked All States" . . . "Thanks to the contest I worked another new country!" These were some of the rewards earned for just a few hours of contest operation by nearly 1500 participants.

If you're a supporter of 160 meters, you can't help but notice how much the contest has grown since its inception some 3 years ago. The bright future of this world-championship event seems assured.

Year	Participants
1980	569
1981	917
1982	1482

This year, W9RE single-handedly produced 1118 QSOs, 58 states and provinces, and 8 DX counties to become the 1982 World 160-Meter Phone Champion for single-operator stations. Mike managed to beat second-place finisher and 1981 World Champion W8LRL by a margin of 136 QSOs and 20,000 points. A race as close as this, involving two of the most prominent stations on the band, sets the stage for our 1983 event just around the corner. The upcoming contest will decide the best two out of three.

Both W9RE and W8LRL are to be congratulated for their superb performance in our own "survival of the fittest." Who will surpass W9RE's 1118 QSOs which now establishes a world record on 160?

In the multi-operator category, the crew members at W8NGO are the 1982 World Champions. They compiled 877 QSOs, 56 states and provinces, and 4 DX countries for a total score of 273,900 contest points. The gang at W4CN, last year's World Championship station, finished second with a total of 238,950 points. It was a very close race for the top slot, with only 73 QSOs and 1 multiplier separating the two stations. Here again, the 1983 contest will decide the best two out of three, since last year's champions finished second this time.

Of all the single-operator entries, the following stations compiled 500 or more QSOs: W9RE (1118), W8LRL (982), WB3GCG (932), WD8CRY (762), WBØCMM (722), W1CF (697), KJ9D (622), N8ATR (582), N5JB (579), KC8P (561), K9OLL (552), W3BGN (524), and N5CG (502).

In the multi-operator class, 500 or more QSOs were earned by the following stations: W8NGO (877), W4CN (804), AK2E (688), K9ZUH (677), W9ZX (512), and K9YUG (504).

W9RE worked the most states and provinces (58) for the single-operator class, followed by W8LRL and WB3GCG with 57; K9RJ with 56; KC8P, WD8CRY, KJ9D, N5JB, WBØCMM, and K9OLL with 55; W1CF, W9DUB, and WØCM with 54; N5CG, W4VKK, KB8HW, and W2FJ with 53; K1MNS, W5YZ, KAØHIG, and KA7BTO with 52; and KC4OV, KØSTF, WA2GZB, N7DF, and K1LPS with 51 W/VE multipliers.

For the multi-operator category, W8NGO, K9YUG, and K9ZUH accumulated the most W/VE multipliers, with 56 each; AK2E had 54, W4CN had 53, KØUK had 52, and W9ZX had 51 states and provinces.

Screening all logsheets, EA5ET worked 17 DX countries, followed by G3XWZ/A with 15 countries; W8LRL with 13; N4IN, OK1AVG, and W1CF with 12; WB3GCG and VE1YX with 11; and ZF2DX with 10.

After all the contest entries have been tabulated, it is rewarding to analyze the station equipment and antennas used by the participants. The tables below tell the story.

Equipment	Usage
Kenwood	38.5%
Yaesu	27.0%
Drake	20.5%
Icom	4.9%
Ten-Tec	3.3%
Collins	2.4%
Hy-Gain, Astro, Heath, Signal One	.85% each

Equipment used in the 160-Meter Phone Contest.

Antenna	Usage
Dipole/Inverted vee	37.3%
Inverted-L	15.3%
¼-wave sloper	9.3%
Trap vertical	9.3%
Shunt-fed tower	7.9%
Vertical (½, full wave)	7.9%
Long wire	5.7%
½-wave sloper	2.8%
Quad, delta loop, 5-element yagi, windom, zepp	.9% each
Receive antennas only:	
Beverage	10.7%
Loop configuration	1.9%

Antennas used in the 160-Meter Phone Contest.

The success of this very popular contest would not have been possible without the dedication of two superb gentlemen of the "gentleman's band." Our special thanks to Dan WA2GZB and Ed K3IXD who both tackled the responsibilities of scoring all the entries and corresponding with the entrants. These gents have been involved with this world-championship contest ever since its founding some three years ago. Both have burned the midnight oil countless nights when the rest of us were enjoying the openings on the band.

The 4th annual contest is just around the corner. After you read these results, pass them on to your friends on 160. Be sure they're aware of our world-championship contest, scheduled for January 15-16, 1983. If you think this year's scores were record breakers, wait until January 1983! With the relaxation of the FCC rules on this band, we expect to see nearly 2,000 stations participating. I'll be there, how about you?

WORLD 160-METER PHONE CHAMPIONSHIP MULTI-OPERATOR STATIONS

Callsign	State	QSO	St/Pr.	DX	Points
W8NGO (W)	MI	877	56	4	273,900
W4CN*	KY	804	53	6	238,950
AK2E*	NY	688	54	8	224,750
K9ZUH*	IN	677	56	6	213,280
K9YUG	IL	504	56	4	152,400
KØUK*	CO	467	53	5	137,120
W9ZX	IL	512	51	—	130,560
N8AKY*	MI	369	50	3	98,580
KBØTJ	CO	324	50	—	81,000
AA1K/3*	DE	279	46	7	75,525
KB8AC*	OH	244	44	1	56,350
N4DBR	KY	219	40	—	43,800
KØUR*	KS	189	43	1	41,800
WØCEM	KS	143	45	1	31,970
WD8NJR	MI	133	40	1	27,470
KBØSF	CO	136	40	—	27,200
DF5ZD/A*	Germany	35	—	6	3,135

(W) World Champion for 1982
* State/Provincial/DX Country Champion
Disqualified: WB8JBM

160-METER CONTEST SOAPBOX

"A very excellent test. Something should be done about improving the conditions, however (hi)."—W1BB.

"Suggest you give a multiplier of zero for all kW stations. With their excess power, that would certainly thin the results considerably."—AA1K.

"My first try at a contest. Hope I help those needing Rhode Island."—W1LOV.

"Excellent conditions the first night. Sure was a fantastic contest and I'm really looking forward to next year, now more than ever."—K1LPS.

"Lots of activity. The band was extremely crowded."—K1NBN.

"A very fine event! Many big signals, and there were more stations on the band than I have ever heard on 160 meters!"—K2DWI.

"Had nothing but antenna problems the 1st night. Blew a borrowed rig to top it off. I'll be back next year though."—AK2E.

"Excellent first-night European opening."—N4IN.

"Score would have been higher but had 300 kHz interference from an op who lives just down the road. He deliberately QRMs and the FCC has given him warnings about it."—W4PZV.

"My first 73 contest. Had a great time. Will have a better receiving setup next year."—W4TMR.

"The most enjoyable contest I've ever been in!"—W4TWW.

"A bunch of activity on the band. Hardly any DX."—WB4ZPF.

"Must say there was much activity and I certainly enjoyed it very much."—N5CG.

"Enjoyed the contest. Sounded like 20 meters. The strobe light atop my 300 vertical gave my receiver fits throughout the contest."—W5GFR.

"Thanks for a fine 160-meter contest."—AE5H.

"Nice contest. Ended up doing surgery and missed half of it, unfortunately."—K5JZN.

"Lots and lots of QRM!"—W5LFG.

"Very interesting contest. Sure enjoyed it."—KC5LK.

"Sure had lots of fun in the contest. Lots of QSOs and lots of QRM."—K6ANP.

"Great contest. Wish I could have worked the entire event."—WD6EFU.

"Enjoyed it, as I'm sure everybody did. Second night was not as good as the first. Doubled last year's score, though."—W6WBY.

"Had to work both nights but managed to slip in a few Nevada multipliers for the stations on the band."—W7ABX.

"Sounds like the contest is growing every year. Had a great time as did everyone I talked to."—KA7BTQ.

"Daytime contacts are okay but too bad you couldn't work a station a second time if you worked him the night before."—N7DF.

"Sure enjoyed the contest. Lots of stations heard on the band."—WB7FDQ.

"Super contest! I did better than last year and it sure helps toward my 6-band WAS award. See you again next year."—AK7H.

"Very enjoyable contest. Amazed at the number of stations on the band. All were very courteous. It was a real gentleman's contest."—K7SFN.

"Great contest. Heard a lot of activity from my QTH here in Montana. Plenty of QRM, too."—K7VIC.

"Daytime bonus points should be deleted."—KC8A.

"Had lots of fun and looking forward to 1983. The contest is definitely growing each year. Thank you, 73!"—N8AKY.

"S-9 power-line noise throughout the contest!"—W3CV.

Continued

"A fun, gentlemanly affair. Worked maybe 12 calls on 160 the last 35 years. This weekend I managed over 700 contacts!"—WD8CRY.
"Sounded like everyone had a great time."—K8HF.
"42 states worked. Not bad for a 25-foot helical-wound vertical with only 5 radials."—KC8NR.
"Enjoyed the contest very much. I think it is the best one held on 160!"—KC8P.
"Sure enjoyed the contest. Lots and lots of stations were on, I see."—AA8S.
"Daytime bonus was confusing. Had a great time, though."—K8US.
"The first 160-meter contest ever for me. I invited the Smoke Valley ARC over to help me out."—W0CEM.
"Unbelievable activity this year. 73 has done it again!"—WB0CMM.
"My first effort on 160-meter contesting. I was really impressed with the turnout. Had loads of fun."—KA0HIG.
"Sorry, no US stations heard on the band . . . just Europeans."—DF5ZD/A.
"Had a special 160-meter license and heard only Europeans."—EA3CCN.
"A very popular contest according to the turnout. Good luck."—KH6IJ.

WORLD 160-METER PHONE CHAMPIONSHIP
SINGLE-OPERATOR STATIONS

Callsign	State	QSO	St./Pr.	DX	Points
W9RE (W)	IN	1118	58	8	371,580
W8LRL*	WV	982	57	13	350,700
WB3GCG*	MD	932	57	11	322,660
W1CF*	MA	697	54	12	236,280
WD8CRY*	MI	762	55	6	234,240
WB0CMM*	CO	722	55	8	230,895
KJ9D*	IN	622	55	4	184,670
KC8P	MI	561	55	5	169,800
N5JB*	TX	579	55	3	169,650
N8ATR*	OH	582	50	5	164,640
K9QLL*	IL	552	55	3	160,950
W0CM*	KS	484	54	6	147,600
K9RJ	IL	471	56	4	142,500
KB8HW	MI	491	53	3	138,320
N5CG*	OK	502	53	1	135,810
W3BGN*	PA	524	45	4	135,730
W9DUB*	WI	473	54	3	135,660
KC4OV*	TN	479	51	3	130,140
K1MNS*	NH	436	52	3	120,725
K1LPS*	VT	440	51	3	119,610
W4TMR*	NC	461	48	6	117,720
KA7BTQ*	ID	368	52	7	111,805
K0STF*	SD	401	51	3	109,080
W4VKK*	GA	367	53	4	106,020
W2FJ*	NJ	347	53	6	104,430
N7DF*	UT	362	51	5	103,880
N4IN*	FL	318	48	12	101,100
KA0HIG*	IA	338	52	3	93,775
W5YZ*	NM	333	52	3	92,950
K4AQQ	FL	331	49	5	90,720
VE1YX*	NS	292	47	11	88,740
N4MM*	VA	336	48	4	88,400
K2BO*	NY	285	49	8	84,075
KD4NI	VA	315	49	3	78,645
KG4W	VA	347	46	1	77,315
VE2ZP*	Quebec	343	42	2	75,900
W4PZV	FL	259	49	7	74,760
K7SFN*	NV	293	50	1	74,715
N4ARO	TN	289	48	3	74,460
N3CO	MD	283	43	3	73,580
WB7FDQ*	AZ	266	50	3	71,285
K7VIC*	MT	263	49	4	70,490
WA2GZB	NJ	253	51	3	69,120
NA4D*	KY	251	49	3	66,040
W8QBF	OH	303	39	3	62,730
N0AN	IA	246	50	—	61,500
WA0OFH*	WA	179	48	7	61,410
K3IXD	MD	252	47	1	60,960
W0HW*	MN	235	50	1	60,435
AA8S	OH	304	36	2	58,140
W5GFR	TX	240	41	5	56,350
K3LGC*	DE	237	40	2	54,600
KB3MI	PA	215	46	3	53,410
AE5H*	MS	254	40	1	52,480
W3ICM	MD	243	39	3	51,650
VP9BO*	Bermuda	251	35	5	51,200
KK8L	OH	251	38	2	51,000
WB4TUO	TN	192	46	4	50,960
K2DWI	NY	245	39	2	50,635
KC8A	MI	253	37	1	48,260
K4CNW*	SC	215	44	—	47,300
K6ANP*	CA	201	42	3	45,900
W3AP	PA	235	35	2	44,955
N8TN	OH	233	37	1	44,460
WB1CWZ*	CT	252	33	2	44,450
KC5LK	MS	206	41	1	43,680
VE4WR*	Manitoba	176	49	—	43,120
W4OWJ	FL	167	45	5	43,000
KC8NR	WV	190	44	1	42,750
AE3T	PA	185	42	2	41,140
K2FL	NJ	200	34	3	40,600
WB0UFL	IA	196	43	—	40,140
W4TWW	SC	179	41	3	40,040
W8DN	OH	177	39	2	36,285
K1NBN*	ME	175	39	2	35,465
WB7QZM*	OR	191	33	1	32,980
AI0Z	IA	154	41	1	32,550
WB4ZPF	VA	154	39	2	31,980
W4YZX	NC	165	35	1	30,880
AK7H	WA	130	42	4	30,820
WA5NFC*	AR	156	34	2	28,620
WA9FTV	IL	130	41	1	27,510
KC8JH	OH	123	41	2	26,660
K3SXA/MM	NY/MM	124	34	6	26,400
K4YFH	NC	176	30	—	26,400
K1ECK	MA	167	24	5	24,505
K8US	OH	143	34	—	24,310
K5JZN	OK	110	43	—	23,650
N0ZA	CO	99	43	2	22,725
N7AKU	NV	138	31	1	22,400
WA9RHU	IL	118	35	1	21,420
ZF2DX*	Grand Cayman	82	37	10	21,150
VE7WJ*	BC	110	33	3	20,160
VE6OU*	Alt.	127	30	1	19,995
W3CV	PA	92	40	1	19,270
VE7ERY	BC	100	38	—	19,000
WB9LFD/1	CT	119	29	2	18,755
W4KMS	VA	109	31	2	18,315
AA4FF	VA	126	27	2	18,270
K4OD	VA	112	30	1	17,515
W6WBY	CA	105	32	1	17,490
K8SVT	OH	116	30	—	17,400
WA2ORX	NY	103	31	1	16,640
VE1BPY*	PEI	93	33	2	16,625
VE2OG	Quebec	93	34	—	15,810
K8AQM	MI	117	27	—	15,795
VE2QO	Quebec	101	27	3	15,300
K9CGD	IL	89	31	2	14,585
KB8YE	OH	85	30	1	13,330
W5LFG	TX	98	27	—	13,230
K2MN	NY	95	26	1	13,095
W1BB	MA	72	30	3	12,375
WD8LCD	MI	101	22	—	11,110
W1LUG/4	VA	85	23	1	10,320
W4HVU	FL	71	25	2	10,260
W1LOV*	RI	94	21	—	10,185
KB0W/6	CA	71	26	—	9,230
WD8MRF	OH	73	24	—	8,760
VE5XU*	Sask.	60	26	—	7,930
WD8LCN	MI	62	25	—	7,750
KB7M*	WY	58	23	3	7,540
G3XWZ/A*	England	94	—	15	7,450
K8HF	OH	59	23	—	6,785
EA6ET*	Balearic Is.	57	1	17	5,130
WD6EFU	CA	44	20	—	4,600
OK1AVG*	Czech.	71	—	12	4,260
W7ABX	NV	50	17	—	4,250
KB8UO	MI	62	13	—	4,030
KB7WN	WY	33	20	—	3,400
W1GOM/5	OK	35	18	—	3,150
EA3CCN*	Spain	26	—	8	3,120
AK7F	WA	40	13	1	2,870
KJ7I	AZ	35	15	—	2,625
K8CV	MI	32	16	—	2,560
KA7HBS	WY	28	16	—	2,240
KH6IJ*	HI	29	15	—	2,175
KA8MSO	MI	50	7	—	1,750
8P8KZ*	Barbados	16	7	6	1,495
VE7FBS	BC	23	10	—	1,150
W3ETB	PA	14	10	1	825
N8ASB	MI	13	1	—	130
KA8ALO	MI	8	1	—	80
K9GDF	WI	4	2	—	40

(W) World Champion for 1982
* State/Provincial/DX Country Champion

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received at 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458.

SOUTH BEND IN
JAN 2

A hamfest swap & shop will be held on Sunday, January 2, 1983, at Century Center, downtown on US 33 One Way North between the St. Joseph Bank building and the river, South Bend IN. Tables are $3.00 each in a carpeted, half-acre room. The Industrial History Museum is in the same building. Four-lane highways lead to the door from all directions. Talk-in on .52/.52, .99/.39, .93/.33, .78/.18, .69/.09, 145.43, and 145.29. For more information, contact Wayne Werts K9IXU, 1889 Riverside Drive, South Bend IN 46616, or phone (219)-233-5307.

WEST ALLIS WI
JAN 8

The West Allis Radio Amateur Club will hold its 11th annual Midwinter Swapfest on Saturday, January 8, 1983, beginning at 8:00 am, at the Waukesha County Exposition Center. Tickets are $2.00 in advance and $3.00 at the door. Tables are $2.00 in advance and $3.00 at the door. For advance reservations, send an SASE to WARAC, PO Box 1072, Milwaukee WI 53201.

OAK PARK MI
JAN 9

The Oak Park Amateur Radio Club will hold its annual Swap 'n Shop on Sunday, January 9, 1983, from 8:00 am to 3:00 pm, at Oak Park High School, southwest corner of Coolidge and Oak Park Boulevard, Oak Park MI. There will be ample parking and refreshments. Talk-in on 146.52. For prepaid table reservations, write OPARC, 14300 Oak Park Boulevard, Oak Park MI 48237.

RICHMOND VA
JAN 16

The Richmond Amateur Telecommunications Society will hold Richmond Frostfest '83, the annual winter ham radio and computer show, on Sunday, January 16, 1983, at the state fairgrounds, Richmond VA. General admission is $4.00. All flea-market and commercial exhibit spaces will be indoors in a 30,000-square-foot exhibit building.

SOUTHFIELD MI
JAN 30

The Southfield High School Amateur Radio Club will hold their 18th annual Swap & Shop on January 30, 1983, from 8:00 am to 3:00 pm, at Southfield High School, 24675 Lahser, Southfield MI. Doors will open at 6:00 am for exhibitors. Admission is $2.50. Reserved tables (payable in advance) are $18.00 for two 8-foot tables and $9.00 for each additional reserved table. Tables also will be available at the door. There will be food and parking. All profits go toward electronics scholarships and to support the activities of Southfield High School's amateur radio club. For more information or reservations, write Robert Younker, Southfield High School, 24675 Lahser, Southfield MI 48034, or phone (313)-354-7372 from 8:00 am to 10:30 am or (313)-354-8210 from 10:30 am to 3:00 pm Monday through Friday.

ARLINGTON HEIGHTS IL
FEB 6

The Wheaton Community Radio Amateurs will hold their hamfest on February 6, 1983, at Arlington Park Race Track Expo Center, Arlington Heights IL. Tickets are $3.00 at the entrance and $2.50 in advance. Doors will open at 8:00 am. Flea market tables are free and plenty of floor space will be available. There will be a large commercial area (including a computer section), awards, and clear, paved parking. Talk-in on 146.01/.61 and 146.94. For general information, call W9JTO at (312)-231-9524. For advance tickets, send an SASE to WCRA, PO Box QSL, Wheaton IL 60187.

MANSFIELD OH
FEB 13

The ARRL-approved Midwinter Hamfest/Auction will be held on Sunday, February 13, 1983, beginning at 8:00 am, at the Richland County Fairgrounds, Mansfield OH. Tickets are $2.00 in advance and $3.00 at the door. Tables are $5.00 in advance and $6.00 at the door. Half tables are available. Talk-in on 146.34/.94. For additional information or advance tickets, contact Harry Frietchen K8HF, 120 Homewood Road, Mansfield OH 44906, or phone (419)-529-2801 or (419)-524-1441.

MARLBOROUGH MA
FEB 20

The Algonquin Amateur Radio Club will hold its annual flea market on Sunday, February 20, 1983, at the Marlborough Jr. High School, Marlborough MA. Admission is $1.00 and children under 12 will be admitted free. The doors will open at 9:00 am for dealers and 10:00 am for buyers. Refreshments will be available. Tables reserved before February 12, 1983, are $7.00; any remaining tables will be $10.00 at the door. Talk-in on 146.01/.61 and 146.52. For table reservations or more information, contact Algonquin ARC, PO Box 258, Marlborough MA 01752.

GLASGOW KY
FEB 26

The Glasgow Swapfest will be held on Saturday, February 26, 1983, beginning at 8:00 am Central time, at the Glasgow Flea Market Building, 2 miles south of Glasgow just off highway 31E, Glasgow KY. Admission is $2.00 per person. There is no additional charge for exhibitors. The first table per exhibitor will be free, and extra tables will be available for $3.00 each. There will be a large heated building, free parking, free coffee, and a large flea market. Talk-in on 146.34/.94 or 147.63/.03. For further information, write Bernie Schwitzgebel WA4JZO, 121 Adairland Court, Glasgow KY 42141.

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LETTERS

FIGHT CITY HALL

OK, Wayne, I've sat here every month and read how you think that the code requirement is hindering the growth of amateur radio. I think you are missing a problem facing amateur radio that is much bigger than a code requirement. The problem that I am referring to is local ordinances that restrict or prohibit amateur towers and antennas.

I can only imagine the number of hams who have worked hard to upgrade and feel that now is the time to put up that dreamed-of antenna system only to have their local government say it's illegal, so take it down. Why upgrade anymore? In fact, why even continue on with ham radio? It is truly disheartening to be told not to practice your hobby to its ultimate limit and enjoyment.

Believe me, fighting city hall is no fun (well, maybe a little fun when you win). I speak from experience. In my city, Cerritos, California, it took about 2 years of fighting city hall to get our ordinance changed. Led by George Goumas N6AWF, we outlasted our city officials by getting to meetings at 7:00 pm and often not being able even to begin our presentation as to why our ordinance should be changed until 1:00 or 2:00 am. Well, our perseverance paid off with a new ordinance that allowed us to go to 70 feet with a conditional use permit.

Wayne, if it had not been for many out-of-town hams who came and helped to fill up the council chambers, we would never have made it. Of the 100-plus hams in our city, only a handful were interested enough to come out for our hearings. It was the backing of the out-of-towners that saved our bottoms.

I applied for the first permit under the new ordinance. It was granted after a two-hour discussion with neighbors who claimed I was causing them continuous interference. A well-kept log book blew that argument away. I really thought that my permit was to end up on the scrap pile after a 137-signature petition against me was presented to the council. For a number of reasons that I won't go into, it had no effect.

From these experiences I have come to some conclusions that I would like to share with all amateurs. First of all, most of you don't care about what is going on around you until it hits you square in the face. Amateurs need to fight for their property rights as home owners. I have a little 50' × 100' piece of property that I'd like to call mine, but it is never mine when I have people telling me I can't practice a hobby that's not noisy or harmful. It's a lot easier to keep restrictive laws off the books than it is to change existing laws. Each amateur should make it his (or her) business to keep tabs on what is going on in his city. Finally, don't assume that because the guy a mile away has up a tower and antennas that there are no laws against it in your city. It may be that no one has complained to the city so they just haven't taken the time to tell the amateur to remove it.

Wayne, as much as I dislike fighting with my local government, I'll never stop fighting. It looks as if I will be moving in the next year so that I will probably have to go through the permit process again. Local governments are slowly taking away our personal freedoms. If you don't believe it, just check to see what kinds of no-nos are on your local government's books. These ordinances will range from what color you are allowed to paint *your* house to what you are allowed to park in *your* driveway. Believe me, restrictive antenna ordinances are becoming more of a widespread problem than you will ever know and are certainly more of a problem than a code test.

Carol Green KK6V
Cerritos CA

P.S. Since writing you this letter, our city is trying to pull the wool over our eyes again. They have decided to take the new ordinance and put it back into the Planning Commission for further study. So far through all of this, we have received no League backing. If the ARRL won't help us this time then I suspect that 100-plus amateurs in this city will no longer have any reason for belonging to the League because amateurs that cannot operate have no reason for belonging to an organization that deals with the operation of amateur radio stations.

HYPOCRISY

How far have we progressed in ham radio? Is it possible that our technology has passed our intelligence? Can it be that many of our population lean towards hypocrisy?

One of the most common comments one hears on the air is, "Ham radio is so great, it has something for everyone." I suppose they speak of the hobby where, if you have the money, you can own monobanders on each band, several transceivers, and amplifiers. Do we include the other guy? The one who lives by the dipole and no amplifier? Which hobbyist is more important?

Looking back, more than half of what I now have collected I owe to a list or a net of some kind. Myself, I have never taken a relayed report, which some seem so concerned about. The percentage of people who operate with the same self-dignity set of rules I operate with is probably 98 percent.

I have sat in awe at my station listening to what some say is the only way to work a DX station (the pileup). I have heard gentlemen such as FB8WG and A51PN (and the list could go on) try to dig a call or just a letter out of the pileup; being unable to do so because people kept calling so long, they just go QRT or QSY.

Gentlemen, channel efforts towards making ham radio a better hobby. During contests, for example, stations all over the bands run 20-30 kHz wide. These guys don't care, because it keeps others from moving close. Why not focus support towards allotting overlapped segments of the General and Advanced band, i.e., 14250-14300 kHz. This way, non-contesters are not forced out of their weekend of operating. How many lists or nets mess up the whole band for others throughout the entire weekend? I suppose that's OK, though, because somewhere, someone up there likes contests.

I firmly believe that the majority of the old-timers that are against lists or such have all or nearly all of their countries and have done so during times when the ham population was one-tenth what it is today. I would like to see them start over with a dipole and barefoot.

I hope any kind of stand against lists and/or nets is only a rumor. Let us consider how much control any organization which is supposed to help hams should have over how we make a contact.

I feel the desire for the coveted accomplishment in each of us will stop the taking of the invalid report. Those who are dishonest will find a way to be dishonest in every facet of ham radio, no matter what rules are set.

Gentlemen, ponder this and let's all try to improve what we have and not take away that which each of us is entitled to.

Philip Pritchett N6ATS
Mounds OK

VENDOR SERVICES

You know the cliche: Each of us is eager and ready to take pen in hand and complain, grumble, bellyache, etc., against or about some vendor or products or services. But to say something nice about someone or something, that is another scenario, and here comes one.

I have been a ham for about four years, starting at the tender age of 57. In this relatively brief period I have sampled the wares and services of many vendors selling to amateur radio people. Overall, it has been a pleasant experience, but let me single (or is it double) out two vendors from the many I have experienced.

First—Trio Kenwood, makers of fine rigs for two-meter and HF operation along with excellent, if somewhat expensive, audio gear. I have been particularly impressed with service out of their Compton, California, site. They are professional and timely, either by mail or through the reception desk. One gets to speak to a technician right up front, and if the one serving you is not familiar with your particular rig he goes for help in the back room. The rule is courtesy and the proper amount of sympathy. When appropriate, charges are less than the "minimum" posted in the reception area. Service time is often less than posted minimum time. All in all, *real* service after the sale!

I am equally happy with the products and service from Communications Specialists, Orange, California, makers of tone generators for PL applications. Customer service by telephone has always been polite and efficient. You get the feeling that they care about their customers. On several occasions, they have given no-charge service well after the end of the warranty period, sevice required by my clumsiness rather than product failure. Again, a company that unstintingly backs up its product.

I would like to hear from other hams with similar experiences.

I. Olitzky KA6CLE
Venice CA

BE AN ELMER

For the past several months I have been reading letters directed to you by proponents and opponents of code-free licensing. I have yet to read one letter that addresses the central issue, which I believe is how we as amateurs propose to make our hobby better.

I struggled with the code and theory as, probably, most do . . . my callsign attests to that. The pivotal feature is that perseverance and desire can get most everyone past the hurdles. I do not feel that 20-wpm code . . . 13-wpm code . . . nay, even 5-wpm code, nor Mr. Bash's crib text detract from amateur radio; neither do I feel that those things support ham radio. I feel amateur radio's biggest asset lies in the individual hams who comprise our society and the fact that ham radio is a challenging and just plain fun hobby.

Each and every one of us, the already-licensed hams, should do our part to fascinate, encourage, instruct, and support non-hams in the acquisition of an amateur license. We should, on an individual basis, be Elmers to any who show an interest. We should, as groups or clubs, promote and participate in spreading the word that ham radio is fun by supporting and teaching classes. Learning aids are available. *73*, Heathkit®, the ARRL, Ameco, and others publish many fine learning aids. The FCC, while not always as responsive as we would like, is the arbiter of our licensing exams and makes those exams available on schedule and without prejudice.

What may be missing is the incentive for us as individual hams or groups of hams to encourage others. I propose that *73* spearhead an effort to encourage hams to teach others about ham radio. How?

1) Awards: I propose that *73* offer awards to individuals and clubs, similar to operating awards, for getting amateurs licensed.

2) Instructor training: Most of us can learn but many require help in the form of syllabi, group instructional aids, and teaching techniques to enable us to help others. Publish these aids.

3) Public knowledge: Advertise to make the public aware of amateur radio. The ARRL does this to some extent—more is needed.

4) Hotline: Match Elmers (either individuals or clubs) with prospective amateurs needing help. Might work like an computer dating service. A national 800 number hotline is one possibility.

5) Service awards: Encourage clubs to promote themselves by offering club awards for participation in activities like SETs, RACES, MARS, etc.

These are some of the possibilities. There are probably many more ideas which would work better or attack a different front. Not everyone wants to become a radio amateur. For one thing it requires some discipline and effort and not everyone is willing to devote the necessary energy. I feel that everyone who is willing to make the necessary commitments should be given all the help possible by all of us amateur radio operators everywhere.

Jeff Barstow WD8DLK
Rodney MI

BASH REFORM

I am a 15-year-old at Hereford High, and I am writing about the public outcry (what little there is of it) towards Bash Educational Services. In *73* for November, you reported the failure of 89 percent of one of Bash's classes and restated your opposition to the books and classes. I must admit that I have great respect for anyone who takes a firm stand for their own opinions. However, I do disagree with you on the "Bash Book" debacle.

When you really think about it, Bash's system was a radical concept, but as with all once-new ideas, an improvement is needed (not a ban).

Now think about this: You have to admit that for anyone intent on passing "Big Brother's" exam for upgrade it is a Herculean effort to find all of the information (much less, carry the ton of books needed) for passing the bewitching exam; even the *ARRL Study Guide* is nowhere near enough. Anyone who has no prior knowledge of the theory will quickly find out that the *Study Guide* is a good book for introducing them to the theory but in no way prepares them for the double- and triple-talk used by the FCC to befuddle our minds. If you get all of

the necessary books to study out of, you wind up studying a lot of information, 70 percent of which you will probably never use or want to know or is not even on the test. All of this useless information mainly serves its purpose by wandering around our minds and mingling with the facts needed. This usually causes a nasty surprise in the form of a failure.

My idea for improvement is a simple change. Continue collecting Qs and As from tests but not for printing in cheat books. I would simply use these and take all of the ham-radio-related books I could get (if I had the sources) and find all I could in the way of theory and facts to back up all of the answers. Take these arranged facts and write them into an easy-to-understand form of writing with flavor and a small vocabulary (*you want more young hams; write it so we can understand you*). Without using boring, dragging wording, present the theory well, and towards the end of the book introduce readers to the language used by the FCC and get them very familiar with it. Also, a copy of the regs in FCC form with simple English definitions would be desired by many people.

I think that anyone bringing out such a book would end the era of the Bash Books. I know that my idea is not new, but I have yet to see it in the print of a large magazine.

Thank you for your good magazine and for your time.

Glen White NA5Z
Hereford TX

YOU'RE MY TYPE

Your last two issues of *73*, namely October and November, have been more my type of magazine. Since I keep my own notebook of the interesting articles I see in the mags, you have kept me busy lately. You see, I look for articles that look interesting to put on the breadboard and play with and when I've played with one long enough and it looks like a good project to finish, so much the better.

In regard to your continually pressing for more amateurs, I feel that I must put in my two bits' worth. Of all the 50 or more Novices that have passed their exams around here the past two years or so, there are only about two or so on the air. Everyone is interested in DX—how far can we get out, etc. The biggest problem seems to be money. Very few seem to be interested in building. *Frankly, I think we need a good set of* textbooks that will take the prospective ham from beginning to end.

I'm all for your computer networks, but so far your computer articles are way over my head and I cannot afford the price of a computer to figure them out. The day you can show me *73* articles where I can borrow my wife's portable TV set and, with the minimum of cost, put it on the air, that will be the day. You'll have to hurry, though: I'm 74 years old.

Laurence A. Knutson W9SFL
La Crosse WI

SCHOLARSHIPS

The officers and directors of the ARRL Foundation announce the recipients of two awards for the 1982-83 academic year. The Long Island School Scholarship, for youths attending Long Island colleges or universities, has been granted to Paul Michael Silverman KA2DSP, of Levittown NY. He entered State University of New York at Farmingdale in September to pursue courses in electronics technology. The $250 ARRL Foundation-administered award was given to this young man for demonstrated interest and excellence in promoting amateur radio and for aspiring to an electronics carreer.

The YL ISSB Memorial Scholarship has been awarded, for the second successive year, to Larry Edwin Smith, Jr. WB9UKE. The awarding of $709 to Larry concludes the ARRL Foundation's administration of this scholarship fund for YL ISSB. Larry pursues associate and bachelor's degrees in electronics engineering, aspires to a career with NASA communications, holds amateur Extra and 2nd class commercial licenses, has maintained an A academic average, and has been very active in extracurricular activities at Vincennes University.

ARRL *Foundation-administered scholarships* are open to all applicants, qualifications and specific criteria being reviewed by screening boards consisting of ARRL Foundation officers and directors and panels provided by sponsoring organizations. Application closing date is May 1, 1983, for the next academic year.

Andrea T. Parker K1WLX
Secretary, ARRL Foundation
Newington CT

FINDING BIRDS

Finally, I have found why the RS-n satellites aren't where they were supposed to be: The tracking program was wrong! I'm referring to "Tracker—The Ultimate OSCAR Finder," p. 88, *73 Magazine*, January, 1981. The computation for satellite longitude is correct only for satellites with inclination greater than 90 degrees. The sign of the variable SO needs to be changed for satellites like the recent Russian ones with inclination less than 90 degrees. I take care of it in my revised Apple version this way:

```
2010 CA = COS(IN):SO = - SO*CA/
     (ABS (CA)) + CO*RD + RD*TI/4
```

There are *many* ways to accomplish this sign change; this is the mathematician's way.

Actually, this program is not the only place this error is made. The RSGB *VHF Handbook* puts that correction for inclination on the TI/4 term. The reference that I found to explain this correction is by Bryan Leipper, "Circulation Orbits with Simple Computing Systems," *QST*, February, 1979, pp. 38-42.

Dr. Gerald N. Johnson KØCQ
Ames IA

Thanks for the tip, Gerald. We thought the Russians were just being obstinate.—Eds.

NO FAULT, PCBs

I just finished reading "Avoiding the Electrical Nightmare," on page 64 of the October issue regarding the unusual voltages encountered by N4UH of Cleveland, North Carolina. I was prompted to write because, while his technical analysis is correct, his terminology is not. There is a great difference between a "ground fault" and the condition he describes which is an "open neutral."

A true ground-fault condition is just what the name implies—a fault to ground, or earth. Visualize your electrical panel and the wires in it for a moment. The black wire from the breaker is *the neutral or return part* of the circuit. An electric light connected between the black and white conductors completes the circuit. The current flowing "out" the black wire is equal in magnitude to the current flowing "in" the white wire. If we introduce a fault into the circuit (such as a broken insulation protecting the black wire from shorting to the panelboard box), then current will flow through the light fixture and back out as before, but also through the black wire to the insulation fault to ground and back to the neutral at the point where the neutral and ground are common. This is a ground fault and the current flowing in the ground conductor is not equal to the current flowing in the neutral return.

Ground-fault circuit interrupters (GFI or GFCI) are devices that sense the current flowing out the black wire and the current flowing in the white wire. If the difference is *greater than 5 mA (for the typical residential units)*, then the device interrupts the current. If the fault from the black wire to ground was through your arm, you would be most appreciative.

The fault described in the article is an entirely different problem. The problem experienced by N4UH was an open neutral. The return conductor (the white wire) was open, creating a voltage-divider effect between the legs of the power system.

The National Electrical Code (NFPA-70-1981) requires that all electrical systems be grounded. The grounding should be accomplished at a single location. This location, as required by the code, is at the supply side of the service at the main service disconnect. This is the only location where the neutral and ground are brought together. All of the uninsulated ground wires running around in your Romex are for the purpose of extending this ground point to each and every receptable and light fixture in your house. A ground fault at any location in your home will cause the ground conductor to carry the return current back to the common point with the neutral at the service disconnect.

It should be noted that the type of problem encountered is rare and should not cause alarm on the part of those with aluminum service-entrance conductors. Utility practices vary but always account for the problems of aluminum oxidation. Aluminum connections, if properly made, are very reliable and need not be of concern to the homeowner. (This applies to the larger sizes of aluminum and not necessarily to aluminum branch-circuit wiring, but that would be the subject of an entire article in itself.)

As long as I am writing, I also would like to extend a word of caution regarding the *article on page 29, "Dissertation Upon* Roast Pig," by N6TO. The transformers obtained from the utility most likely were immersed in mineral oil. A few transformers are still in circulation, however, which contain polychlorinated biphenyl (PCB). PCB is a major component in coolant known as "Askarel." This is nasty stuff which is very toxic and must be disposed of in accordance with EPA regulations. Under no circumstances should you attempt to use a transformer that contained this coolant. The utility should not even consider selling you a transformer which contains PCB. Because the utility may not know which transformers contain PCB, you may discover one by mistake. In addition to transformers, some high-voltage capacitors used in commercial equipment a few years back also contained PCB insulating material. Be cautious with all surplus and used electrical components containing oil for cooling or insulation.

Dave Olsen KL7K
Anchorage AK

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We will send to each reader of this publication who reads and responds to this test before midnight Jan. 23, a 62-piece American and Metric Heavy Duty Industrial tool set and metal storage chest containing all the basic and special tools necessary to service and repair domestic and foreign trucks, tractors, autos, and all heavy industrial machinery. Consists of 7 American 3/8 inch drive sockets (3/8"), (7/16"), (1/2"), (9/16"), (5/8"), (11/16"), (3/4"), 9 American 1/4 inch drive sockets (3/18"), (7/32"), (1/4"), (9/32"), (5/16"), (11/32"), (3/8"), (7/16"), (1/2"), 9 Metric 3/8 inch drive sockets, (9MM), (10MM), (11MM), (12MM), (13MM), (14MM), (16MM), (17MM), (19MM), 9 Metric 1/4 inch drive sockets, (4.5MM), (5MM), (6MM), (7MM), (8MM), (9MM), (10MM), (11MM), (12MM). A 3/8 inch fine tooth ratchet with quick release drive combination-forward and reversible, a 1/4 inch × 3/8 inch adapter, a 3/8 inch drive extension bar 3 inch. A 3/8 inch spark plug socket with oil resistant insert and speed installation and removal. An 18-piece industrial steel ignition wrench set, complete set of spark plug gap setting gauges for any type of spark plug. One "1/4-drive heavy screwdriver. (One) large set of feeler gauges, industrial "Phillips" heavy duty and "regular" screwdriver. All tools are drop forged alloy steel for durable heavy duty repair work, and will be accompanied with a LIFETIME guarantee that it must perform 100% or it will be replaced free. Add $7 handling and crating for each Tool Chest requested, we pay all shipping. Should you wish to return your tools, you may do so for a full refund. Any letter postmarked later than Jan. 23 will be returned. LIMIT: Six (6) sets per address, no exceptions. Send appropriate sum together with your name and address to: Tool Test Dept. #120DW, *Viking Ind.*, 6314 Santa Monica Blvd, Los Angeles, CA 90038, or for fastest service from any part of the country, call collect before midnight 7 days a week (213) 462-1914 (Ask for) *TOOL TEST*, #120DW, have credit card ready.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 8

bringing world reports to *73* could do the job.

We do have a world hobby, so let's see if we can get it together more.

HAMMING FOR CREDIT?

Down in Georgia there is a proposal to have ham classes count for educational credits. That's a good move.

There is a desperate need to get amateur radio going again in our schools and this approach could generate some interest for the students. It would be a way of, so to say, paying the students back with credits as well as in fun.

Though it is old hat to *73* readers to read about the needs America has for technical people, . . I've been writing about that for several years now . . . I see that the general media are getting more concerned over the problem. Even the normally liberal writers are getting to worry about the overwhelming loss of technical consumer products to Japan.

With the increasingly rapid development of video technology, microcomputers, data access over the phone or via television stations, video teleconferencing, satellite services, 100-channel TV cables, and so on, it is getting ever more difficult for the general public to ignore the coming developments. They've even been noticing that almost all of the recent developments have been coming from Japan and figured out that this just might make it difficult for America to catch up once we fall seriously behind.

Articles about this have been appearing with increasing regularity in *Newsweek*, *Time*, *Business Week*, *Fortune*, and so on. The situation is getting so serious that a small handful of our educators is beginning to get uneasy. When a problem reaches that level, you know it has to be serious.

Naturally, there are pressures for our government to force Americans to buy more expensive and technically-inferior products just because they are made here instead of in Asia . . . just as there are heavy pressures to force Americans to buy crummier cars because they are made here. I'd like to see more interest in American productivity, American pride in perfection, and American unions promoting something besides the highest pay possible . . . with the result that the products are priced out of the market.

But that's another problem . . . to some degree. The key to any American success in communications and computers in the next twenty years lies in our having the technically-qualified people to invent the products, manufacture them, sell them, operate them, and service them. This is going to take an enormous number of engineers, technicians, and scientists . . . vastly beyond anything which we even have in prospect to develop in this country.

Only Japan has laid the groundwork to develop the high-technology people who are going to be needed to provide the whole world with video, computers, information, and other technical services which are going to be the key to personal happiness, business success, and educational achievement in, say, twenty years.

While we're busy lowering our academic standards and seeing our proponents of liberal-arts education winning most of the battles in academia, we see Japan loading their schools with enthusiastic technically-inclined students. Do you realize that there are over 900,000 amateur radio operators in Japan today? They have us outnumbered in active hams by a margin of at least three to one . . . possibly four to one . . . and Japan has only half of our population! They are running rings around us.

Amateur radio has never been a very popular hobby in America. Even when we were growing at our greatest rate, back in the 1950s, we were growing at only about 11% per year, which was about 22,000 newcomers. Then, with the "incentive licensing" disaster of the 1960s, we fell to zero growth (and worse). Now we're back into a growth mode, but not an impressive one.

Unless the Japanese technology program runs out of steam, their teenagers will be doubling the number of hams in Japan in the next three years, while at our rate of growth we are looking at about eight years for a doubling of our hams.

There has been some criticism of calls for more engineers with a reminder that only a few years ago massive numbers of engineers were dumped and were unable to find work. To a degree, that is right. But what is glossed over in that response is that the engineers and technicians who joined the unemployed were those who had not kept up with the changes in technology. There has never been any surplus of technically-trained people.

Remember that by 1970 it had dawned on even the most backward of firms that solid state was here and unavoidable. This was when the axe fell. Those engineers who were living in the good old tube days were suddenly not needed. This axe was wielded again when the industry discovered ICs and had no further use for engineers who could not cope with them. Each new generation of electronics is going to be ruthless in weeding out the people who do not adapt.

Today, the need is for young engineers and technicians. Our schools have been almost totally emptied of these talented people, leaving the over-40 remnants of previous technologies to try to teach things they haven't bothered to fully understand. This does not bode well for our schools or the next generation of kids . . . the ones we're depending on to cope with the Japanese incursions.

Amateur radio can help, at least to a degree. By interesting teenagers in a high-tech hobby, we may be able to develop the engineers and technicians we need, both for industry and for our schools as teachers. Of course, the exceedingly slow growth of amateur radio over the last twenty years has meant that the average age of amateurs has been rising steadily, with the result that within our ranks we have few qualified teachers to get new hams started. The technical competence of hams as compared with industry has been dropping for twenty years, where at one time hams were a cut above the average engineer or technician.

I can remember the time when hams were responsible for virtually every major breakthrough in radio communications. Now we can merely point out that long ago hams pioneered FM, NBFM, SSB, SSTV, RTTY, and so on. We old, doddering relics of the past can remember the pride of those olden days. But the world is ruthless; it wants to know what you've done for it lately. Not much.

The plan for giving scholastic credits for ham classes is a fine move; let's see if we can get that idea spread around. I'll be interested in getting articles for *73* on proven ways of getting teenagers interested in amateur radio and on successful programs to get amateur radio growing.

In the meanwhile, I'd like to see a lot more articles in *73* on current technologies. Perhaps we can get amateur radio back into developing some inventors and pioneers of new techniques. Running articles on designing and building kilowatt tube-powered linear amplifiers is not it . . . unless someone designs a digital automatic-tuning device.

There is no shortage of things to invent which are well within our technical capability . . . if we let ourselves go and get cracking on it. For instance, we could use a system for automatic identification of transmitters so that our receivers would indicate the call of the station being tuned in as we tune. This could be done via an ASCII signal sent on a subcarrier, thus furnishing the receiver a reference signal to use for automatic tuning. Once we have that development, we will be ready for receiver-tuning systems which will be automatic, alerting you when chosen prefixes or calls are tuned in.

This could be a great stride ahead for amateur radio, pioneering a new digital communications technology which could be quickly applied to CB, two-way, and most other communications services. It could help to bring about some extensive changes in amateur radio operation, too . . . perhaps the first real changes in over 50 years. Except for the development of

the vfo, our Morse-code communications has changed hardly at all in 50 years. And other than the shift to SSB, phone communications is almost identical to hamming of 50 years ago, complete with pileups on DX, jamming, endless nets, and so on.

We've had practical RTTY on the ham bands for over thirty years and there still is no noticeable dent in traffic handling as a result. Amateur radio, which at one time was the spawning ground for new technologies, has turned into the most rigid and unchangeable remnant of the past.

You invent it and we'll publish it. . . okay? Let's get amateur radio into gear for the first time in years. The last change of any sort was over ten years ago when we went to FM and repeaters on two meters. Unfortunately we contributed little technically in this move, merely taking advantage of the already-existing technology developed for two-way commercial operating. Now let's do some pioneering for a change.

DIGITAL MANIA

With the new freedoms being granted by the FCC, I'd like to see some serious experimenting on our bands with digital techniques. Ham radio is never going to go anywhere unless we get busy and take advantage of the recent technological advantages in ICs.

For one thing, isn't it about time that the RTTY crowd stopped puttering around, dodging QRM, and came up with some circuits which will dig out those weak signals and copy them? I tried a recently-advertised computerized-RTTY setup and was astounded to find out how crummy it was. . . even as compared with the circuits we were building back in 1948. Almost any kind of interference sent it into spasms of incomprehension.

Fellows, I have some news for you. You should be designing RTTY gear which uses the el cheapo computers such as the Timex 1000 (Sinclair ZX81), the Atari 400, the VIC-20 and so on. Your circuit should make it duck soup to tune in a signal. . . and copy should be 100%, despite CW or other neighboring RTTY signals. You should copy through QRM, QRN, jamming, fading, with any shift, and so on. Let's get cracking at this and stop horsing around with junk which falls apart as soon as a vindictive CW-monger gets on channel. There is, as you may not know, apparently an unlimited supply of CW jammers, all with unlimited time to sit and trash RTTYers. Perhaps we should devise a certificate, with yearly awards.

And while one contingent is doing the inventing which should have been done several years ago but which was prevented by the FCC, bless 'em, others of you should grab your chips and start working seriously on automatic identification for transmitters. Some early experiments indicated that a system would work using a frequency-shifted subaudible tone, but we need to do a lot more work on this. If someone can come up with a relatively simple system which can be built into every transmitter, we can save the several eons of time every year which are presently wasted with redundant identification. Just think of the saving on pileups alone, where perhaps around five thousand stations are giving their calls from fifty to one hundred times per minute, hour after hour. There is a zero in Minnesota with the unofficial record of 117 complete identifications in one minute! A record to be envied. I understand there is a move to get this amazing chap on "People Are Weird."

Once we have a fairly fast automatic-identification system, we'll be able to instantly read out the call of any station tuned in on our receiver. We'll also be able to build in a microprocessor to check the call for wanted calls or prefixes. Those rare ones can come and go pretty fast sometimes, so why miss one just because he is 50 kHz down the band from where you are working? With an automatic tuning system (dual tuning, of course), one receiver tuner will be on your channel for you while the other is scanning the band, checking out the prefixes.

And a couple of years later, the whole thing will be in an HT for us. Just ask any of the early two-meter folk about the first FM rigs and compare them with the programmable, scanning-all-channel HTs of today. You know what we haven't seen yet? Anything!

So, while all you old-timers sit around and fondle your 807s, we're looking to the youngsters to stop fooling around with girls, get going with with their pile of ICs, and invent us out of the 1930s morass that amateur radio is in today. The technology is here. The parts are here. The need is here. . . and riches are awaiting the entrepreneurs who make it happen.

One thing is for sure. . . if you invent it, I'm anxious to publish your articles in *73* and get the ball rolling.

HELP!

Every now and then I see a notice that the League is looking for some hams to add to their staff. Fine, I suppose, though my understanding is that the place is very, very structured. It also isn't growing much, in case you haven't read their yearly report. When I say it isn't growing much, I mean that the League has been losing members at an increasing rate for the last few years. That would make me nervous.

Now, while they've been shrinking away, my little empire has been growing steadily. They need people to replace those who have bailed out. I need people to help us grow even more. . . and I don't think anyone would really characterize this place as rigidly structured.

In addition to needing a good all-around ham or two to test ham gear and write reviews, to keep the W2NSD/1 hamshack state-of-the-art in RTTY, slow scan, repeaters, antennas, and so on, we also need someone to keep our microcomputers running. We have a hundred or more around here and the darned things keep breaking. I think we could keep a compulsive technician exceedingly happy.

Our audio department has a serious need for a technician to be on top of all the digital recording techniques and assure us that our digital and audio cassettes are first-rate.

For people who for twisted psychological reasons are not particularly interested in living in the finest area of the whole country (the world?), we do have some part-time jobs available which can be done from anywhere. These call for a good deal of responsibility, of course. We're building our national network of sales people and have several nice areas still open. This would entail getting out to visit computer and electronics stores about three days a week to make sure that they are well stocked with our magazines, books, and computer programs.

In Peterborough, we have open positions for people with PR and advertising experience, sales, editing, writing, graphic arts, photography, and so on. In the next year, we expect to add at least 100 people to the staff. . . possibly 200, if we can find them.

We're looking for non-smokers who are more interested in developing careers than in just landing a job. We'll be able to keep up our growth only if we keep up our enthusiasm and innovation. Indeed, we've been growing briskly for seven years now, and by the end of this month, we expect to be about five times the size of the ARRL.

So, if you are not a smoker and you're looking for a place to put your outstanding talents to work where they can do the most good. . . and where you will be able to learn more and grow, think in terms of Peterborough. Send along a letter detailing why we can't go a step further without you. . . and a resume.

COMPUTERIZING

With over 40% of the *73* readers computerized. . . and with thousands more eyeing the Timex computer. . . I'd like to make sure there is no misunderstanding. I want to see you experimenting with amateur radio applications of these contraptions and writing up your results for *73*. The readers are interested in articles on getting rid of computer noise. . . in protecting the computers from interference from the rig. . . in RTTY applications. . . high-speed code. . . beam aiming. . . log keeping. . . automatic QSLing. . . packet communications. . . and so on.

Unless you write up the results of your work, it will be wasted. . . giving only you the benefit. The more you write about what you are doing, the more hams will join you in experimenting and developing new ideas—and we'll all benefit.

Remember, too, that the market is just starting to open up for add-ons for the low-end computer systems. There are millions to be made by those who come up with practical new ideas. We've already seen dozens of new millionaires as a result of the recent microcomputer developments. . . and we haven't seen anything yet. With

hundreds of thousands of Timex computers being sold, just about any useful accessory for it will be able to generate millions in sales.

In order to encourage this development, *Microcomputing* will be devoting a special section to the low-end computers. We need not only interfaces, programs on cassettes, and so forth, but we may also have a need for better ROM character generators and operating systems, plug-in ROM programs, and so on.

I've helped a lot of people get very wealthy in the microcomputer business... and I can help you, if you are seriously interested. I write about this in my editorials in *Microcomputing, 80 Micro,* and *Selling Micros*, and I'll be covering this aspect in *inCider*, too. It's fun to be rich, and the opportunities are almost unending. As a ham, you have an inside track, if you have the will.

HOW'S THE ARRL DOING?

Too bad you didn't get the *QST* annual report... and read it. In amongst the lavish self-praise... an orgy of it... are the stark financial figures, and they are so dark-cloud that they tend to cut through the baloney. Membership is down. And despite the massive increase in the subscription price for *QST*, the income for the League has not even kept up with inflation. Nowhere near it!

The financial management in any normal business would call for the immediate replacement of the people responsible. Of the 74 stocks and bonds in which the League has put the money they've made in profits in past years... being a nonprofit corporation they have to salt away all that money rather than distribute it to the stockholders... only eight are worth more now than they paid for them. Maybe you were wondering who was investing in oil companies, railroads, and so on. Heh, heh... *you* are.

They seem to have concentrated on economizing on membership benefits such as awards, cutting that by 76% in 1981. This is balanced by an increase in unemployment compensation which went up by 973%... yep, almost ten times, as staffers went through the old revolving door. That's quite a one-year record.

Automobile expenses only went up 370% in the year. Are they providing limousines for the top echelon these days? We did see healthy cuts in such pork-barrel items as ARRL headquarters expenses, which were 70% higher in 1978. And the W1AW expenses came down, too. They were 51% higher in 1980. It looks as if someone made a trip somewhere, because while there were no overseas expenses chalked up in 1980, they managed to spend $17,762 in 1981. That's a very nice trip!

Unless you take a serious interest in League financial matters, you have no beef about what they are doing. You are a stockholder of the corporation and should look into how your money is invested. You might even question why the HQ people are salting away millions in stocks and bonds, losing your shirt for you with poor investments, when perhaps they should be spending your money on more services... or, even better, in encouraging some growth in amateur radio.

A million-dollar budget to produce some first-rate films about the excitement of amateur radio... about the benefits of amateur radio to our country... about how to start a high-school ham club... could get amateur radio growing again. We have plenty of friends in television broadcasting to see that the films would get on the air. And a million dollars wouldn't even put a big dent in the bankroll they've built up. It might keep them from blowing so much on lousy investments ... and, after all, isn't that what the money *should* be used for?

Look, I know you hate to have me carping about the League... but I'm not giving the League hell right now. I'm giving *you*, the League member, hell. The chaps at HQ will do whatever they want with your money if you don't say anything. It's only by your being a silent partner to the crime that all this money has just plain been thrown away. You haven't been paying attention. You haven't been insisting on meeting with your directors and finding out from them what the situation at HQ is... and they are not going to level with you unless you push them. They'll put the pressure on for membership benefits... and for promotion of the hobby... but only if you lean on them.

The League, under the direction of the directors you have elected, has been spending a pittance on membership benefits and promotion of the growth of the hobby. Get after 'em... let's see some growth.

MAJOR LEAGUE CHANGES AFOOT?

Knowing how undependable the rumor mills are, I don't put a lot of stock in repeated reports that Skip Tenney will soon be promoted as a replacement for Vic Clark as president. Tenney, well known as the publisher of *Ham Radio* magazine, either has sold or seems about to sell what is left of his magazine, so that would make him both available and eligible for the spot.

The move makes sense, too, when you consider how close Tenney has worked with the League all these years. At times, it has seemed as if he were almost an untitled League official. Being independently wealthy, Tenney wouldn't be restricted by the lack of remuneration which goes with the position.

A lack of expected aggressiveness on the part of the recently-appointed president seems to have sparked the search for someone to help take hold of the organization and get it into shape. Many of the directors feel that it is important to have a businessman with experience helping to guide the League into safer financial waters... and perhaps stem the growing loss of *QST* subscribers.

Others of the directors like Vic and feel that he should have more of a chance to get things turned around... to, so to speak, haul the old boat out of the water and scrape off the barnacles. I've personally always held Vic in the highest regard as a ham and a DXer. The directors should realize that even with a relatively small organization such as they have at HQ, people get set in their ways and it is difficult... often very difficult... to bring about changes, no matter how badly they are needed. My unasked-for council would be to give Vic more time and not rush with Tenney.

BUILDERS VS. BUYERS?

Sometimes I get the impression that people will believe just about *anything*! First, we had a bunch of old hams, probably irritated because they had to change from AM to SSB, grousing that hams weren't building any more. I still hear that chorus when I visit some ham clubs, many of which seem to have been taken over by old old-timers.

When I point out that there are more ads for parts in *73* these days percentage-wise than there were in *QST* forty years ago, they look shifty-eyed and shut up... at least until I'm safely out of earshot. The fact is clear that hams are building as much or more than they ever did. It just isn't the old ones who are doing it. Possibly they're too busy watching television.

The increased coverage of relatively simple building projects in *73* has sparked a lot more interest in building and experimenting. Fine... for that's one of the great pleasures of electronics and hamming. I put quite a few years in at the workbench myself, with a barn full of old gear I built to show for it... and a twisted pelvis from standing on one foot for about twenty years. The local chiropractor has given up trying to straighten it... and I've stopped seriously trying to lift anything heavy. I've paid my dues in building.

There is a gross misunderstanding on the part of some of the manufacturers in the industry. This is odd, because it really means that they have been reacting emotionally and not giving any serious thought with some research.

This has to do with the interesting concept that hams who build are not very good customers for commercial equipment. The facts are the opposite, as even a few moments of contemplation will make clear. The major buyers of new equipment are the exact same people who are also building gadgets. How come? Let's look at it.

First, a little lesson in economics. Way, way back, in the early days of amateur radio, hams built their own receivers and transmitters. There were only a handful of hams then, so there wasn't enough of a market to warrant commercial equipment for them. Then, when the first commercial receiver was put on the market, the home construction of receivers virtually stopped. Hams quickly realized that a home-built project would cost more, have a smaller resale value, and not work as well as a commercial receiver. They did just what you and I

would do in the circumstances: They bought their receivers.

I came along just shortly after these halcyon days, getting started as a shortwave listener along about 1936 and doing my first pirate operating (called bootlegging then) in 1938. There were no practical transmitters for hams as of that time, there being only about 40,000 licenses. These came along after WWII, when our ranks had swelled to about 80,000. But we did have some beautiful receivers and the hams ate them up.

As a teenager, I was living in Brooklyn and I made it my business to visit as many of the active hams as I could. In those days virtually every licensed ham was active. I visited well over a hundred hams and found just one who had built his own receiver. It really wasn't practical from any viewpoint.

Once transmitters got practical, hams stopped building transmitters. . . with a few exceptions. We've always had a few stranger-than-normal hams, but not many. I went the same route myself, buying war-surplus rigs and converting them. I did build power amplifiers. . . but only because they weren't commercially available.

Much of my own building was involved with complex RTTY gear, autocall circuits so that my RTTY could work automatically, and so on. Those of us building this sort of stuff were getting into digital electronics. . . back in the late 40s. . . 35 years ago!

But then, as now, we bought our rigs and receivers. Further, then, as now, when we bought our commercial equipment we went for the best and the newest we could get. This was only natural since we were deeply involved with hamming and wanted to get the best out of the hobby. Why would I go to the trouble of spending two weeks designing and building a piece of Teletype® equipment and then hook it to a crummy receiver? No way! I went for the best and so did the rest of the builders. They're still doing this.

Today hams *are* building gadgets and enjoying it. But you can bet that these active hams are also very particular about the commercial gear they buy. You can also bet that they are lying in wait for anything new that comes along. These chaps are the best of customers for the industry because they are the most deeply involved.

It is the older hams who already have their KWM-2s who sit and rag-chew, who talk endlessly on nets, who are the bane of the industry, not the enthusiastic builders and experimenters. We are fortunate in that we do have a magazine in the ham field devoted to these nice old men, complete with pages and pages of "operating news" for them to read each month.

When you consider what an incredible bargain ham gear is today, I get a bit aggravated when I hear someone griping about the high cost of it. Lordy! When I got started in hamming we had crystal-controlled transmitters and each crystal cost about \$3.50. Not bad—until you translate that into 1983 dollarettes, which puts those nice little crystals at about \$63 each.

The cheapest hunk-of-junk ham receiver on the market, the Hallicrafters Sky Buddy, cost \$19.50. Cheap? Well, my friend, if we look at the comparable prices for other things, that comes to about \$350 today. The average ham wanted something better, running around \$80, or about \$1,500 in today's puny money.

No, we're getting incredible bargains today as a result of the solid-state revolution, ICs, and mass production. Japan, with nearly one million licensed hams, has such a huge market for new ham gear that the production quantities have brought down the cost of manufacture to much less than one half what it would be without them. Each doubling of production normally drops the cost of manufacture about 15% or so.

So, though we hams are building more than ever before, we also are buying as much as we can get commercially made. . . and getting incredible value for our investment.

ARE YOU MISSING THE DX?

Now, I suppose I should shut my typewriter off and not let you know what is going on. I've been sneaking around twenty meters lately and I want to let you know that you are missing out. The band has been super in recent weeks, and the DX is rolling in at all hours of the day and night.

Just in the last couple of days, I've had contacts with the following, to give you an idea: ZL2WM, ZL1VY, PY2CYT, PY1BFZ, HR1RBM, 7X2BK, VK6RU, IK7AGT, EZ7BXP, 4Z4JS, EA3CXG, N3RD/VP9, JX1JO, PY0ZZ, HH2MC, TU2HJ, PP6ACP, ZS1DG, ZS6WB, ZS4AF, PR7SSM, S83MMK, TU2LM, ZS6BRD, ZS6BNS, ZS4D, JY3ZH, JY4MB, JY5ZM, YI1BGD, 7X5SI, LX1JAS, Y27FN, Y56FN, SM7DLZ, WB5VIH/DU2, VK6CF, VS6CT, HL9RT, UA0JBN, EA9NG, U9H, UK0SBB, 8Q7AV, 3BD8DB, OD5FB, HZ1AB, 4S7EA, T32AF, F5RV/FC, VU9GI, VU9CK, ZL4OY/A, OH0W. . . and so on.

Besides some bragging about working DX, the above list is indicative of what you can do if you get on the air with a reasonably good rig and antenna. It's there, with thousands of DX operators looking for you. While some put up with contest-style operating, whacking out the contacts for QSLs and the good old ARRL Honor Roll listings, most of them will stop this nonsense and be most interesting to talk with if you ask them some questions. Most of them love to talk. . . and they love most to talk about the most interesting subject in the whole world: themselves.

Think what an impression hamming could make on innocent teenagers if they could hear us talking with Christmas Island out in the middle of the Pacific Ocean! Or some chap in Baghdad! They're there, looking for you. Where are *you*?

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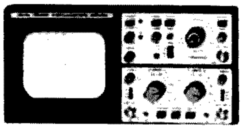

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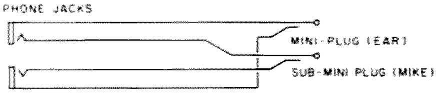
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



"STAR-SET" HEADSET CONVERSION: This adapter will enable you to use "Star-Set" headsets with an Icom IC-2AT (or a similar HT). The IC-2AT has about 1-2 volts present in the mike line to power an external electret condenser mike. This voltage is used to power the "Star-Set" as well. To key the PTT, you use the mike mute switch on the belt clip of the "Star-Set." The PTT works by completing the mike circuit. If you want to use the set on both the radio and a telephone, simply unplug it, because no changes are made in the headset. Use shielded wire in the adapter to prevent rf feedback. If you don't receive anything, reverse the plugs, marking them after you have determined the proper placement.—Joe Eisenberg WAØWRI, Lincoln NE.

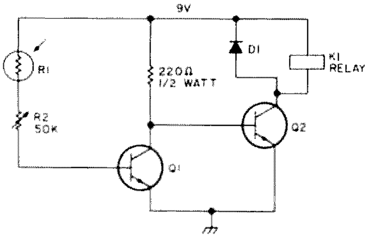


Fig. 1.

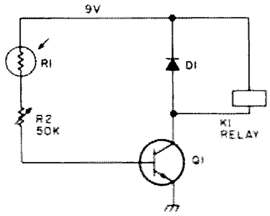


Fig. 2.

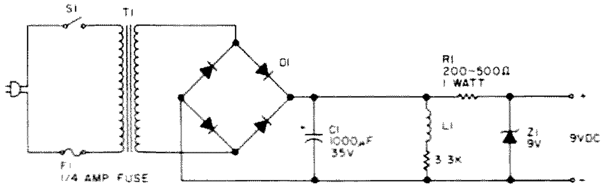
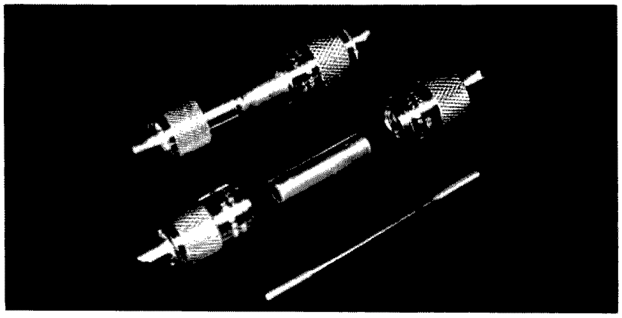


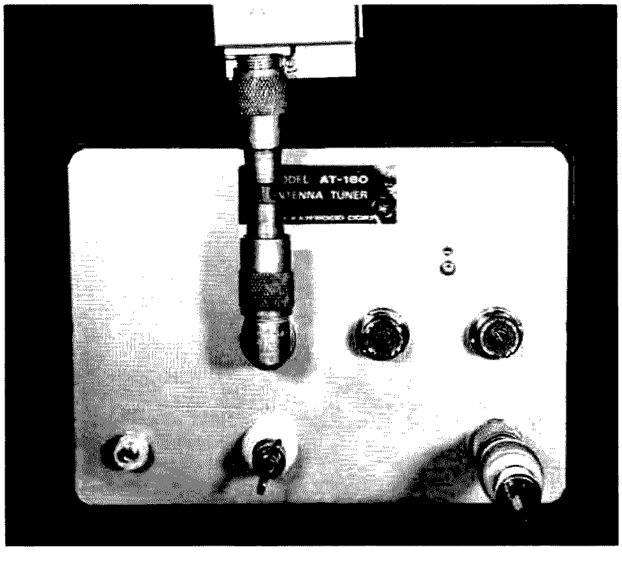
Fig. 3.

LIGHT-ACTIVATED RELAY: Fig. 1 shows a circuit which will trip relay K1 when the light-sensitive resistor R1 is in the darkness. A buzzer can be attached to K1 to indicate that the lights have dimmed. Any small signal diode can be used for D1, which suppresses the high-current inductive kickback, thus protecting Q2. Any NPN transistor can be used for Q1 and Q2. R1 is a cadmium-sulphide resistor which has 5 megohms resistance in darkness and 100 Ohms' in bright light. The resistor can be located away from the rest of the circuit. Fig. 2 is a light-activated relay; the same components are used as in Fig. 1. A power supply circuit is shown in Fig. 3. R1 is a one-Watt resistor valued between 200-500 Ohms.—Alan Weinberg KR7D, Tucson AZ.

CONVERTING THE DRAKE TR-7 TO RECEIVE VLF WITHOUT THE AUX-7: This is a simple modification for the Drake TR-7 which will enable the unit to receive 0-to-1.5 MHz. Open the unit and locate U9003. Remove the wire from pin 14 of this IC. Carefully solder a 6.5-inch insulated hookup wire to pin 14 and connect the other end of the wire to the unused terminal on the STORE switch. Replace the cover. To receive below 1.5 MHz, you must set the bandswitch to 1.5, press STORE, press the DOWN switch once, and then release the STORE switch. The UP/DOWN switch will now select the VLF band in 1.5-MHz segments. Repeat the sequence, and the unit will then tune 0-500 kHz. The antenna for the lower bands should be connected to pin 7 on the accessories connector (see pages 3-7 of the manual). This modification does not affect the usual operation of the STORE switch.—Andrew H. Kilpatrick K4YKZ, Longwood FL.



RIGID MALE-TO-MALE UHF CONNECTOR: Materials required are two PL-259 connectors, a straight length of no. 10 AWG 3-1/2 inches long, and a straight length of 3/8-inch o.d., 5/16-inch i.d. copper tubing, 1-1/8 inches long. (You can find the tubing in the plumbing department of many hardware stores.) After cutting the tubing, be sure to deburr the inside and outside edges of both ends. Then place PL-259s on either end, connecting the center pins with the no. 10 wire. Solder the assembly together using a large enough iron to avoid cold solder joints.—Gary Legel N6TO, Fullerton CA.



REVIEW

ELECTRONIC RAINBOW SATELLITE TELEVISION RECEIVER KIT

Like a lot of hams who have developed an interest in satellite TV, I have been reading about and watching the market for the last couple of years for a satellite receiver that had all the features I wanted and the right price as well. Most of these factory-wired units' price tags still hung up there in the high dollar range, while kits for these receivers were few and did not enjoy the best publicity from articles I had read. I felt a kit was the best means to meet my end. Having built quite a variety of electronics kits and semi-kits down through the years, I felt that I could handle a quality kit without too much difficulty.

Browsing around the hamfest at Indianapolis back in July, I spotted a few satellite antennas set up around the area and visited each booth to check out their wares. Most of the equipment was factory-assembled, high-priced, turn-key stuff, not for me. Then I happened by the booth where Electronic Rainbow was showing its latest offering to the industry. The owner Ron Ross and I had met at various hamfests and I knew he handled quality products. Ron had his satellite receiver hooked up and it had a crisp, clear picture. I checked the spec and price sheets he had on hand and was very impressed with the features his satellite kit offered, like built-in rf modulator, detent tuning, variable audio from 5.5 to 7.5 MHz, afc, LNA power supply, remote tuning jacks and baseband jacks for the optional remote tuning control, and stereo decoder along with many other features found only on much higher-priced units.

I asked Ron if the units were available yet and he said in a couple of weeks. They were presently getting the assembly manual ready for the printers. I left with an order form and spec sheet so I could review the receiver and make up my mind at home. About a week later, I sent my order in for the kit and looked forward to getting started on my very own satellite TV receiving system.

A few weeks went by and I decided to call Ron and check on my order. He told me that they were just about ready to ship the units with a photocopied manual because the printer did not have the final manuscripts yet.

I immediately saw a chance to get my receiver quicker and help out Ron with comments from the consumer point of view. I suggested that if he could sell me a receiver right away, I would be happy to give him some feedback on the assembly of the units from a builder's standpoint. Ron accepted my offer and I picked up my receiver the next day.

After sorting through the kit and checking parts (a few were missing as we both expected), I dove into the manual and read it from cover to cover, picking out minor errors and missing points that would help a builder do a better job of assembly and ensuring that the unit would work upon completion. I have had a few bad experiences with kits where even experienced builders would pull their hair out trying to figure out the sequence of assembly. This is not the case with the Electronic Rainbow satellite receiver kit. I found the manual to be very easy to follow; there was very little chance for error in the step-by-step assembly of this quality receiver kit.

Fortunately, I had a week's vacation coming and I decided to use it to put together my kit. I was able to assemble the kit in approximately 15 to 20 hours, making numerous trips to Electronic Rainbow for changes in the manual and a few parts that were missing or wrong.

I completed the receiver and was looking forward to checking it out on Ron's antenna, since I did not have one yet. The final alignment was to be done with an actual picture from the satellite. The receiver kit had all the sections, such as the 70-MHz filter, the remote downconverter, and oscillator pre-wired and tested, so final alignment was a simple matter of adjusting the picture, sound, and rf modulator under operating conditions according to the step-by-step instructions in the manual using a VOM to check power-supply voltages.

Even though the main board of the receiver has all the parts on it, the board is divided into six sections with each of the sections having an A and B part for very easy assembly. All the parts are in zip-lock bags for each of the sections of the board, making it much easier to find them.

I had to wait a week or so for Ron's design engineer, Paul Turner, to return from vacation, so his ace assembler, Terri Murphy, and I finished off the few changes in the manual. When the final printing came back from the printer, she could add all the changes to complete and update the fine-quality manual, which was all the individual sections shown in halftones, making placement of the parts on the silk-screened boards a simple matter.

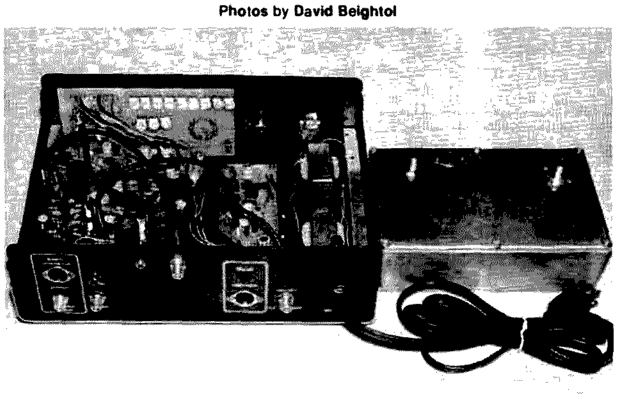
Finally, when Paul returned, Ron asked me over to his shop and the receiver was hooked up along with my downconverter to the bench monitor; when Paul flipped the monitor onto channel 3, there was the picture from transponder 11 MTV, clear as a bell. I was really happy that the unit worked the first time. Paul made his way through the individual trimmers for each of the 24 channels (transponders), peaking and adjusting the sound for a perfect picture on each. He let the unit burn in for about 30 minutes to be sure everything was okay and then put the cover back on the very attractive cabinet. Off I went like a kid with a new toy, proud as could be that my kit was finally ready to go.

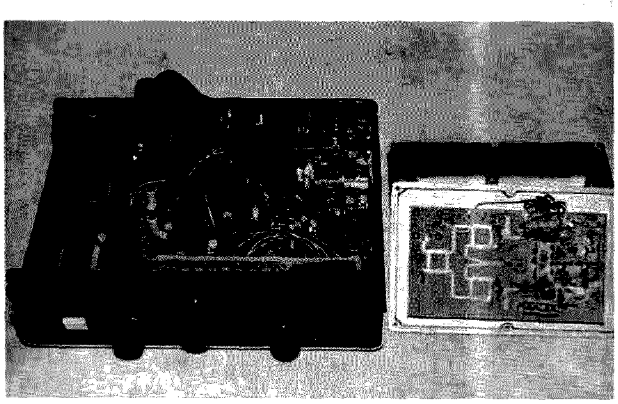
In conclusion, I am sure that the Electronic Rainbow satellite TV receiver kit will be a popular item for those builders who have waited so long for just such a product. I plan to use my receiver with a Wilson MD 11 B antenna, Locom LNA, Chapperal super feed, and Beachcraft polarizer. I will be glad to answer any questions about any of these items. Please write only and include a self-addressed stamped envelope.

The complete satellite TV receiver kit costs $395.00. For further information on the receiver, board kit, or manual, contact Ron Ross or Paul Turner at *Electronic Rainbow, Inc., 6254 LaPas Trail, Indianapolis IN 46268, (317)-291-7262.* Reader Service number 477.

J. E. Beightol, Jr. WB9ZNU
Indianapolis IN

Photos by David Beightol





The completed Electronic Rainbow satellite TV receiver. At right is the downconverter unit, which is mounted at the antenna.

ADVANCED COMPUTER CONTROLS' MODEL RC-850 REPEATER CONTROLLER

Imagine, if you will, the amateur repeater that I'm about to describe. It can be controlled via telephone, over a UHF control link, through the main repeater receiver, and, of course, locally at the repeater site. All you need is a touchtone™ encoder and the necessary codes.

If you call the repeater on the telephone, it answers the phone (with a message you've chosen) and waits ten seconds to receive a valid command. After you enter a code, the repeater verifies in voice over the telephone the function that has been selected. It does the same if you enter a command through the main receiver, except that the acknowledgement comes back to you over the air.

If you want to check your touchtone pad, you only need to enter a test prefix followed by a series of keys. The repeater reads your entry sequence back to you, again in voice. And that's only the beginning of what the repeater will do for you. It can evaluate received signals for frequency error, deviation, and percent quieting and give a similar voice response back to the user. Maybe you would like to check conditions at the repeater site from the comfort of your favorite armchair. No problem at all. Just ask the right questions with your touchtone pad and the repeater can give you voltage and power output measurements and also the temperature at the site. It will even give you the time of day!

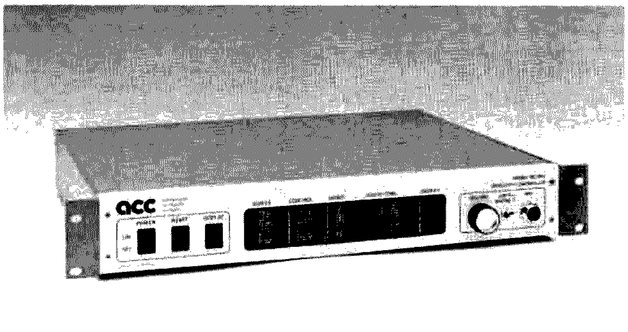
This only begins to describe the features of this particular repeater. Whose repeater is it? It could very easily be yours, just by interfacing your present repeater with the RC-850 repeater controller being manufactured by Advanced Computer Controls of Cupertino, California. And please, don't be put off by the word "interfacing," because in this case you can access most of the features of the controller just by feeding a carrier-operated switch (or relay) logic signal and audio from your receiver into it and by letting the controller feed audio into your transmitter along with a push-to-talk logic signal. Plug the controller's modular jack into a telephone line at your repeater site, supply it with 12 volts dc, adjust one or two audio levels, and you will be able to put much of the power of the controller to work for you right away.

Naturally, other connections need to be made between the controller and the repeater station in order for it to provide received signal reports and other voice response telemetry (VRT) information about the repeater itself. You can even connect the controller's logic outputs to a synthesized transceiver and operate a remote base station, *complete with frequency selection*, through your repeater. This makes it simple to link up with another repeater for nets or public-service activities.

Software-Based

The controller itself, even without the synthesized voice capability, offers features which to my knowledge are not available in any other commercially-manufactured controller or repeater/controller combination. The key to the power of this unit, and the thing that enables ACC to expand the controller's features on a continuing basis, is that it is software-based (or, to be technical, firmware-based in the form of several EPROMs). New releases of the operating system software can enhance the capabilities of your machine, in many cases without any additional wiring or work on your part beyond changing out the EPROMs. It also makes it possible for the manufacturer to incorporate into the controller some additional feature which may be very important to you.

The Blue Knob Repeater Association, which sponsors the highest amateur repeater in Pennsylvania (147.75/.15 MHz), had a special problem which ACC was able to solve through a small amount of



The RC-850 repeater controller from Advanced Computer Controls.

additional programming (which then became available to every user of the controller through an upgraded release of the software). Most of us are familiar with just dialing (or pressing) the number "1" to access the nationwide long-distance telephone network. However, there is a fairly rural telephone system operating at our site on Blue Knob Mountain, and it requires entering "1121" to make a long-distance call. Couple this with the fact that most of our members live outside the local calling area from the exchange at the site and you've got a cumbersome number of digits to enter when operating mobile, a number which can rise to 14 digits in order to place a call outside our own area code. What made this even worse was the fact that while the controller has the capability to store up to 90 telephone numbers in its user autodialer and 10 numbers in its emergency autodialer (these numbers can then be called just by entering an access prefix plus two digits), the storage locations are limited to 11-digit numbers at most. This would present no problem for the typical long-distance number, but it would have severely limited the usefulness of the autodialers in our system. Ed Ingber WA6AXX, who founded ACC, solved the problem just by programming the controller to "see" a leading "1" and substitute an alternate sequence when the number is dialed out (in our case, "1121"). This small change, which was relatively easy to handle by modifying software, would have been far more difficult, if not impossible, in a hardware-based system.

The controller's autopatch, which is logically separated into three different components (basic autopatch, user autodialer, and emergency autodialer) is extremely advanced in design. Phone numbers are read back to the user for confirmation (in voice with the voice-response option installed, and otherwise in CW) before a call is placed. The controller itself enters the number into the landline system in your choice of ten pulses per second, twenty pulses per second, or standard touchtones. This greatly increases the reliability of the autopatch, since tones are not being passed from many different user's touchtone pads directly into the telephone system.

The user autodialer codes can be programmed by the members themselves, or the user autodialer can be "locked" so that only control operators can load and change the telephone numbers to be stored. The access prefix for the autodialer can also be changed if and when necessary.

The emergency autodialer provides for the storage of 10 public-service telephone numbers and associated response messages for each agency (such as "Fire").

With the voice-response option, the reverse autopatch (which requires entering a code sequence after calling the repeater on the telephone) can actually call a repeater user *by callsign*. Forty callsigns can be stored in the controller's memory for use with these directed reverse autopatch calls (or as part of a demonstration message).

Separate timers can be set for each type of autopatch call, and the three functions can be enabled or disabled separately. This can be used as a way of allowing emergency calls to be placed at night, while the other autopatch functions might be turned off. A programmable activity timer functions with all autopatch calls to drop the patch if no activity (or constant keying) comes from the repeater user for the designated period of time.

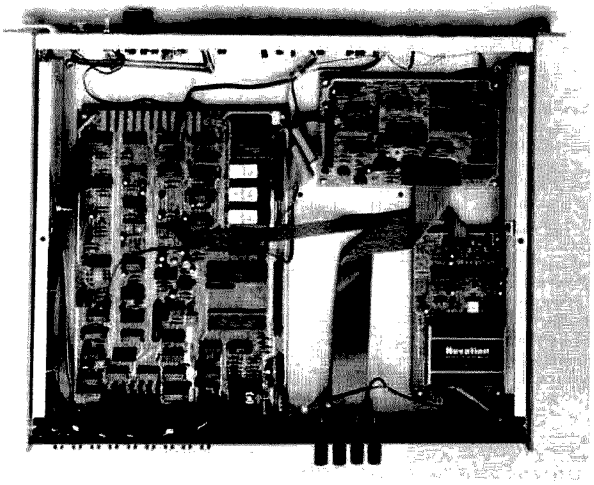
It's also possible to place a full duplex autopatch call (for simultaneous receiving and transmitting) and a semi-private patch where the repeater-user side of the conversation is not fed through to the transmitter, but instead is replaced with a "cover tone" to alert other users that a call is in progress. If your repeater suffers the misfortune of having someone maliciously dropping the autopatch on legitimate users, you can program the controller to allow *each user* to define his or her own custom hang-up code just before placing a call. Then, only that code or the control operator's override code will terminate the call.

Long-distance calls can be prohibited on the main autopatch, which then allows the entry of a 7-digit number only, which cannot begin with "1" or "0." There is even an "antidialer," which can be loaded with up to five telephone numbers which may *not* be called on the autopatch (such as a local pizza parlor?).

One convenience which anyone who has ever used an autopatch will appreciate is that the controller will give the time and date for you automatically upon completion of a call. This is also very helpful to the repeater owner for the proper logging of autopatch calls.

Identification, Please

The controller handles repeater identification requirements in a similarly sophisticated manner. An "intelligent" ID algorithm directs the unit's handling of several different ID messages in accordance with the activity on the machine. For example, if the repeater has been dormant and is then keyed up, an initial ID (typically a voice greeting) is given. As time progresses from the initial keying of the repeater and with a QSO in progress, the controller will wait for an opportunity to ID again when a user lets the repeater carrier drop. If this opportunity doesn't occur, then the unit becomes anxious to ID, but will still try to avoid IDing over the top of a user transmission. But, if ten minutes pass without even a break in the QSO, then the controller will do a forced CW ID over the top of the user, but at a fast, unobtrusive level.



Interior view of the RC-850.

With the voice-response option, you can use the built-in message editor, either on site or remotely, to program the messages you want for IDs and other responses. The controller has a vocabulary of over 200 letters, numbers, words, and sound effects. You can even have custom words, such as your group's name or location, merged into your controller's software, but these words are not cheap at $200 each!

Probably the second most remarkable feature of the RC-850 (I'll save the first one for later) is that all of your repeater's operating parameters, including timers, courtesy tones (you can select from eight sets that you program yourself), messages, autodial numbers, control operator and user codes, and even an initial power-up configuration (in case power to the unit is temporarily lost), can be changed *remotely*.

Non-Volatile Memory

If you're like me, you're wondering now what happens to all of that information stored in the controller, including the 90 user autodialer numbers and 10 emergency autodialer numbers, if power to the controller does fail. Incredibly, absolutely none of this data is lost, because it has been stored in EEPROMs (Electrically Erasable Programmable Read Only Memory) by the controller's own built-in programmer/eraser. The controller will "awaken" according to the configuration you've programmed as soon as power returns. And, by the way, battery backup circuitry is included in the unit.

Other standard features include several modes of operation based upon a subaudible tone input, touchtone up/down access by users with programmable automatic timeout, logic outputs for remote control of other devices (complete with response messages to indicate their function in your system), provisions for a control receiver, a kerchunker filter that can be switched on or off, spare audio inputs, tone signalling, and a host of others literally too numerous to mention in this review.

One extremely clever feature of the controller is that it suppresses the squelch tails of user transmissions (which makes listening comfortable for users and control operators alike) and also, at your option, touchtones. It does this through the use of a 75-ms analog delay line which allows the controller to cut off audio to the transmitter when the carrier-operated switch signal disappears or when touchtones are properly decoded by the state-of-the-art Mitel chip set. Without actually hearing it operate, it's hard to believe how effective this circuitry really is.

Construction

A review of a product such as this one wouldn't be complete without some description of how it's constructed. I can honestly sum it up with one word: impressive. Machine-contact IC sockets, fully sealed, are used throughout the controller. Signal connectors are gold on gold for long-term reliability. The circuit boards are computer-grade glass epoxy with through-plate holes. They are solder-masked and silk-screened with component designations. And, finally, low-current CMOS circuitry provides highly efficient operation.

Product Support

Another important plus is that the device is fully documented with a comprehensive owner's manual which includes a description of the unit, how to install it, how to operate it, service and maintenance information, and schematics and parts placement drawings. The manual makes liberal use of figures and tables. It's clearly written, but don't expect to skim through it once or twice and completely understand the operation of the controller. Careful reading is necessary due to the many advanced features of the unit.

From my own experience, however, by far the most impressive support for the product comes from the designer himself. Ed Ingber WA6AXX is an electronics engineer, and his background (which includes a Master's Degree) lies primarily in designing test equipment, programming microcomputers, and working with speech synthesis. I have been able to reach him by telephone (he provides owners with both his factory and home numbers) any time our group has needed information or assistance.

I mentioned earlier that I would save the most remarkable feature of the controller for last, which is that *it works just like the manual says it will* (the manual can be purchased by itself for $30), and it sounds terrific on the air. The speech synthesis is so good that during the first few days that we had the controller on-line, we actually had people responding to the female "Good Morning" greeting with a complete rundown of their name, location, and other information, only to be tremendously sur-

prised to learn that they had been talking to a computer!

Few Problems

In our controller, problems were hard to find, and I heard essentially the same thing from other owners before we made our decision to purchase one. Our unit was shipped with an interim version of the controller's operating system software designated as 1.4X, and this version did have a few bugs in it. One example was that giving the controller the code to disable the autopatch *timer* disabled the autopatch itself. Another bug caused two of the front-panel display LED indicators to be reversed. In a way, though, these problems actually point out the strengths of a software-based device, because the final release of this version of the software corrected both of these glitches.

If you haven't guessed by now that the price tag for one of these controllers is pretty hefty, then you might consider price alone to be a drawback. Actually, the RC-850 controller comes in a number of different configurations, ranging in price from $1195 for an assembled and tested control circuit board only up to nearly $2800 for the maximum system, which includes an FCC-registered telephone interface, voice-response telemetry option, and front-panel display option, all contained in a rack mount cabinet ready to install at your repeater site. There are also several versions between these two extremes. For example, you may want to provide your own telephone interface, which reduces the cost of the unit by $349. Or, while you might want to have synthesized voice IDs and the time-of-day clock, you may not really need the 16-channel analog measurement and speech-readback capability provided by the complete VRT option. This would also reduce the cost of the controller. And, it's good to know that you can start out small and expand to a maximum system at a later time with very little difficulty, since the control board has been designed to be upward compatible.

If you want to significantly enhance your repeater's capabilities and at the same time *infuse your organization* with new enthusiasm and excitement, the RC-850 repeater controller may well be just what you're looking for!

For more information, contact *Advanced Computer Controls, 10816 Northridge Square, Cupertino CA 95014; (408)-253-8085.* Reader Service number 476.

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LJM2RK STORM ALERT

My wife does not like ham radio. She despises the funny noises my radio makes, and she would really rather it didn't ride in the car with us. So, I find myself and my rig relegated (or maybe I should say "banished") to a remote corner of the basement.

Now, I don't mind being in the basement, but I'm an Army officer whose specialty is tanks. That means, after years of firing tank guns on various ranges in combat, I'm rather hard of hearing. Consequently, I can't hear when someone is calling me unless I'm right at the radio, and, while I'm a pretty avid ham (my wife thinks too avid), I do occasionally go upstairs to get a cup of coffee or take care of the effects of an earlier cup. So, I've been looking for months for a simple (and affordable) tone decoder I could put on the two-meter rig to alert me to calls. I needed to be able to set up a visible signal to alert me when I was copying CW traffic on the HF bands (since I wear headphones to muffle the sound of the "mill"), and an audible alarm to call me when I was elsewhere in the house. I also needed to mute the audio, since my wife does not have a hearing problem and would have fits on those occasions when the repeater was really busy.

It didn't take me long to find that a simple tone decoder, even if you elect to just buy the parts and home-brew it yourself, isn't all that cheap, while ready-made or kit decoders are downright unreasonable ($50.00 plus is the normal range). I had finally decided the *only* way out was to home-brew one, with the attendant costs involved in making a circuit board and the costs in time to construct it, when I happened to stop at a hamfest in Lafayette, Indiana.

At one of the booths, a guy (whose name I never did get) was demonstrating something that caused alarms to sound and strobe lights to flash. Intrigued, I stopped to watch what turned out to be a demonstration of exactly the thing I'd been looking for.

He was demonstrating a tone decoder—he called it the "LJM2RK Storm Alert"—in nine different configurations. Each of the nine circuit boards was attached to a big board and each was wired for a different option. All nine were essentially the same—only a few jumper wires were different. The same board, ICs, resistors, etc., were used in each one, and each was constructed exactly the same, except for the jumpers. When the guy running the show told me they cost only $15.00, I picked up two. I had already proven that parts alone would cost that (not counting the cost of constructing a circuit board and my time to find all the parts).

Once I got home, it took me about 45 minutes to build the first one, most of that time spent locating the parts on the board. The second one took about 20 minutes. For such a little company, the kit is a real joy to build. The written instructions, while not elaborate, are more than adequate, and the circuit board is beautifully silk-screened with both a drawing of the component and its reference number (R1, C3, etc.). Orientation of every polarized part is shown on the board and referenced in the instructions.

In only one case are the instructions a little remiss. Two of the LEDs have to be mounted with nylon spacers (if you use the company enclosure). The instructions mention that in passing, but when you go down the list of parts to install, as the instructions suggest, the spacers are listed well after the LEDs. It would be wise to write in "spacer" next to the LED listing, although it won't damage the operation of the device even if you forget the spacer. It just won't fit as neatly in the enclosure.

Once the boards are finished, aligning them is even simpler than building them. First, apply an audio source to the decoder. If you use one of the Metheny enclosure kits, that simply means plugging the thing into the speaker jack. Then attach a power lead and have someone generate a tone. I did mine by hooking my HT into a dummy load and the decoder into my Wilson WE-800. If that is not sufficient attenuation of the signal, leave the antenna off the receiving unit or attach it to a dummy load. At any rate, that hookup attenuated my 100-mW signal enough to allow me to align the decoder. A buddy at the other end of the repeater can do the same for you, if you'd rather.

Transmit the tones you want (I used the number 9, since the local RACES net uses that as an alert signal) and adjust a simple pot for tone B (it's well marked on the board) until an LED on the board lights. (They have thoughtfully provided this LED just for alignment.) Then, still applying the tone, adjust the pot for tone A until another LED comes on (you'll be able to see this LED even after you put the device in the enclosure). The decoder is now aligned and all you have left to set is the delay. Another little pot allows you to set in a delay so the decoder will not do its thing until the tone(s) you choose have been applied for whatever time you want. I use one second, but you can go from instant on to a very long delay.

Electronically, the device is equally simple. It uses two 567 tone decoder ICs, one to control each tone, and then feeds them to an LM7402N quad 2-input NOR gate. Each 567 is adjusted to one of the required tones by varying a single potentiometer (you could easily change the frequency range by modifying the value of the capacitor on the circuit, but since the thing already operates on all the touchtone™ and likely PL® frequencies, you will need to do that only if you use really exotic tones). When the first 567 is triggered, it lights an LED and signals one of the LM7402 gates, which waits for the next 567 to decode the other tone (when using the two-tone option). Once the second tone appears, the gate opens, lights a second LED (labeled "decoding" on the Metheny enclosure), and provides the logic state that causes the LM7402 to activate the delay and, finally, the relay. If either tone is removed too soon, the delay resets. Once activated, the relay does whatever you wired it to do, the usual task being to connect the speaker to the audio line. All the components, save the circuit board, are generally available at well-stocked Radio Shack stores, so repairs should be especially easy. The Metheny enclosure also has a couple of well-placed mounting holes in it to allow attachment of the power source and an external relay, driven by the on-board relay.

Now, let's see what else this thing will do. It has an on-board relay, so the control possibilities are almost unlimited. You can have it take two tones (standard touchtones) to open the audio on your transceiver so the thing stays quiet until you are called. Or you can have the relay sound an alarm or turn something on or off (great possibilities for a repeater system). Metheny even provides a suggestion for a simple timing circuit that will automatically reset your decoder after a preset delay. You can also set it up so one tone turns it on and another turns it off, or one tone turns it on and leaves it on. Delays can be worked on both ends. It can also be set up to turn on with a subaudible tone and off when the tone is removed. And, by changing a single resistor, you can use 12-V-dc, 9-V-dc, or 6-V-dc power sources. *All the required controls mount right on the board and are included in the kit.*

You can also do a number of other things not mentioned in the Metheny instructions—*your imagination will be your* only real limitation. With two boards, you can use one dual tone to turn a device on and another to turn it off (retaining all the

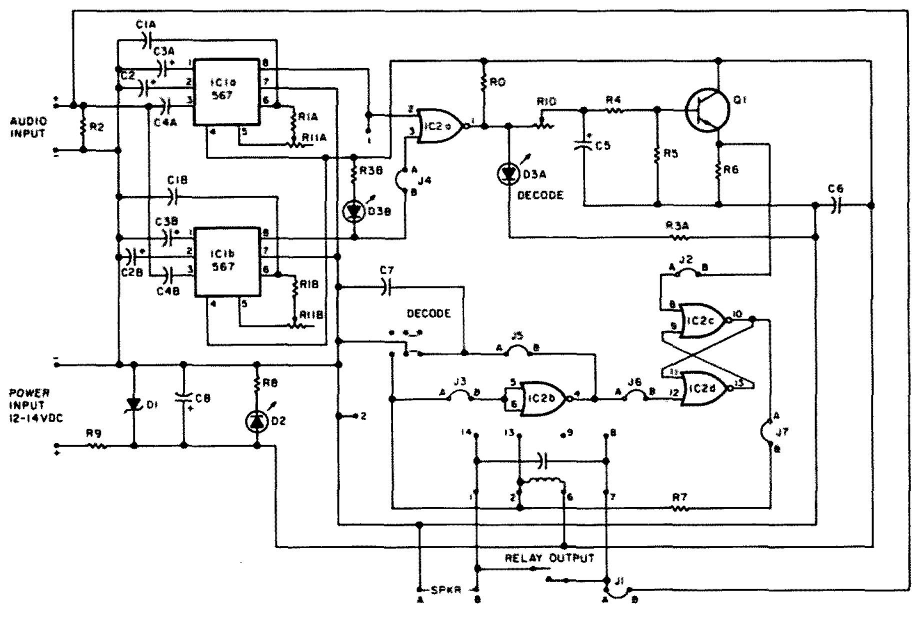
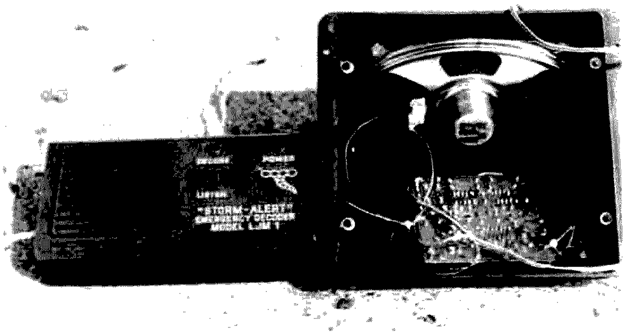
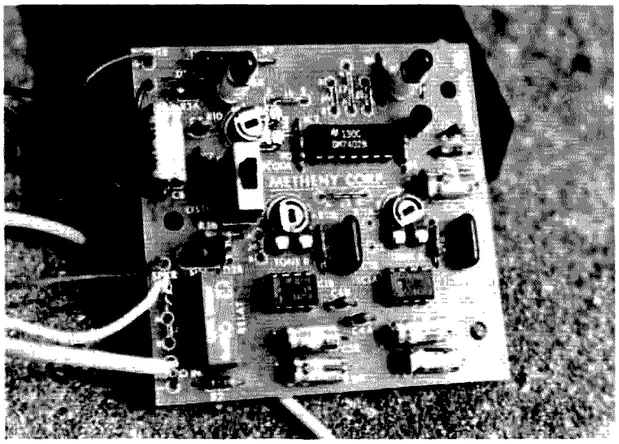


Fig. 1. Schematic.



The front side of the Metheny enclosure, next to the speaker case.



The decoder itself. Note that while it does not leave a lot of wasted space on the board, there is sufficient room to work comfortably.

usual options for each tone) With one board, you can even use sequential single tones with a delay In this case, a single pot would establish the delay so that, in effect, the device will require that you input both tones within two seconds, or three, or whatever period you program. Using multiple boards, you could do the same thing, but with variable delays between selected digits to safeguard your autopatch from the guy who breaks your code (he's not likely to catch on to the variable delay idea) And if you use the Metheny enclosure, it is easy to add a battery pack, hang it on your belt, and have an inexpensive tone-accessed HT. Or you could forego the speaker and package it in an even smaller enclosure.

It is really nice to see a little outfit like Metheny offer a really useful and inexpensive device like this. If only we had more such little companies in ham radio.

The LJM2KR (I have no idea what those letters mean) is sold for $15.00 plus shipping. The "Storm Alert" enclosure is available for $5.00 plus shipping and includes speaker and patch cable. For more information, contact the *Metheny Corporation, 204 Sunrise Dr., Madison IN 47250.* Reader Service number 478.

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RTTY LOOP

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Happy New Year! I do hope the winter is going well for all of the readership, with projects underway and the like. One such project we have been dealing with in this column has been the design of a computer-based RTTY terminal. This month, another installment: character input and control mechanisms.

It should be obvious that in any complex system there is a need for suitable control mechanisms. Now, while we are not talking about Three-Mile Island here, with a computer-based RTTY terminal there is a need to direct the data flow, fill or empty buffers, change speed, etc. If the terminal being designed operated only on Murray, the job would be relatively easy. The ASCII character set, which most computers use, supports many more characters than could ever be sent on Murray. It would be easy, therefore, to use any or all of those codes, such as control codes, special punctuation, or even lower case, to implement some of these special functions. In fact, an earlier terminal I designed did just that.

However, when designing a terminal which will be able to operate on any of the several modes, including Murray, ASCII, or even Morse, using these extra or control characters becomes difficult, if not impossible. A glance at some of the specialized RTTY terminals on the market reveals the presence of several function switches on the keyboard. These function switches do not send out one ASCII character, but a sequence of characters which can command a task to be carried out.

Such a sequence of codes is normally preceded by the ASCII "ESCAPE" character. Normally abbreviated ESC, this character is 27 in decimal, $1B in hex, or 00011011 in binary. As defined in the ASCII standards, the ESC character is used to shift into another character set, or code grouping. We can use it, as many terminals do, to indicate to the program that the character(s) which follows is not to be sent, but to be treated as a special command.

Once such a protocol is adopted, an essentially infinite number of command sequences become possible. For example, ESC-F might be used to fill a buffer and ESC-S to send it. Numbers appended to the command could denote one of a series of buffers, such as ESC-F-7 to fill buffer number seven. As we have been looking at the design of an "ideal" RTTY terminal, such a technique would appear to fill the bill nicely.

Implementing this scheme is not as hard as it might sound. Fig. 1 is a flowchart of the way a character, once received from the keyboard, might be screened for a command sequence. By use of a flag, input which follows an ESC character can be diverted to initiate the appropriate command sequence. I will add here, for the smarties among you who are worried that you won't be able to send an ESC out over the air even if the distant station requires it because it would be trapped in this sequence, that the command ESC-ESC is normally configured to send the ESC code out. Does that make you happy?

Combining this command input routine with the receive and screen display routines presented in previous months begins to suggest just what this terminal will be able to do. Additional modules will be presented in the months to come, don't worry.

I have a panic note here from Roy E. Denney N5DQX of Roswell, New Mexico. Roy bought a "Transcillator," Mod ZUH II, at a hamfest, and despite being told that it was in fine working order, it isn't. Now, I don't know what this beast is, and Roy notes that the manufacturer, Prossen Industries of Westminister, California, is apparently out of business. I presume it has something to do with RTTY, and so does Roy, and we both address the readers of this column to scrounge around and see if something can't be turned up. If so, send it to me and I will see that Roy gets it.

Thanks to Winston Yancey WA4TFB who relates that RTTY Loop is the first thing he looks for in *73*. He notes being upset if we miss a month and wonders why that happens. For those of you not fully acquainted with the schedule a magazine such as *73* must follow, there is a two- to three-month delay between when I write a column and when you read it. Since I try to delay until just before deadline to keep the material as topical as possible, it becomes very sensitive to unscheduled delays, such as demands from my work (I am a physician in active practice here in the Baltimore area) or family. Hopefully, that's not too often, but it will occasionally happen.

Winston also relates trying to interface his Texas Instruments TI-99/4 computer for RTTY. Apparently little in this vein is available through the users group. I must say that I have noticed TI-99/4s being widely marketed, from computer stores to discount outlets to toy stores. I'm sure somebody out there is writing software that would be useful to the RTTYer, if only we can find it. Hopefully we can collect some here and display it for all to see in a future column. Are you listening, TIers?

Greetings to Kevin A. Muench, Ph.D., a RTTY buff working in the Philippines. He is attempting to interface a Flesner TU-170 to a Teletype* Model 33 and is looking for help. I am afraid that the TU-170 is another piece of equipment I have very little information about, but it is widely used and I am sure someone out there has already accomplished such a mating. If so, let me know so that I can send the details along to Kevin. I am sending Kevin some other material on the 6800 programs detailed here in the past. I am sure that with his 6800/6809 system, Kevin will be interested in following the current "super-terminal" series as it develops.

From one end of the world to another, I have a letter here from John M. Clarke VO1EE, Newfoundland, who is having problems of a different sort. John has been working on the LNW-80 computer and, after building the boards, apparently has trouble getting the thing to work right. He's unable to obtain a good display and thinks that the onboard regulators are running too warm.

Well, John, I will offer two words of advice. First of all, regulators usually run warmer than you think they should, but rarely are they hot. If they are too warm to touch comfortably, something may well be drawing too much current. Which brings me to my second bit of wisdom.

Projects which come on printed circuit boards, especially widely-marketed and complex ones like computers, are usually well designed if they come from reputable manufacturers. In the case of the LNW-80,

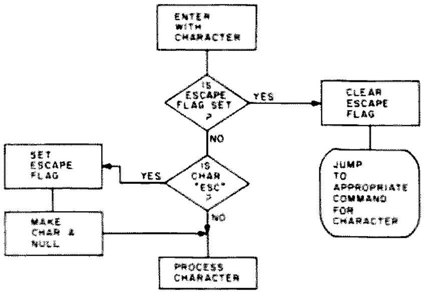

Fig. 1. ESCAPE code processor flowchart.

this is a widely-marketed piece of equipment which has received good reviews. Problems such as you describe can be traced to anything from an integrated circuit installed backwards (that is, 180 degrees out of phase—don't tell me it can't happen, I've done it!) to a solder bridge between two printed circuit tracings (ditto!). The critical thing about this is that if something "happened," the result may be remedied easily by reversing the integrated circuit or clearing the bridged conductors. But circuit damage could be temporary or permanent. If the former, fine, but if the latter, you are in for a lot of headaches unless you really know your way around a circuit.

The moral of this story, if there is one, is to check all the work out *very carefully* for integrated-circuit placement, solder bridges, unsoldered pins, or misplaced plugs *before* you apply power. If something is not working right after power is applied, *stop right there!* Cut the power to the circuit and check again. If you find an error and correct it and the unit still does not function or if you are unable to locate any mistakes at all, seek expert guidance. This may be a friend who has a similar device or the expertise and equipment to troubleshoot complex digital electronics. If all else fails, write a clear description of your problem to the manufacturer, including the model and serial number of your unit. After all, changes in printed circuits or designs may make an early production run and a late one two different animals, and in order to help you, the manufacturer needs to know what you have, what the problem is, and any information such as measurements or the like which will aid in diagnosis. Do not just bundle up the unit and ship it back without the manufacturer's consent unless their book tells you that you can. Doing so will only prompt the string of letters that should have preceded and may have prevented the shipment.

While we are up north, regards to another newcomer, Irvin F. Haworth VE7CVL from West Vancouver, B.C. Irv has a rather complete Apple II setup which he wants to try on RTTY, and he wonders how to proceed. Well, by now I hope Irv has read last month's column with its raft of sources for Apple (and other computer) interfaces. You might ask around in your area to get a feel for what others are using, then visit their shack to see how the various units operate. Let me hear from you when you get on the air, OK?

My Atari 400 is coming along, for those of you who have asked, although it's not yet "on-line." I will be looking into various interfaces and the like in the coming months and will pass along any tips on what I find. I have also been looking into buying eight-inch disk drives and have been having a rather interesting time with a dealer. No details right now, just a caveat to be sure that what you order by mail is really in stock and shipped. It appears that the back-order is a way of life for some mail-order houses. I will pass along more information if the situation warrants it. Stay tuned to this magazine and don't miss next month's RTTY Loop!

FUN!

John Edwards KI2U
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THE YEAR IN REVIEW—1982

Like most years, 1982 was a year of turmoil. In ham radio and the rest of the world change was in the wind. Proposed massive FCC rule changes and the advent of microcomputers were just two areas that may mark 1982 as the year ham radio embarked on a new era.

This month's FUN! takes its annual look at the year just gone. How much can you remember?

ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

Across

1) Craft announced last year as a 1983 DXpedition site (2 words)
7) CW salutation (abbr.)
8) Critical sunspot point (abbr.)
9) Prompt or pool stick
10) Harvest
11) Pacific prefix
12) Problem
13) Satellite TV (abbr.)
15) Least-crowded DX time
17) Prosign
19) Half a headset
20) Slang for FCC rule
22) Interference (abbr.)
23) Whatever number
24) Your residence
25) What a jammer usually gets on his face
28) Former ARRL president (2 words)

Down

1) Not ordinary
2) Popular 1982 ham accessory
3) New ARRL General Manager
4) Above VHF (abbr.)
5) Potential no-code license class
6) Earthquake, fire, etc
7) ARRL listener (abbr.)
11) Standby
14) Peru prefix
16) In the airmobile (abbr.)
18) Man who signed new communications bill
21) Avarice
25) Listening organ
27) Summer contest (abbr.)

ELEMENT 2—MULTIPLE CHOICE

1) The year 1982 witnessed one of the greatest turnovers in ARRL upper-level personnel in quite some time. By now, we all know that Vic Clark is the League's new president and Dave Sumner the new General Manager. What, however, was the fate of Richard Baldwin, the old General Manager?
   1) The job of ARRL International Affairs Vice President
   2) The job of ARRL Secretary
   3) The job of ARRL TVI Task Force Chairman
   4) No job
2) What was last year's big news from the Heath Company?
   1) Heath's withdrawal from the amateur radio marketplace
   2) The introduction of Heath's first non-kit amateur transceiver
   3) The introduction of Heath's first solar-powered radio
   4) None of the above
3) Last year's amendment to the Communications Act of 1934 will permit the FCC to perform which of the following actions:
   1) Complete elimination of all code requirements
   2) The addition of a new satellite band
   3) The delegation of amateur testing to local radio clubs
   4) Last year's amendment gave the FCC no new powers

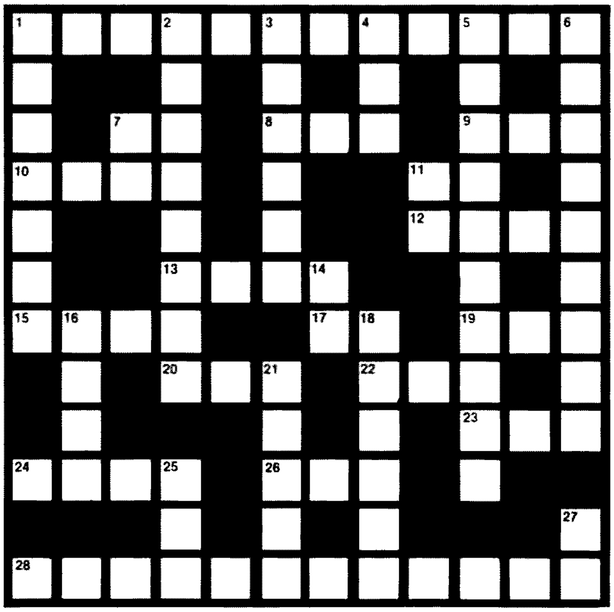

Illustration 1.

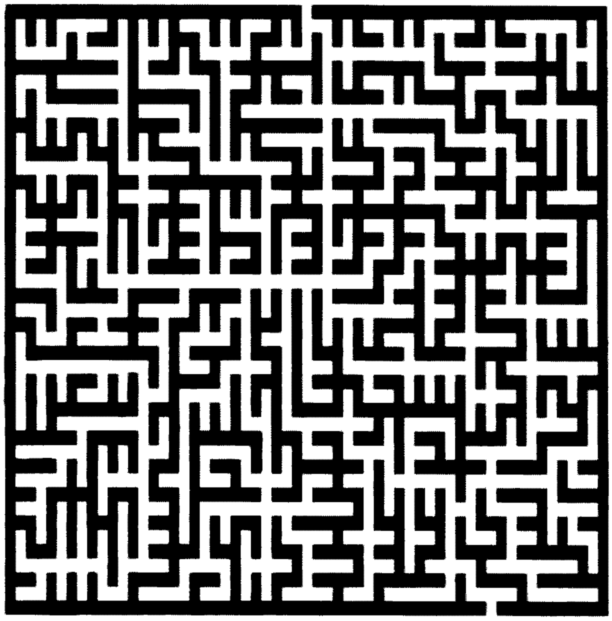

Illustration 2.

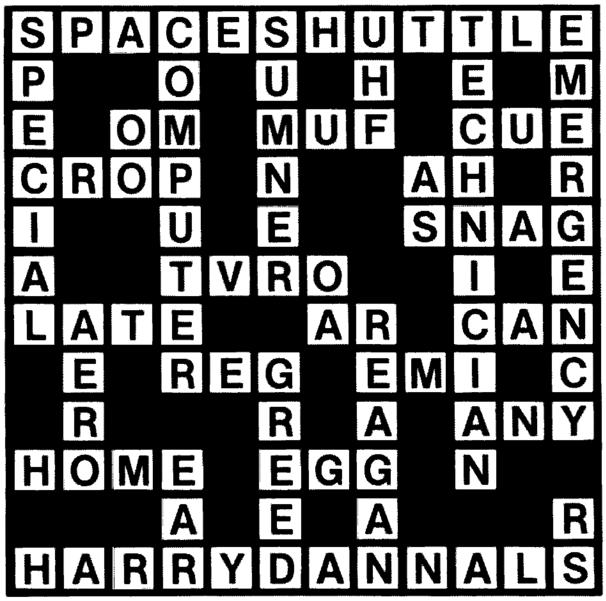

Illustration 1A.

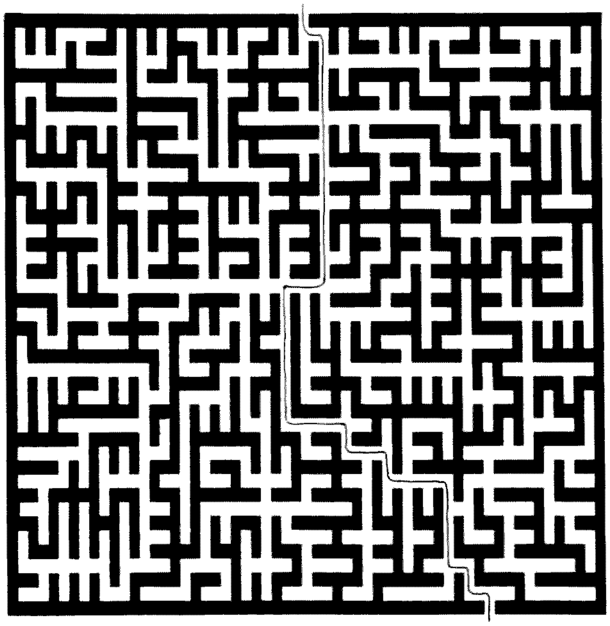

Illustration 2A.

4) Which of the following countries reached a third-party agreement with the US during 1982:
 1) Spain
 2) Austria
 3) Sweden
 4) Australia

5) What did the FCC plan to do to our phone bands in 1982?
 1) Expand them
 2) Contract them
 3) Eliminate them
 4) Leave them alone

ELEMENT 3—CRYPTIC PUZZLE

By using a standard substitution code, decipher this message: YMUDV CEQ YMJV QHCK QCO KFH MO M JMZKW SWKUDVJ DMOC LVMW

ELEMENT 4—MAZE
(Illustration 2)

Did 1982 leave you confused? Join the club. This maze certainly won't make you any less dizzy, but at least it isn't very difficult.

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1—1 The man's too young for retirement.
2—2 The SS-9000 computer-controllable rig.
3—3 Soon, perhaps, no more trips to the Federal Building.
4—4 Down Under was the place.
5—1 Much to the irritation of most foreign hams.

Element 3:
Coded as follows—

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
M	U	Y	B	V	P	A	X	Q	Z	I	D	J	H	K	S	R	W	O	C	N	E	F	T	L	G

"CABLE TVI CAME INTO ITS OWN AS A MAJOR PROBLEM LAST YEAR."

Element 4:
See Illustration 2A.

SCORING

Element 1:
Twenty-five points for the completed puzzle, or one-half point for each question correctly answered.

Element 2:
Five points for each correct answer.

Element 3:
Twenty-five points for the completed puzzle.

Element 4:
Twenty-five points for the completed puzzle.

How well did you remember '82?

1-20 points—Skipped the year
21-40 points—Not very well
41-60 points—Bits and pieces
61-80 points—Very well
81-100+ points—Total recall, proceed to '83

FUN! MAILBOX

I just got to the June issue of *73* and began your logic puzzles. Element 3, DXX Couples is incorrect by your solution as Diane has 206. You say Diane is Stan's wife, but that Frank's wife has more countries than Stan's wife. Therefore Stan's wife cannot have the highest total. It was given that Diane had 206. The correct solution is:

Stan 198, Wilma 202—Total 400
Frank 194, Diane 206—Total 400
Joe 196, Susan 200—Total 396
Stan has 198
Joe has 196

Bob Gingras WB4JMH
Cocoa Beach FL

Very good, Bob. Don't you like the way I mess up answers just to keep my readers on their toes?—J. E.

CORRECTIONS

In the "Automatic Beam Aimer," which appeared in the November issue, there was an error in the schematic on p. 23. The diodes across K1, K2, and K3 were drawn in the opposite direction from what they should be. In the parts list on the same page, Radio Shack part number 271-1715 refers to a 25k pot. Actually, part 271-1715 is a 10k pot, but it will work equally as well in the circuit.

Avery Jenkins WB8JLG
***73* Staff**

Our apologies to Steven Katz WB2WIK, author of "Build Yourself A Paralyzed Beam" (December). Readers might better view the photo of the relay box on page 24 by turning the page upside down.

Avery Jenkins WB8JLG
***73* Staff**

Several errors crept into the "Circuits" feature in recent months. In the September, 1982, issue on p. 92, there were two errors. The first occurred in the description of the "Visual Adjust for Gamma Match," with the sentence beginning, "Even if you use an swr meter at the transmitter end of the scale. . . ." It should read, "Even if you use an swr meter at the transmitter end of the cable. . . ." And in the description of the "Electronic Phone Bell," "heat-sink tubing" should be heat-shrink tubing.

On p. 109 of November's issue, there were two errors in "Substitute Transformer for Heath Gear." Circuit author Terry Martin points out that the circuit is a voltage tripler, not a voltage doubler as stated in the text. He also adds that it supplies 950 V, not 450 V.

On p. 112 of the same issue, in "Modification to the Kenwood TS-520S for AFSK," Fig. 3 was incorrectly labeled. Fig. 3 shows the i-f filters of the 530S, not the 520S as implied by the text.

Avery Jenkins WB8JLG
***73* Staff**

DX

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NEW YEAR'S RESOLUTIONS

The new year always provides a good time to review operating practices and perhaps improve techniques on the air. Here is my list of New Year's DX resolutions; why don't you come up with your own list and post it next to your rig!

1. I will not tune up on the air without checking the frequency. Instead, I will use a dummy load, mark the controls for each band, or search for a clear frequency before tuning up.

2. I will listen carefully before I call. No more "Who did I just work?" or calling out of turn when the DX station is working by call areas.

3. I will keep well informed, so that I don't have to ask "What's his QSL address?" in the middle of a DX pileup.

4. I will not be a "DX hog." I won't flaunt my (multi-)kilowatts in pileups and then ask the rare DX station to run a few tests with different antennas, etc.

5. I will not be a self-appointed policeman on the DX bands, nor will I talk back to one. The bands are crowded enough without this nonsense.

6. I will keep my transmissions short and listen often, to reduce QRM.

7. I will be courteous at all times to my fellow DXers, no matter what they do.

8. I will QSL promptly, with the card carefully filled out.

9. I will check out my rig to ensure that my signal is clean and not causing QRM.

10. I will try other bands and modes and not sit on 20 SSB.

If we all follow these resolutions, we will have an easier and more pleasant DX experience in 1983. And we'll need every advantage we can get for the big pileups around Heard Island early this year.

HEARD UPDATE

The race is on to Heard Island. One of the most difficult and expensive DXpeditions continues its relentless drive towards this isolated rock (see this column, September, 1982), as the members of the VK6 DX Chasers Club nail down many of the details of the trip.

At the same time that the VK6 DX Chasers are organizing their trip to Heard, the well-known South Pacific DXer, Jim Smith VK9NS, has chartered his own transportation to Heard. Jim sports an impressive record of successful DXpeditions throughout the region and is as knowledgeable and experienced as any DXpeditioner. Jim aims to arrive at Heard a month before the mountaineering group. So after years with absolutely no activity, it looks like Heard might be the subject of not one but two DXpeditions.

As of press time, the operators on the VK6 DX Chasers DXpedition are slated to be: Alan Fisher N8CW, Charles Brady N4BQW, and David Shaw VK3DHF. Alan is a mechanical engineer, which is likely to be a very useful talent on icy, wind-swept Heard. N4BQW is a physician when not DXing, and one hopes *his* specialty will not be needed on this DXpedition. The Australian on the DXpedition team has worked with the Australian meteorology department as an electronics technician. Both meteorology and electronics will certainly be needed on Heard Island.

The vessel taking the hams and mountaineers to Heard is as impressive as the list of operators. The *Anaconda II* is 84' long, 20' wide, and sports a 98' main mast. *Anaconda II* has Antarctic experience, having just completed the Rio De Janeiro Race through the "Roaring Forties" and around Cape Horn. The yacht comes fully equipped with the latest in navigational and electronic systems, including radar, satellite and terrestrial navigation, depth sounder, and access to remote computers. (It's probably too much to hope that they could keep the radio log in their computer . . .) The hams and mountaineers will use inflatable surf rescue boats to get to the rocky shore of Heard.

The choice of rigs and antennas for the Antarctic DXpedition presents a difficult problem. Sturdy, dependable, easy-to-repair radios are the order of the day. Another key to dependable operation involves taking several of the same radio. Then a malfunctioning radio can be cannibalized for parts if another fails.

The antennas and outside gear will take an even worse beating than the radios. The combination of freezing rains and high winds can destroy most antennas, so specially reinforced antennas are required of the day. Finding lubricants that won't freeze up for the antenna's rotors represents another necessity.

After the hams collect their equipment they must practice its assembly and repair. Each antenna and support system must be put together and taken apart again and again. What tools are needed? Can they be handled with gloves and mittens on? Exactly what hardware is needed for each operation? How many extra nuts and bolts should be taken? What do they do if piece X breaks? The size of the yacht limits the number of spare parts the DXpedition crew can take, so which are the most essential? These are the kinds of decisions which go into a well-planned DXpedition.

But even more important than the hardware is the "software"—the radio skills of the amateur operators. There are definite skills necessary for handling pileups, keeping the contact rate high, and giving everyone a fair chance at a contact. Weather conditions are going to be rough on Heard, and radio conditions might not be much better. Heard is a long, long way from any sizeable collection of amateurs. That means that Heard's signals will be relatively weak, and European, stateside, and Japanese signals will also be weak at Heard. It will take highly-skilled amateurs to keep the pileups under control.

We hope that the Heard Island DXpeditioners will avoid the kind of poor operation shown at the St. Peter and Paul Rocks (PYØ) this fall. There is simply no excuse for spreading out the callers over 100 kilohertz of the 20-meter phone band. Even the Clipperton Island DXpedition used only 75 kHz! There are many ways to spread out the callers without disrupting the entire 20-meter phone band. Non-DXers think poorly enough of the DX fraternity without this kind of bad manners. Perhaps it's time for a standard of DX conduct for DXpeditions. We'll have more to say about this in a future issue.

Meanwhile, the question of money continues. The mountaineering Heard Island trip may well cost $150,000 or more. Donations of equipment, supplies (including warm underwear), and cash have started the ball rolling. The expedition is taking film of the entire trip, to recoup some of their costs. An artist on the expedition team intends to sell paintings of the Heard Island landscape and penguins.

One major source of expedition funds is the amateur community. Both the Northern California DX Foundation (PO Box 2368, Stanford University CA 94305) and the International DX Foundation (PO Box 117, Manahawkin NJ 08050) have pledged $10,000 to the program. And both DX foundations are looking for new members and contributions to assist their work. The Australians organizing the amateur part of the trip are inviting amateurs and others to become associate members of the "Antarctic Adventure," at $30 (Australian). The VK6 DX Chasers are also selling DXpedition T-shirts at $9.50 (Australian). Contact them at Box 10, Perth 6005, Western Australia.

Meanwhile, Jim Smith continues to solicit funds and operators for his assault on Heard. You can send your contributions to Box 103, Norfolk Island, Australia.

Your contributions will help with the Heard Island DXpeditions and future trips to other rare spots.

Who will get to Heard first? Will there be anyone left to work for the second DXpedition? The best way to find out is to turn on your receiver and listen.

MAILING YOUR QSL CARD

If you do work Heard Island this winter, either VKØHI or VKØJS, you will want to get a QSL card confirming the contact. In the last two months we discussed how to design and fill out your QSL. This month we'll look at ways to get your card to the right place. I'll discuss these methods roughly in order from slowest to fastest.

The Bureaus

By far the easiest way to send your QSL to another amateur in another country is via the QSL bureau system. Every civilized country (and some that are not) has an incoming QSL bureau for the benefit of its amateurs. Incoming cards are sorted every so often and distributed to local amateurs.

Some of the bureaus are excellent. The Japanese and West Germans have especially top-notch bureaus. The smaller countries have less formal systems; in some cases, they are essentially nonexistent.

Sending your card to a DX station via the bureau is simply a matter of writing the DX station's call in the upper right corner of the back of the QSL and sending it to the address listed in the IARU information or the *Callbook*. If you have any number of cards going to the same country, the cost is a few cents a card.

An even easier system for ARRL members is the League's on-going DX QSL bureau. A membership label off *QST* and $1.00 per pound of QSLs (about 150) gets the cards off to the DX bureaus for less money (and probably faster) than any other service. Contact the ARRL for more information.

The chief complaint about the bureau method is speed. There isn't any. Three to four months is about as fast a turnaround as anyone can expect. A year or two is not unusual. With Russian QSLs (through the famous Box 88, Moscow), delays of 3-5 years are common and I have seen 10-15-year-old QSLs in packages direct from Box 88. Small wonder that it takes twenty years to get on the honor roll; it can take that long for a bureau card!

Commercial QSL Forwarding Services

There are other outfits which provide the same service as the League's outgoing QSL bureau, plus the added benefit of searching out QSL managers and faster QSL methods. These services advertise in most amateur-radio magazines.

The price per card runs about $0.10-.20, but service depends on the volume of cards and the expertise of the amateur running the operation. W3KT's service used to be the best, before Jesse passed away last year (see this column, September, 1982).

If you want to go this route, contact the operator and find out the number of cards per week he handles, how long the cards sit in his hands, how he arranges for return QSLs, and the calls of some hams who have used the service. Then follow up on this information before depending on the QSL forwarding service.

The same problem applies to this kind of service as to the League bureau system: It can take a long time. A well-run forwarding service can get cards to stateside QSL managers and back quite cheaply and rapidly. But DX QSLs usually go by sea mail and can be months in transit. There is another potential problem with the QSL forwarding services: Their success depends heavily on the skills of the manager. His knowledge of DX and QSLing can make the difference between cards on the wall and wasting your money.

Direct QSLs

Since DXers are an impatient lot, the preferred method involves sending a QSL of an important DX contact directly to the person handling the QSL chores. This person might be the actual DX operator himself or a QSL manager.

To send the card, you need the correct address. Obtaining this accurate address is one of the fine arts of DXing. The first place you look for this information is on the air. Listen to the DX station. Where does *he* say you should send the QSL? The horse's mouth is by far your best source of QSL information.

Next best are second-hand sources, such as DX nets, repeaters, and bulletins. Pulling information out of the bulletins is a time-consuming task, and errors abound. DX nets are a little better, but it helps to know who is providing the information, to help judge its reliability. DX repeaters offer the chance to talk to someone who has already received a card back from that DX station. Whatever method was successful once is worth another try.

If you don't want to spend your DXing time reading every bulletin and monitoring every DX net, you might consider subscribing to one of the DX QSL lists. Look for their ads in the magazines and bulletins. W6GO and K6HHD publish a QSL Manager List with more than 5000 calls. This list is updated monthly and costs $15.00 per year in the US. The address is PO Box 700, Rio Linda CA 95673.

Another possible source of DX address information is the *Callbook*. Some amateurs say they are "OK in any *Callbook*." The *Callbook* also lists QSL bureaus in the various DX countries. The *Callbook* is available at your local radio store or by mail.

Addressing the Envelope

You have finally located what you are sure is the "latest word," the "up-to-the-minute" QSL address. You could just write the address on the back of your card and mail it, but you would get an answer via the incoming QSL bureau or not at all. You probably want to send the card in an envelope, with a self-addressed, stamped envelope (SASE) enclosed.

Avoid the temptation of putting more than one card in an envelope. Say you worked Eric SMØAGD from several of his Pacific locations this past fall (see this column, August, 1982). Please don't put all the cards for SM3CXS (Eric's QSL Manager) into one envelope. Use a separate envelope for each QSL card. Or if you really can't afford to do that, at least send cards for each separate callsign in a separate envelope.

Mixing the calls or cards will only delay the response. Often, different people in different locations handle the cards for different calls, even though the QSL address is the same, as is the case with SM3CXS. If you mix several callsigns, the cards and your return envelope will go to one QSL manager, back to SM3CXS, and so on. Anywhere along the line your cards might get lost or separated from the return envelope. Make everyone's life easier, and speed your return QSL by sending each card in a separate outer envelope.

Should you put the callsign of the DX station on the outer envelope? An excellent question. If the card is going to an address in the States, Western Europe, or Japan, by all means do so. The first callsign on the address should be that of the DX station you worked, the second the call of the QSL manager: VP2ML via K1RH. This allows the QSL manager to sort the cards quickly.

On the other hand, I recommend *leaving off* the callsign on the envelope if the card is going to an African country, Eastern Europe, Turkey, or any other country where amateur radio is illegal or frowned upon. The reason is theft or danger to the DX amateur. Callsigns on the outer envelope may indicate money inside, so many of these envelopes never reach their intended destinations. In the case of Turkey, the DX amateur can run afoul of local authorities by receiving mail with a callsign on the envelope.

The best rule of thumb is, when in doubt, leave it off. And if you ever send personal mail to an active QSL manager, write in large letters, "Not a QSL" on the envelope! Otherwise, it may get thrown in with the QSLs to be answered "tomorrow."

When to Mail

We are all anxious to get our return QSL card, especially one confirming a rare QSO. So many of us rush right out the day we work the DX station and mail off the card. This is fine when the card is going directly to a DX resident in another country. But it is not necessarily the best time to send a QSL card for a DXpedition contact or to a QSL manager.

Many DXpeditioners handle their own QSLing. If you can still read them on the radio, they can't be home answering your QSL. Wait a while. In fact, most DXpeditions don't print the QSLs until they get home and know how many they need. It will often be a month or more before they even have any cards to fill out.

If you really jump the gun and send the card out while the DXpeditioner is still away from home, you can create some unneeded friction between the DXer and his local post office. When I returned from 10 days in the Galapagos, there were *6 bags* of QSLs waiting for me. On one day I received more mail than the rest of the local residents combined! The post office personnel thought I was running some sort of mail scheme and threatened to charge me a commercial rate and storage fees. And somewhere, buried in that tome of mail, were personal letters, bills, and checks. It took a solid day just to pull my personal mail out of the QSLs!

So give the DXer some time to get home, get some cards printed, and catch his breath, before overflowing his PO Box.

The same problem can happen when QSL managers get their log information via the mail. The logs might take weeks or months to get to the QSL manager, before he can look up the contact and answer your QSL.

Some QSL managers get around this by having regular schedules with the DX station. The manager reads the contact information, the DX station checks his log, and the QSO is confirmed. This system worked so well for me at VP2ML that one amateur received his QSL card less than 48 hours after the contact!

Enough about how to get your QSL card to the right place. It's the next step that's the important one anyway: getting the DX stations's QSL card back! Hang on until next month!

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

LABRE AWARD

The Worked All American Award has been instituted by LABRE (Liga de Amadores Brasileiros de Radio Emissao) to promote interest in the American area.

The WAA award will be issued to any licensed amateur station presenting proof of contact with forty-five (45) or more countries in the American area.

All applications should be sent to the Awards Manager, LABRE, PO Box 07/0004, Brasilia, Distrito Federal, Brasil, CEP 70.000.

Confirmations must be accompanied by a list of claimed countries to aid in checking. A log verified by the awards manager of the applicant's country league or association will be accepted instead of QSL cards. Logs may also be verified by two amateurs in the applicant's area.

All contacts must be made with licensed amateur stations operating in authorized amateur bands. Contacts must be made only with licensed and based amateur stations. Contacts with ships and aircraft *cannot* be counted.

All stations must be contacted from the same call areas where such areas exist, or from the same country in cases where there are no call areas. One exception is allowed to this rule. If a station moves from one call area to another, or from one country to another, all contacts must be made from within a radius of 150 miles from the initial location.

Contacts may be made over any period of years since November of 1945. Contacts may have been made under different call letters in the same call area (or country) if the license for all was the same.

Any altered or forged confirmations will result in permanent disqualification if observed by the WAA award advisory committee. A minimum readability of 3 (R3) must be recorded for phone and a minimum signal tone of 5 (S5) must be recorded for CW.

All applications must be forwarded with ten IRCs or equivalent for handling and postage and return of QSL cards by registered air mail.

All certificates will be consecutively numbered and an honor roll showing all those issued will be kept by the awards manager of LABRE.

The following list of countries in the American area (North and South America) is presented as a guide. Deleted countries will not be valid.

WAA Countries List

CE	Chile
CE	Easter Island
CE	Juan Fernandez
CE	San Felix
CM-CO	Cuba
CX	Uruguay
FG	Guadeloupe
FM	Martinique
FO8	French Polynesia
FO8X	Clipperton Island
FP	St. Pierre & Miquelon Islands
FS	Saint Martin
FY	French Guiana
HC	Equador
HC8	Galapagos Island
HH	Haiti
HI	Dominican Republic
HK	Colombia
HK0	Bajo Nuevo
HK0	Malpelos Island
HK0	San Andres & Providencia
HP	Panama
HR	Honduras
J3	Grenada
J6	St. Lucia
J7	Dominica
K-W	USA
KC4	Navassa
KG4	Guantanamo Bay
KP7	Alaska
KP4	Puerto Rico
KP4/D	Desecheo Island
KS4	Swan Is. (now HR)
KS4	Serrana Bank (now uses HK0)
KV4	Virgin Islands
KZ5	Canal Zone (until March 24, 1978)
LU	Argentina
OX	Greenland
PJ	Neth. Antilles
PJ	Saint Maarten
OA	Peru
PP, P2, PR, PS, PT, PU, PW, PY	Brazil
PY0	Fernando Noronha
PY0	St. Peter's & St. Paul's
PY0	Trindade & Martim Vaz Islands
PY0	Abrolhos Island
PZ	Surinam
TG	Guatemala
TI	Costa Rica
TI9	Cocos Island
VE	Canada
VP1	British Honduras
VP2A	Antigua and Barbuda
VP2E	Anguilla
VP2K	St. Kitts
VP2M	Montserrat
VP2S	St. Vincent
VP2V	British Virgin Islands
VP5	Turks & Caicos Islands
VP7	Bahama Island (Now C6)
VP8	Antarctica
VP8/LU	Falkland Island
VP8/LU	Georgia Island
VP8/LU	So. Orkney Island
VP8/LU	So. Sandwich Island
VP8/LU	So. Shetland Island
VP9	Bermuda
XE	Mexico
XF4	Revilla Gigedo
YN	Nicaragua
YS	El Salvador
YV	Venezuela
YV	Aves Island
ZF1	Cayman Island
ZP	Paraguay
6Y	Jamaica
8P	Barbados
8R	Guyana
9V	Trinidad & Tobago Islands

MARTINIQUE AWARD

The FM DX Group of Martinique is offering a certificate for QSOs with FM7 and FM0 stations. Three hundred points will earn the certificate, with scoring as follows: Contacts with an FM DX Group member count 10 points per QSO, FM0 contacts count 4 points each, and FM7 contacts count 2 points. A phone QSO is worth 1 point, RTTY or ASCII count for 2 points, and a CW contact is worth 3 points.

One point is given for a contact on 10, 15, or 20 meters, a contact on 160 or 80 meters is worth 2 points, and a QSO on any other frequency receives 3 points. One point also is added for each 3,000 miles distance from Martinique.

A minimum of 7 days is required between two QSOs with the same station, and 25 percent of the points must have been made in contact with an FM DX Group member.

Logs and a $5.00 money order should be sent to Gerard Souqui FM7BX, PO Box 152, 97202 Fort de France Cedex, Martinique.

W. VIRGINIA QSO PARTY

The West Virginia QSO Party, sponsored by the West Virginia State Amateur Radio Council, will be from 1700Z January 22 until 1700Z January 23. Single operator only. Exchange signal report, serial number, county (WV only), state, or country. WV stations multiply total by sum of WV counties, states, and countries worked. Others multiply QSO totals by WV counties worked. Multiply score by 1.5 if you run 200 Watts or less. Suggested frequencies Phone—10 kHz from lower edge of General subbands; CW—35 kHz from low ends; Novice—35 kHz from low ends. Repeater contacts permissible. Mail logs by February 11 to K8BS, 950 Gordon Road, Charleston WV 25303.

WISCONSIN SPECIAL EVENT

The Eau Claire, Wisconsin, ARC will operate K9EC/9 during the National 70-Meter Ski Jumping and Nordic Combined Championship on January 29 and 30 from 1400Z to 2300Z. Frequencies: CW—52 kHz up from bottom edge. Phone—3980, 7277, 14282, 21382, and 28620. For an 8½ x 11 certificate, send SASE to N9AIX, PO Box 201, Altoona WI 54720.

GROUNDHOG DAY

The Punxsutawney (Pennsylvania) Amateur Radio Club will operate on 14.290 and 7.230 from 9 am to 5 pm, January 30, 1983, in commemoration of Groundhog Day 1983. We will operate also on 7.230 on February 2, 1983 (Groundhog Day). This special-event station will operate from Gobblers Knob, the home of the Groundhog. Certificate for SASE and QSL card to Art Sweeney K3HWJ, RD #1, Box 371, Punxsutawney PA 15767.

GEORGIA'S 250TH BIRTHDAY

Savannah area amateurs will have a special-events operation in honor of the State of Georgia's and historical Savannah's 250th birthday. Operation will be February 12 and 13, 1500-2000Z on upper 25 kHz, all General phone, and 21.130 to 21.170 kHz Novice. QSOs on 2 meters 146.52 only. For special certificate, send QSL card with QSO number and large SASE to call of contact operator.

GOLDEN SHEARS AWARD

In honor of the 1983 Golden Shears

Sheep Shearing Contest in March, 1983, the members of New Zealand's Branch 46 in Wairarapa are offering an award for contacts made that month with their members.

To be eligible for the award on HF bands, ZL stations must have 10 points, VK stations must have 7 points, and DX stations need 5 points. Net contacts count toward the award.

On VHF, ZL2 stations need 15 points to qualify, other ZL stations have to get 7 points, and DX stations must have 3 points. Repeater QSOs count toward the award, but repeater/net contacts do not.

Scoring is as follows: Golden Shears President ZL2AHU is worth 3 points; club station ZL2OA, a YL operator, farming branch member, or mobile station within Wairarapa are worth 2 points each, and any other member is worth 1 point.

Except for crossband operation, any band/mode combination is allowed. However, only one contact per member is permitted unless the member is operating the club station or working mobile within Wairarapa. No QSLs are required for the award; send your application with $2.00 (NZ) or an equivalent International Money Order to Awards Manager, PO Box 860, Masterton, New Zealand. Entries must be received before August 31, 1983. All proceeds will go toward funding for an operating room for emergency situations.

NEW PRODUCTS

APOLLO X10 ANTENNA

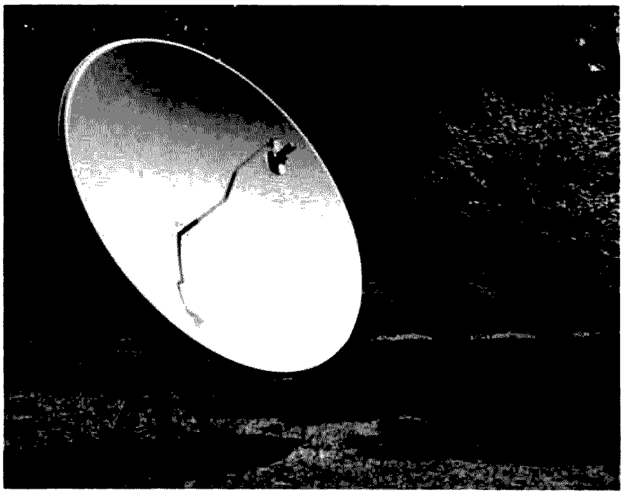
National Microtech, Inc., has just introduced its new Apollo X10 antenna, which utilizes a 10-foot, eight-segment, compression-molded fiberglass reflector. The reflector provides high strength-to-weight ratio and significantly reduces the size of the shipping container, thus providing savings in handling and shipping costs.

The X10 can be erected easily by two installers. The individual reflector segments are interchangeable and field-replaceable, utilizing indexing tabs for position and self-alignment.

The Apollo X10 delivers 40.1 dB gain at 3.95 GHz. Its textured front surface diffuses sunlight and reduces solar heating at the focal point, and the high-quality fiberglass material is impervious to salt, pollutants, and contaminants that may be encountered in coastal and industrial areas.

The center-mounted "button hook" prime feed provides accurate alignment with the focal point without the use of cables and other supporting gear. The LNA is located at the focal point while the rotor is placed at the rear of the dish, permitting rotation of the feed through 360 degrees of polarization by remote control.

For more information, contact *National Microtech, Inc., PO Drawer E, Grenada MS 38901.* Reader Service number 481.



National Microtech's Apollo X10 antenna.

Simpson's model 467E DMM.

UNITED STATES FREQUENCY ALLOCATION CHART

An updated "Varian United States Frequency Allocation Chart" is now available free of charge from Varian Associates Electron Device Group. The four-color chart includes radio, television, point-to-point, microwave, satellite communications, and millimeter wave frequency allocations. This 15" by 21" foldout wall chart features a ledger guide and is both color- and line-coded for easy reference.

Frequency allocations from 3 kHz to 300 GHz are divided into eight one-order-of-magnitude divisions. These divisions are color-coded to illustrate frequency uses of government exclusive, non-government only, and government and non-government shared frequencies. Line coding is then used for the demarcation of 31 specific frequency categories such as fixed satellite, radio navigation, land mobile, broadcasting, and meteorological satellite.

For further information, contact *Varian Associates, Electron Device Group Marketing, 301 Industrial Way, San Carlos CA 94070.* Reader Service number 488.

AZDEN INTRODUCES NEW PCS-4000

Japan Piezo Company, Ltd., and Amateur-Wholesale Electronics have announced their new PCS-4000 2-meter FM transceiver. Like its predecessors, the PCS-4000 utilizes keyboard frequency control, but many new features have been added, making this a truly unique radio.

Some of the features are 8-MHz coverage (142 to 149.995 MHz), extremely small size (2 inches high by 5½ inches wide by 6¾ inches deep), two banks of eight memories which can be scanned separately or together, capability for up to eight nonstandard repeater splits, and two priority channels. Other feaures include a full 16-key touchtone™ pad built in, multicolored display for easy function recognition, discriminator scan centering, repeater reverse button, and free/vacant scan mode selection with auto-resume.

For more information, contact *Amateur-Wholesale Electronics, Inc., 8817 SW 129 Terrace, Miami FL 33176; (303)-233-3631.* Reader Service number 483.

SIMPSON'S MODEL 467E LCD DMM

Simpson Electric Company has introduced a new hand-portable LCD digital multimeter. Model 467E joins the Simpson line of LCD hand-portable DMMs.

Features include peak hold to capture surge currents and voltages, a continuity mode to provide instant visual/audible checks for shorts and opens, and true rms capability for more significant measurements of non-sinusoidal waveforms over a wide frequency range. The 467E has 26 ranges to provide full ac/dc voltage, current, and resistance (including low-power Ohms) measurement capability.

Additional features include 0.1% dc V accuracy, high-voltage transient protection, a double fusing system, and color-coded front-panel graphics. Its size is a compact 2" × 5.6" × 4.6" and its weight is 1½ lbs.

For further information, contact *Simpson Electric Company, 853 Dundee Avenue, Elgin IL 60120; (312)-697-2260.* Reader Service number 486.

SUBMINIATURE CHANNEL SCANNER

Midian Electronics, Inc., has introduced a subminiature channel scanner. It features 6-channel capability on radios employing crystal high switching, 16-channel capability on radios using battery-line binary address, and 8-channel capability on radios using battery or ground switching. The scanner also has a priority channel scan capability as well as a three-second hold timer, manual advance, and an adjustable channel scan length.

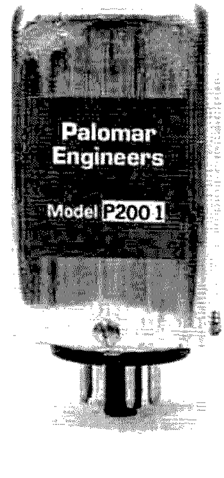
For further information, contact *Midian Electronics, Inc., 5907 E. Pima Street, Tucson AZ 85712; (602)-885-6883.* Reader Service number 487.

PLUG-IN DTMF DECODER

Palomar Engineers has announced a new single-digit decoder which is available for any of the 16 DTMF digits.

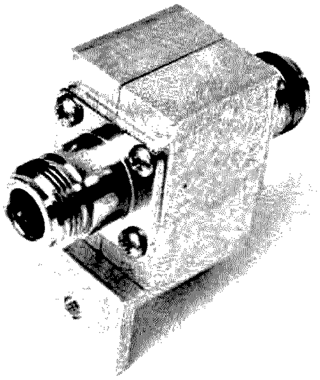
Replacing the firm's older model T2, the new P200 features improved temperature stability, high input impedance (200,000 Ohms), and a ½-Ampere SPDT output relay. It operates from 12 volts dc, signal levels from −25 to +5 dBm, and has a response time of 100 ms. The decoder plugs into a standard octal socket.

For further information, contact *Palomar Engineers, 1924F W. Mission Road, Escondido CA 92025; (714)-747-3343.*



Palomar Engineers' P200 DTMF decoder.

Icom's IC-290H transceiver.



PolyPhaser's new impulse suppressor.

ICOM'S IC-290H

Icom has announced the release of a new 2-meter multimode mobile transceiver, the IC-290H, featuring a powerful 25-Watt output and a highly sunlight-readable green readout in the same compact package as the IC-290A. Other features and styling of the IC-290H are the same as the previous model—the IC-290A. These include 5 memories for storing your most worked frequencies, a call channel to make your favorite frequency instantly available, 5-kHz FM tuning or 1-kHz/100-Hz tuning on SSB, FM/USB/LSB/CW modes, programmable offsets, a priority channel that monitors 2 frequencies, and scanning of memories or band.

For more information, contact *Icom America, Inc., 2112 116th Avenue NE, Bellevue WA 98004.*

ENCON PHOTOVOLTAIC PANELS

Encon, Inc., distributors of Solarex photovoltaic products for the Midwest, has introduced the new Solarex SX series of semicrystalline photovoltaic panels, using state-of-the-art technology.

Solarex semicrystalline cells offer unique advantages over earlier technology, including lower cost, increased packing efficiency, and higher power output compared with the traditional round single-crystal silicon cells. Semicrystalline cells are made by melting less-than-pure polycrystalline silicon, crystallizing it into rectangular "bricks," and then sawing the bricks into wafers to make rectangular cells. The cost reductions afforded by the new process promise to bring prices down from $100 per Watt to under $20 per Watt within the next few years.

Solarex suppplied the photovoltaic cells for the UoSAT (University of Surrey) OSCAR 9 satellite launched on October 6, 1981. OSCAR 9's four solar panels each contain 408 high-efficiency 2 cm × 2 cm cells. Each panel produces 27 Watts when fully illuminated. The Solarex system is designed to produce 18 Watts peak power and 8 Watts average power in orbit to charge the 14-volt nicad battery.

Encon, Inc., assembles complete photovoltaic power systems for emergency and primary communication applications, as well as residential and commercial packages. Interested amateurs are invited to contact *Encon, Inc., 27584 Schoolcraft, Livonia MI 48150.* Reader Service number 479.

ICOM'S IC-R70 GENERAL-COVERAGE RECEIVER

Icom has just announced its new professional general-coverage receiver, the IC-R70.

It is a full generation newer and features more functions than other less sophisticated general-coverage receivers on the market. Features include squelch on sideband, adjustable-width noise blanker, adjustable-speed agc, passband tuning as standard, and adjustable notch filter as standard.

Other convenient features are high-stability, synthesized tuning with tuning speeds, an optional AM/FM mode, variable CW-filter widths, dial lock, and two vfo's with data transfer. Also, the IC-R70 will operate transceive with the IC-720A, making an ideal combination for the serious DXer or CW buff.

For more information, contact *Icom America, Inc., 2112 116th Avenue NE, Bellevue WA 98004.*

POLYPHASER'S IMPULSE SUPPRESSORS

A new series of bulkhead-style impulse suppressors for coaxial lightning protection was recently introduced by PolyPhaser Corporation. This new IS-B50 series can easily replace older air-gap-type arrestors and can be mounted on up to 1/8"-thick bulkhead panels. These weatherproofed gas tube protectors are designed for repeaters, base stations, and TVROs to 1 GHz, with typical (N) 0.1 dB loss and 1.1-to-1 vswr. Their hefty 20-kA multi-strike and 50-nanosecond turn-on time make protection against most direct strikes possible. They come complete with weather washer and stainless steel hardware in both N and UHF fittings. A tower mounting kit is also available.

For further information, contact *PolyPhaser Corporation, 1500 West Wind Boulevard, Kissimmee FL 32741; (303)-396-1807.* Reader Service number 485.

DC POWER SUPPLY

Many mobile operators would like to be able to operate their mobile equipment at home on ac power mains. Tripp-Lite has just announced a product that meets that desire: a precision regulated dc supply that converts 120 V ac into 13.8 V dc. For example, CB radios, automobile tape players, tape recorders, high-power stereo systems, amateur radio equipment, linear amplifiers, and marine- or business-band radios can now be used at home.

The new low-cost power supply saves the user money, since it also eliminates the expense of having to buy ac equipment. It features a solid-state integrated circuit for precise regulation. A built-in filter ensures low-noise operation, and current-limiting electronic "foldback" is provided for automatic overcurrent protection. Other features include a heavy-duty power transformer for complete line isolation, a maximum ripple voltage of only 0.1 volts from zero to full load, an on/off switch and indicator light on the faceplate, and a UL-listed ac cord and plug (type SPT-2).

For more information, write *Tripp-Lite, 500 N. Orleans, Chicago IL 60610.* Reader Service number 484.

W9AV MORSE CODE TRANSLATOR FOR TRS-80 COLOR COMPUTER

J. C. Sprott W9AV announced some time ago his Morse-code programs for the TRS-80 Mod I/Mod III computers. Now, he has announced the availability of a Morse program in 16K extended color Basic for the TRS-80 color computer. It is believed that this program is the only Morse-code program available for sending and receiving Morse code by way of the computer's cassette port.

With 9 programmable memories of 240 characters each and a random-character "practice" mode, the translator program allows you to send and receive the code by merely plugging the computer cassette plugs directly into the transmitter key jack and the receiver phone jack. Morse code may then be sent at speeds of up to 60 words per minute and received at speeds of up to 30 words per minute.

For more information, write *Professor J. C. Sprott W9AV, 5002 Sheboygan, #207, Madison WI 53705.* Reader Service number 480.

Icom's IC-R70 receiver.

Tripp-Lite's dc power supply.

SLEP SPECIALS

AEA	
MBA-RO Reader Receive Only	$269.00
MBA-RC Receive/Code Converter	395.00
MM-2 Morsematic Ultimate Keyer	135.00
CK-2 Contest Memory Keyer	99.00
Isopole 144 2M Antenna	35.00
Isopole 220 Antenna	35.00
BARKER & WILLIAMSON	
370-15 Broad Band Dipole Antenna 3.5-30 MHz, 90 ft., 5 KW PEP	$134.00
370-10 Portable Window Sill Apartment/Mobile-Home Whip Antenna covers 2, 6, 10, 15, 20, 40 Meters plus 27 MHz	39.50
331A Grid Dip Meter Solid State, Range 2 MHz thru 230 MHz, Takes 9V Transistor Battery	112.00
374 Dummy Load Wattmeter DC to 300 MHz, 1500 Watts input	199.00
375 Coax Switch, 6 Position Rear SO-239	22.50
376 Coax Switch 5 Position Side SO-239	22.50
COLLINS/ROCKWELL	
55G-1 VLF Preselector for 51S-1 and KWM-380, Limited Supply	$375.00
312B-5 Station Console/VFO, Limited Supply	550.00
DRAKE	
TR-7A XCVR	$1,439.00
TR-5 XCVR	695.00
PS-7 P/S 25 Amp	269.00
PS-75 P/S 15 Amp/25 Amp Surge	179.00
RV-75 Synthesized VFO	269.00
R-7A Receiver 0-30 MHz Digital	1,399.00
ICOM	
IC-720A XCVR	$1,140.00
IC-730 XCVR	690.00
IC-740 XCVR	985.00
IC-2AT Hand Held w/TTP 2M	235.00
IC-25A 2M Mobile 25W	305.00
IC-45A New Model 440-450 MHz Mobile, 10W, FM	call
IC-290H New Model All-Mode 2M FM/USB/LSB/CW 25 Watt, Easy-To-Read Green LED Read-Out, Scans	489.00
IC-R70 New Model Professional General-Coverage Receiver, Many Beautiful Features	685.00
MIRAGE	
B-23 2M 2/30W Amplifier	$78.00
B-108 2M 10/80W Amplifier/Preamp	154.00
B-1016 2M 10/160W Amplifier/Preamp	239.00
B-3016 2M 30/160W Amplifier/Preamp	199.00
D-1010 440 10/100W Amplifier	279.00
RC-1 Remote Control Head, All Models w/18 ft. Cable	24.95

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✓367

HAM HELP

I am looking for schematics for a Siltronics LA 550 bi-linear.

Arthur Lee
Route 1, Box 329
Centreville MD 21617

I need help troubleshooting my Spectronics digital readout DD-1C. The display has quit counting, and I need a schematic for it.

Dr. M. R. Klein WA4GUH
201 East Arbor Ave.
Pt. St. Lucie FL 33452

I am looking for a manual for the Tektronix 524D oscilloscope and a meter movement for a Bird model 43 wattmeter. I will pay any reasonable price and postage.

Don DeLung WB4LJE
830 Pinecrest Ave.
Bedford VA 24523

Can anyone help me eliminate the chirp and drift in my Heath HG-10B vfo?

Dave Artman N9CZJ
599 Wheel Estates
Greenwood IN 46142

MULTI-BAND SLOPERS

160, 80, and 40 meters

Outstanding DX performance of slopers is well known. Now you can enjoy 2 or 3 band BIG-SIGNAL reports! Automatic bandswitching • Very low SWR • Coax feed • 2 kw power • Compact • Ground or tower feed • Hang from any support 25 ft. high or higher • Easy to install • Very low profile • Complete instructions • Immediate shipment • Check ok

3 BAND SLOPER · 160, 80, & 40 Meters · 60 ft. long	$ 43.00 frt.ppd
2 BAND SLOPER · 80 & 40 Meters · 41 ft. long	$ 30.00 frt.ppd
3-BAND NO TRAP DIPOLE, 160, 80, & 40M · 113 ft. long	$ 66.00 frt.ppd
2-BAND NO TRAP DIPOLE, 80, & 40M · 84 ft. long	$ 49.00 frt.ppd

FOR ADDN'L INFO on these and other unique antennas: send SASE

W9INN ANTENNAS
BOX 393-S MT. PROSPECT, IL 60056

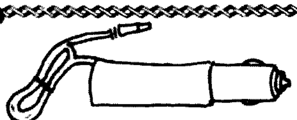
2 GHz Microwave Receiving Systems

The new **Micro-System** features a machined 18" parabolic reflector for maximum efficiency, a linear feed-point downconverter with ceramic high performance RF preamplifier transistor, a variable 12 to 18 volt regulated power supply and 50' of 75Ω coaxial downlead, including a 3' jumper and matching transformer. The **Micro-System** includes a full 6 month warranty.

Micro-System (MS-021)	**$159.95**
Micro-System (MS-578)	**$169.95**
Micro-System (MS-645)	**$179.95**

Shipping & Handling: USA ... $4.00 AK, HI & PR ... $10.00

Data Service Company 612-636-9469
✓346 3110 Evelyn Street
Roseville, MN • 55113



MOBILE POWER For Your H.T.

only $21.95 ppd

The new MOBILE ENERGIZER will provide operating power for your H.T. from any 12 volt source and charge it's nicads at the same time! Featuring a time-proven regulator circuit enclosed in a tough, rugged housing that plugs into the cigarette lighter jack of your car, it will work with any synthesized H.T. except Icom, Azden, and Tempo S-15. Specify H.T. model when ordering.

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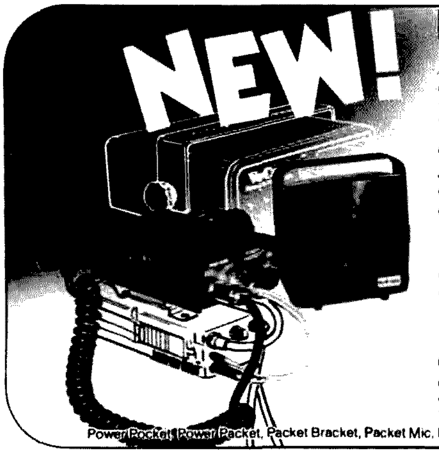

Introducing the POWER PACKET™ from VoCom

An innovative new product that you can combine with your VoCom Power Amplifier to obtain the functions of the famous VoCom Power Pocket™ *using any handheld radio.*

AF POWER — 2 to 3 watts of road-noise-overcoming audio to your vehicle speaker or to external Packet Speaker™ (optional).

EASY HOOK-UP — Packet Bracket™ at bottom of Power Packet, provides place to clip almost any make or model handheld. Connects to handheld through pin jacks. Hooded light on Power Packet illuminates portable's front panel.

CHARGE POWER — 35 mA charge on receive, 400 mA when mic is keyed. Unless your handheld draws more than 400 mA, you can talk as long as you wish and the batteries will be at least as charged as when you started.

MIC PREAMP — adjustable; tie in your handheld directly without changing its mic input. Also makes Power Packet compatible with most standard mobile mics. Optional Packet Mic™ available.

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DEALER DIRECTORY

Culver City CA

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ALASKA	14A	7A	7	7	3A	3A	3A	7B	7B	14	21A	21A
ARGENTINA	21	14	7B	7B	7B	7	14	21A	21A	21A	21A	21
AUSTRALIA	21	14	7B	7B	7B	7B	7B	14B	14	14	21	21A
CANAL ZONE	14A	7	7	7	7	7	14	21	21A	21A	21A	21
ENGLAND	7	7	7	3A	3A	7	14	21A	21A	14	7	7
HAWAII	21	14	7B	7	7	7	3A	3B	7A	21A	21A	21A
INDIA	7	7	7B	7B	7B	7B	14	14	14B	7B	7B	7B
JAPAN	21A	7B	7B	7B	7	7	7	7B	7B	7B	14	14
MEXICO	21	7A	7	7	7	7	7	14A	21A	21A	21A	21A
PHILIPPINES	14A	14B	7B	7B	7B	7B	7	7B	7B	7B	7B	14
PUERTO RICO	14	7	7	7	7	7	14	21	21A	21A	21A	21
SOUTH AFRICA	14	7	7	7	7B	14	21	21A	21A	21A	21	14A
U. S. S. R.	7	7	7	3A	3A	7B	14	21	14	14B	7B	7
WEST COAST	21	14	7	7	7	3A	3A	14	21A	21A	21A	21A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	7	7	3A	3A	3A	7	7	14	21A	21A
ARGENTINA	21	14	7B	7B	7B	7	14	21	21A	21A	21A	21A
AUSTRALIA	21A	14	14B	7B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7	14A	21A	21A	21A	21A
ENGLAND	7	7	7	3A	3A	3A	7	14	21A	14	7B	7
HAWAII	21A	14	7B	7	7	7	7	3A	7A	21A	21A	21A
INDIA	7B	14	7B	7B	7B	7B	7B	14B	14B	7B	7B	7B
JAPAN	21A	14B	7B	7B	7	7	7	7	7B	7B	14	21
MEXICO	21	14	7	7	7	7	7	14A	21A	21A	21A	21A
PHILIPPINES	21	14	7B	7B	7B	7B	7	7	7B	7B	7B	14
PUERTO RICO	14	7A	7	7	7	7	14	21	21A	21A	21A	21
SOUTH AFRICA	14	7	7	7	7B	7B	14	21A	21A	21A	21	14A
U. S. S. R.	7	7	7	3A	3A	7B	7B	14	14	14B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7	7	3A	3A	3A	7	7	14	21A	21A
ARGENTINA	21	14	7B	7B	7B	7	7B	14	21	21A	21A	21A
AUSTRALIA	21A	21	14	14B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	21A	14	7	7	7	7	7	14	21A	21A	21A	21A
ENGLAND	7B	7	7	3A	3A	3B	7B	14B	21	14	7B	7B
HAWAII	21A	14A	14	7	7	7	7	3A	7A	21A	21A	21A
INDIA	7B	14A	7B	7B	7B	7B	7B	7B	14B	7B	7B	7B
JAPAN	21A	21	7B	7	7	7	7	7	7	7B	14	21A
MEXICO	21	14	7	7	7	7	7	14A	21A	21A	21A	21A
PHILIPPINES	21A	14	14F	7B	7B	7	7	7	7	7B	7B	14A
PUERTO RICO	14A	14	7	7	7	7	7	14	21A	21A	21A	21A
SOUTH AFRICA	14	7	7	7	7B	7B	7B	14	21A	21A	21	14A
U. S. S. R.	7B	7	7	3A	3A	7B	7B	14B	14B	14B	7B	7B
EAST COAST	21	14	7	7	7	3A	3A	14	21A	21A	21A	21A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

JANUARY

SUN	MON	TUE	WED	THU	FRI	SAT
						1 F/G
2 G/G	3 G/G	4 G/G	5 F/G	6 F/F	7 G/G	8 G/G
9 G/G	10 F/F	11 F/F	12 F/G	13 G/G	14 G/G	15 F/G
16 F/F	17 P/F	18 F/F	19 F/G	20 G/G	21 G/G	22 F/G
23 F/F 30 F/G	24 F/G 31 G/G	25 G/G	26 G/G	27 G/G*	28 F/F*	29 P/F

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Page 72

Maximum Repeater Control
Page 32

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Page 103

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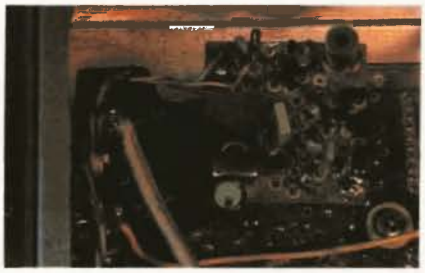
Page 90

February 1983 $2.49½
Issue #269

Amateur Radio's Technical Journal

A Wayne Green Publication



Add-on Bfo—56

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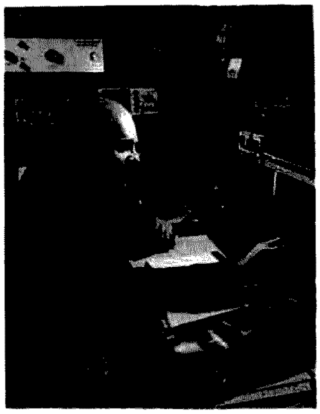
0 74470 65946

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



SABAH!

One of the reasons I got into publishing a ham magazine had to do with a rather serious character flaw on my part, one which dictated that whenever I found something really fun to do I was not satisfied until I shared my fun with others. Thus, when I found out what a blast playing with ham RTTY was, I just couldn't be satisfied until I got others to share my fun and enthusiasm. This got me started publishing a RTTY newsletter and gradually brought me to my present situation with *73* and some other magazines, mostly for enthusiasts.

Well, I'm in a tiny country called Sabah and you really should be here to be sharing my fun with me. The capital city is Kota Kinabalu, which few people have ever heard of. Much to my surprise, I arrived here from Brunei and found a surprisingly large city. The biggest hotel, the Hyatt, is 14 floors high; unlike in America, it has a 13th floor. Being not far from the equator, it is hot during the middle of the day. That's a nice time for a nap or to sit around a swimming pool writing postcards to those of less adventurous spirit.

Hassan 9M6MA met Sherry and me at the airport and drove us into town to the Hyatt. Later, he picked us up and drove us to his house, which is built on stilts over the water. Hassan expected me to be surprised, but I merely felt at home. When I was a teenager, my folks had a summer house built on stilts out near Floyd Bennet Airport in Brooklyn. We reached the house by walking over about a quarter mile of boardwalk; it was perhaps three feet wide and six feet over the mud flats and a couple of feet above the high tides. Some of the full moon tides would bring water up to the boardwalk. And I'll never forget the hurricane of 1938 when the extra high tides and storm washed away most of the boardwalks and some of the houses. We lost a dock and our rowboat, and my family just barely made it across the narrow walk as the storm hit. They had to use sticks to keep from being swept off the long walk. I missed out on that drama, being busy at home listening to 20 meters and the unusual propagation which the storm brought. No, Hassan's house wasn't a bit strange for me. We were joined by Ian 9M6MH, Mohamed 9M6MO, and his brother Ali, an SWL. We had quite an interesting little hamfest. None of them is really a DXer and they would prefer, as would most of the hams in rare spots around the world, to be able to get on the air and talk with people. They want, like every other person to whom English is a second language, to have a chance to improve their English. They'd like to get to know their fellow hams, yet every time they get on the air they are hounded by hams who "need" their remote country and have little respect for the interests of the DX operator. Many hams get very nasty if deprived of their "right" to a new country. This is the bane of most hams in rare spots and often drives them off the air. As long as we hams continue to support the ARRL Honor Roll, I'm afraid that this is going to be a problem. It isn't DXCC that's doing it, just the Honor Roll. Dare we call it a Dishonor Roll and anger the dozens of poor souls who have decided to devote their lives to keeping on top of this blight? What a waste of lives which might otherwise be productive.

A year ago, I wrote an editorial telling you that I was going to be going to Asia and asking you to come along. Well, you sure goofed this time. You not only missed out on consumer electronics shows in Tokyo, Taipei, Seoul, and Hong Kong, but also you missed a great ham convention in Bangkok, with about 150 hams coming in from all over the world, plus interesting visits to weird places such as Sarawak, Brunei, and Sabah. These places are really off the tourist trails, and yet they are each different and fascinating. Sarawak has but one active ham. What a spot for a DXpedition, eh? Well, there was one here recently which knocked off 10,000 contacts and still didn't cut down the pileups. I think you could DXpedition once a year for a week or so to Sarawak and be kept very busy. One of the main topics of discussion in Sarawak during my visit was a 25-foot crocodile which has been eating people. They'd flown in a medicine man to try to catch this bugger. . . somewhere up the Sarawak River. No, I didn't go for a swim in the river, which went right by our hotel.

There not being much of a tourist trade, there are very few stores aimed at tourists. There are hundreds upon hundreds of stores selling things for the local people, plus huge markets. I wandered around one bazaar and saw perhaps fifty stalls selling shoes. There were another fifty selling fruits, an acre or two selling vegetables, and so on. I can't tell you about all these things; you're just going to have to break loose and come with me on one of these trips and see everything for yourself. Oh, I've been taking slides by the hundreds, but even that can't really come close to an actual visit.

Kota Kinabalu is so far out in the sticks that neither McDonald's nor Kentucky Fried Chicken have found the place! Now, that's remote! Oh, they do have a McDonald's-like fast food store which serves hamburgers, fried chicken, sundaes, and even breakfasts. The prices are about the same as in the US.

These Asian tours are surprisingly inexpensive. Commerce Tours has been arranging them for several years and they have them down pat. They take you to the best of hotels. They include most of the breakfasts and a lot of dinners. If you eat only what is provided on the tour, you will put

QSL OF THE MONTH

This month's winning QSL from Roger Schultz NG6P is the result of a family effort. Roger's XYL, Diane, designed and stitched the original needlepoint for the card. Her work then was reproduced with a clarity that permits you to count the stitches, giving the impression of depth to the QSL card. The variety of stitches she used keeps the eye busy, and the border surrounding the design gives the card definition that many other cards lack.

To enter *73*'s QSL of the Month Contest, put your QSL card in an envelope with your choice of a book from *73*'s Radio Bookshop, and send it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries without an envelope or book choice will not be considered.

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on weight. The electronics shows are one of the best opportunities for you to find some little product to import and get your own mail-order business going. Or, if you are in the electronics business, this is a way to find an Asian partner to do some of your manufacturing for you. More and more firms, even smaller ones, have an Asian "plant" which is helping with circuit boards. Just one connection on a trip like this will pay for the trip several times over. The cost of the tour for the last three years has been around $2,500...which includes all airfares, first-class hotels, and a lot of the meals. That's one of the best tour bargains I've seen.

After the organized part of the tour, you can add some extra countries on at surprisingly little extra cost. The tour ended with the Hong Kong Electronics Show, but from there we went on to visit Singapore, Kuching, Bangkok, Bandar Seri Begawan, Kota Kinabalu, and Manila, all for about $500 extra in airfare.

There is going to be a big celebration in Brunei in a bit over a year when the country goes independent. The VS5 calls will change to a new prefix

Continued on page 108

LONG-DELAYED ECHOES

A former Los Alamos National Laboratory scientist has been honored by the Soviet Academy of Sciences for his explanation of long-delayed radio echoes. Robert W. Freyman received the Commemorative Medal of the Polar Geophysical Institute, the first time the Institute had honored anyone from outside the Soviet Union, according to the Oct. 7 issue of *Machine Design*.

Three- to 30-second delayed echoes of radio signals have been observed since 1927, and Freyman conducted a series of experiments aimed at solving the riddle of these echoes. He believes the signals are delayed because they are caught up in ducts of plasma in the solar wind surrounding the Earth. The wind blends with the Earth's magnetic field some 45,000 miles above the surface.

Radio-wave ducts in the blended plasma often stream toward the sun, Freyman says. "If radio signals encounter a duct, they are transported into space. They bounce back when the duct collapses, thus accounting for the delay."

The Soviets duplicated and confirmed Freyman's research. His work had special significance for the Soviets because they have pursued intensive investigations of long-delayed echoes since a 1979 multinational experiment produced the phenomenon over Soviet territory.—Thanks to reader Jacques M. Percourt F2YS/W2, Millbrook NY.

Well...I Can Dream, Can't I? by Bandel Linn K4PP

"We heard you have a ham radio outfit on board, so we're going out of the way to a rare island from which nobody has ever broadcast!"

Fred Studenberg W4BF
1305 E. Norfolk
Tampa FL 33604

Unleash the TS-900

A rig like this deserves more room than 2 meters can give. Get on HF (including WARC bands) with this transverter.

After using my new TS-900 for a few months, I realized that with the exception of its dedicated 2-meter coverage, it had all the features found in the best HF transceivers. It seemed wasteful to keep it caged on 2 meters when all I needed was a transverter for operation on one of the HF bands. At about this same time, the three new WARC bands were announced and this furthered my desire to put the TS-900 on HF.

After considerable research on the subject of synthesizers and conversion techniques, I managed to design a transverter that is a definite engineering overkill. This box will take any switch-selected 1-MHz band from 0 to 30 MHz and upconvert it for receive to the 144-to-145-MHz range. In the transmit mode, the 2-meter transmit signal is translated down to the exact frequency as on receive.

Since I already had a 100-Watt broadband amplifier, I designed the unit for 5 Watts output. This is only 2 S-units below that of the popular 200-Watt PEP input transceivers and is certainly plenty of power for many contacts. If you want more power, I recommend either the 100-Watt-output transistor amplifier described in the ARRL *Handbook* or the unit described in Motorola's Engineering Bulletin EB63 (this is what I used).

What Can You Use It For?

With this transverter, I can operate anywhere in the HF range, transmit or receive, all modes. Unfortunately, the transmit output drops off below 1 MHz, but I don't need to talk to WCBS anyway. The transverter works with any multimode transceiver in the 10-Watt class and has a built-in attenuator to handle the full transmitter output power. There is a bypass relay to permit instantaneous operation on either HF or 2 meters without any cable switching. This also provides an OSCAR mode of operation that automatically switches between 2-meter transmit and 10-meter receive.

Since my TS-900 has FM capability, I have made extensive use of the transverter on 10-meter FM. The dual-vfo feature makes selection of any repeater offset possible. I have also made many contacts on 10-meter AM. Of course, I can operate CW and SSB on any of the 160- through 10-meter bands and listen to plenty of activity on commercial frequencies in between It is also great for MARS and CAP frequencies that are outside the normal overlap coverage of HF transceivers. If you are interested in BCB DX, the 100-Hz readout and super sensitivity are ideal. There is also plenty of interesting VLF activity in the 50-to-200-kHz region, including the 1750-meter band.

Construction

The design uses readily-available components. Most are available from *73* advertisers and my old faithful parts store, Radio Shack. The design has been successfully duplicated by 5 other locals and has worked every time. Total

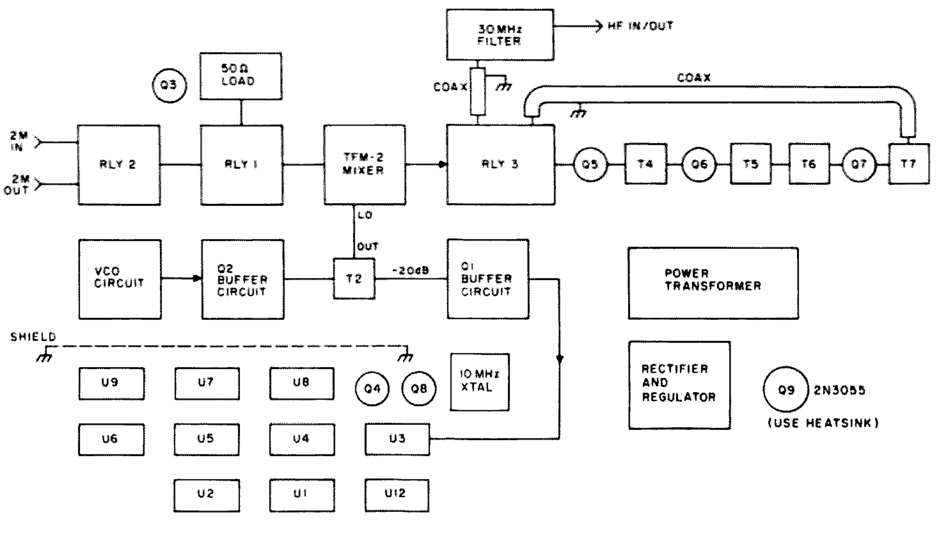


Fig. 1. Suggested layout of the HF transverter for 2-meter multi-modes.

cost with new parts should be under $150.

I didn't use a PCB layout since I was only building one unit, although the layout could be put on a PCB. If anyone is interested in such a project, I would be happy to give some recommendations on a layout.

My unit was built using the "dead-bug" technique and point-to-point wiring. ICs are mounted upside down on the copper side of a sheet of single-sided PCB, and all interconnections between ICs use #30 insulated bus wire. Where possible, components such as disc bypass capacitors are used as tie-points; one lead is soldered directly to the ground plane and the other, free end, supports other common circuit parts. To keep digital noise down, a 1000-pF disc is soldered to the Vcc lead of each IC. This connection along with direct soldering of the ground lead of each IC serves to secure the ICs.

I used a sheet of 8"×11" PCB that also serves as the top cover for an 8"×11" aluminum chassis. This provides excellent shielding and is really not an unattractive method. Fig. 1 shows a layout of various sections and critical components of the transverter. Fig. 2 provides details on winding the various transmission line transformers used in the transverter.

Theory of Operation

Fig. 3 shows the block diagram of the transverter. The key to the versatility of the unit is the synthesizer. It covers 115 to 144 MHz in 1-MHz steps and drives the bilateral mixer at about +7 dBm. As an example of the conversion scheme, to cover 17 to 18 MHz by tuning from 144 to 145 MHz, the synthesizer outputs a signal at 127 MHz (144−127=17).

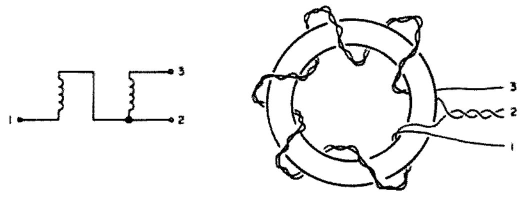
I chose to upconvert in 1-MHz segments and restrict the 2-meter coverage to the 144-to-145-MHz range for two reasons. It greatly simplifies the synthesizer design and also eliminates any problems in reading the frequencies on the transceiver dial. You simply ignore the 144 reading and mentally replace it with the MHz reading on the transverter thumbwheel dials. The other digits are the same.

Using the above example, 17.2366 MHz would read 144.2366 on the transceiver. A second benefit to tuning the 144-to-145-MHz range is that there are fewer strong repeaters operating there that might feed through the converter. However, this is not a serious problem since the design has over 80 dB of suppression of such signals.

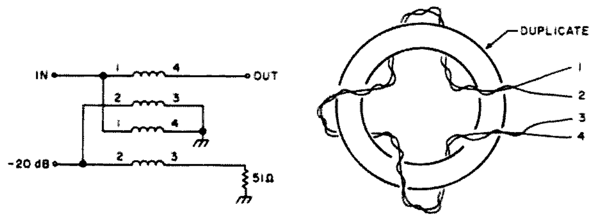
In the receive mode, incoming signals pass through the transmit relay through a 30-MHz low-pass filter. They are mixed with the signal from the synthesizer in the balanced mixer. The output of the mixer at 2 meters passes through the T-R relay attenuator circuit and transverter bypass relay to the 2-meter transceiver. The overall loss through the converter is about 7 dB, so the typical 0.25-μV sensitivity of a multi-mode will be 0.5 μV on HF. This makes for a very sensitive HF receiver that can hear anything that the best HF transceiver can hear.

The scheme used for upconversion results in an overall receiver that is free from spurious responses without the need for elaborate multi-pole front-end filters. All of the newer-generation commercial and amateur equipment uses some form of VHF i-f range to eliminate problems with hard-to-suppress mixing products. This design has no spurious responses anywhere that can't be easily attenuated by the 30-MHz low-pass filter.

When the 2-meter transverter is keyed, the input from its external relay contacts activates two relays in the transverter. The first



Transformer	Turns	Core Material	Wire Size
T1	4	F-50	#28
T3	4	F-50	#28
T4	4	F-50	#28
T5	5	F-87	#26
T6	5	F-87	#26
T7	5	F-125	#24



Transformer	Turns	Core Material	Wire Size
T2	4	F-50	#28

Only one winding shown for clarity. Second winding is connected to first as indicated below.

Function	1st Winding	2nd Winding
Input	1	1
−20 dB	2	2
Ground	3	4
Output	4	no connection
51Ω	no connection	3

Fig. 2. Coil-winding specifications. All cores are mix Q1 from Palomar Engineers, Box 455, Escondido CA 92025. All windings are made with two pairs of wire twisted five crests per inch.

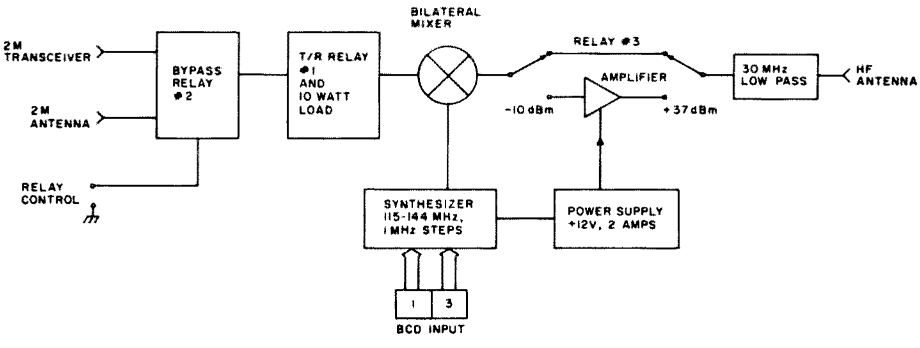


Fig. 3. HF transverter block diagram.

relay switches the 2-meter input into a 10-Watt load and also allows the mixer to sample a small portion of this signal for mixing with the synthesizer signal. The other relay switches the input/output of the mixer to the power amplifier chain. The output of the mixer is about −10 dBm PEP. This is amplified to the 5-Watt level by 3 broadband amplifiers in the power amplifier. Other than the 30-MHz filter, no low-pass filters are used for transmit since harmonics are at least −30 dBc and I felt that at this power level this was more than enough.

OSCAR Mode

In this mode, the 2-meter transceiver is automatically bypassed to the 2-meter antenna whenever the transceiver is keyed. The dual-vfo feature of most multimodes makes OSCAR operation extremely simple. The only disadvantage is that you cannot monitor your own signals, but I have never found this to be a serious disadvantage.

Options

If you don't want or need transmit capability, you can delete the associated relays and power amplifier circuits. The 30-MHz low-pass filter should connect directly from the HF antenna to the mixer. If you delete the 2-meter transfer relay and load, make sure you don't ever key the 2-meter transceiver while connected, or the mixer will be damaged. With the power amplifier eliminated, you can use a much smaller and cheaper power transformer —see parts list for details.

Circuit Operation

Fig. 4 shows the schematic of the transverter. At first glance, the circuit may look complicated, but it is really quite simple and straightforward. The voltage con-

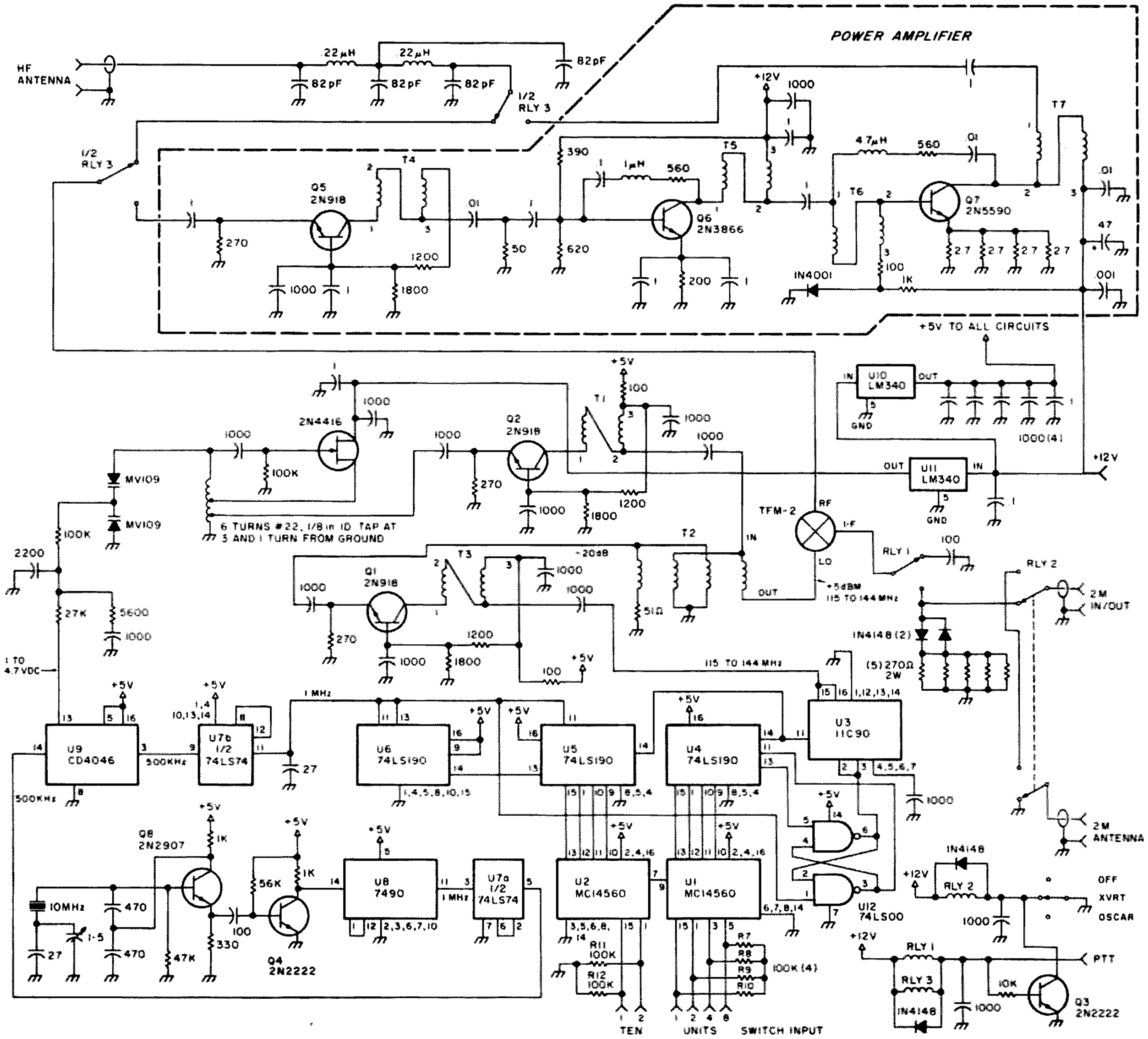


Fig. 4. HF transverter schematic diagram. All resistors 1/4-Watt, 10%, specified in Ohms unless otherwise noted. All capacitors are in pF, disc ceramic, 50-volt minimum unless noted. Pull-up resistors on BCD inputs are connected to ground or +5 volts, depending on use of positive or negative switch logic. Relay 1—Radio Shack 275-003; relays 2 and 3—275-214.

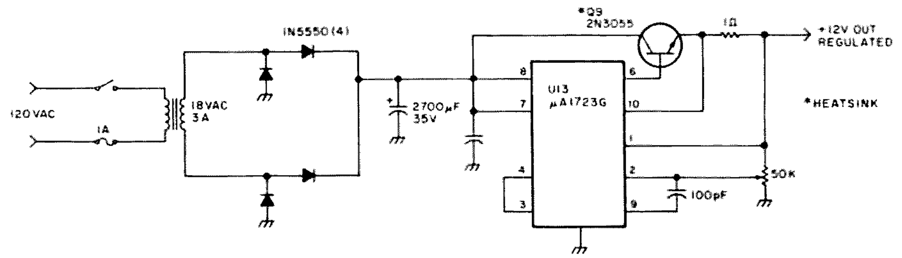


Fig. 5. Regulated +12-volt supply. Power transformer is Radio Shack 273-1514. For receive-only, substitute 273-1515.

trolled oscillator (vco) tunes from 114 to 145 MHz with a 1-to-4.8-V-dc control voltage. There are two common-base isolation amplifiers—one feeds the vco to the balanced mixer and the other, coupled through a 20-dB coupler, buffers the output to the divider chain. Since the desired frequency steps are in 1-MHz increments, the 10-MHz crystal-controlled reference is divided by 10 to produce 1 MHz for one input of the CD4046 frequency/phase detector. The other input of the CD4046 comes from the output of the divider chain that produces 1 MHz when the loop is locked. The phase detector output is filtered and frequency-compensated to deliver a dc control to the vco.

As an example of the divider operation, for a synthesizer frequency of 115 MHz, which corresponds to a range of 29-30 MHz, the thumbwheels are set to 29. The two MC14560 ICs (U1 and U2) are adders that add a constant 66 to the values produced by the thumbwheel input. This sets the first 74LS190 upcounter (U4) to 95. The second 74LS190 (U5) is hard-wired to divide by 8 so the resulting divide ratio is 895 (read left to right). Since this is an upcounter divider, the actual divide ratio is 115: (100−89)+(10−5). I used upcounters instead of downcounters due to the "backwards" relationship of thumbwheel setting to synthesizer frequency and to simplify design of the adders.

The 11C90 divider IC actually divides by 11 for a portion of the rf input period and by 10 for the remainder. Its operation is controlled by the 74LS00 and the output of the first 74L190 dividers.

The phase detector actually operates at 500 kHz, but since both the 1-MHz reference and the variable divider output have identical divide-by-2 circuits, the vco is stepped in 1-MHz increments. I had to operate the CD4046 phase detector at 500 kHz since 1 MHz was too high in frequency for reliable operation with a 5-volt supply. Also notice that the reference frequency is divided from a 10-MHz crystal. This was done for stability reasons since any error or drift at 10 MHz is multiplied by a factor of 14. This also gives reduced noise output of the synthesizer since noise of the reference is multiplied by a smaller amount than with a 1-MHz crystal. A conventional regulated +12-volt supply (Fig. 5) powers the power amplifier and 5-volt regulator for the logic. The circuit is capable of 3 Amps and can be simplified if transmit operation is not needed.

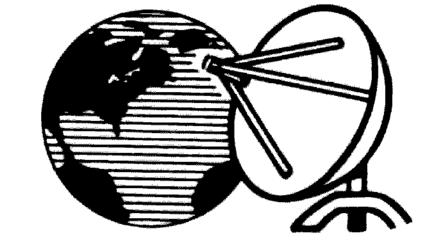
I would recommend using a smaller power transformer, as shown in the parts list, and replacing the 723 regulator and 2N3055 regulator by a simple 3-terminal +12-volt regulator. This will be more than adequate to power the remaining circuitry. Note that for receive-only operation you don't really need RLY 1, and if you don't mind disconnecting cables, you also can eliminate the 2-meter bypass relay, RLY 2, and all associated circuitry.

The 5-Watt power amplifier chain is a collection of various circuits that I've used in the past and I don't take any credit for designing them. There is little that can go wrong if normal rf construction practices are followed. Be sure to use short leads on all components, and keep inputs and outputs separated and physically in a straight line. Refer to Fig. 2 for details on winding the broadband transformers. Also note that the 2N5590 final transistors will require some form of small heat sink attached to the mounting screw. I used a 3" × 3" square of .060" aluminum mounted on the underside of the PCB used for the power amplifier chain.

Putting It on the Air

After all the circuits have been wired and checked out and are working, the best way to tell what kind of a job you did is to put it on the air. The only adjustment is to adjust the vco coil for about 4.8 V dc when set to 00 MHz (144 MHz actual).

If you run into any unsolvable problems, drop me a line with an SASE and I will try to help. ■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Four-Tone Audio Oscillator: A Potent Troubleshooter

For any test that requires a tone, this oscillator does the job. It can also be computer-controlled.

Howard F. Batie W7BBX
12002 Cheviot Drive
Herndon VA 22070

The versatile four-tone audio sine-wave oscillator described here can be used to test originate/answer modems, to generate RTTY tones, for two-tone testing of SSB transmitters, for aligning tone decoders, for analyzing audio filters and discriminators, and for many other audio applications. Its TTL-compatible controls even allow it to operate under software control by virtually any

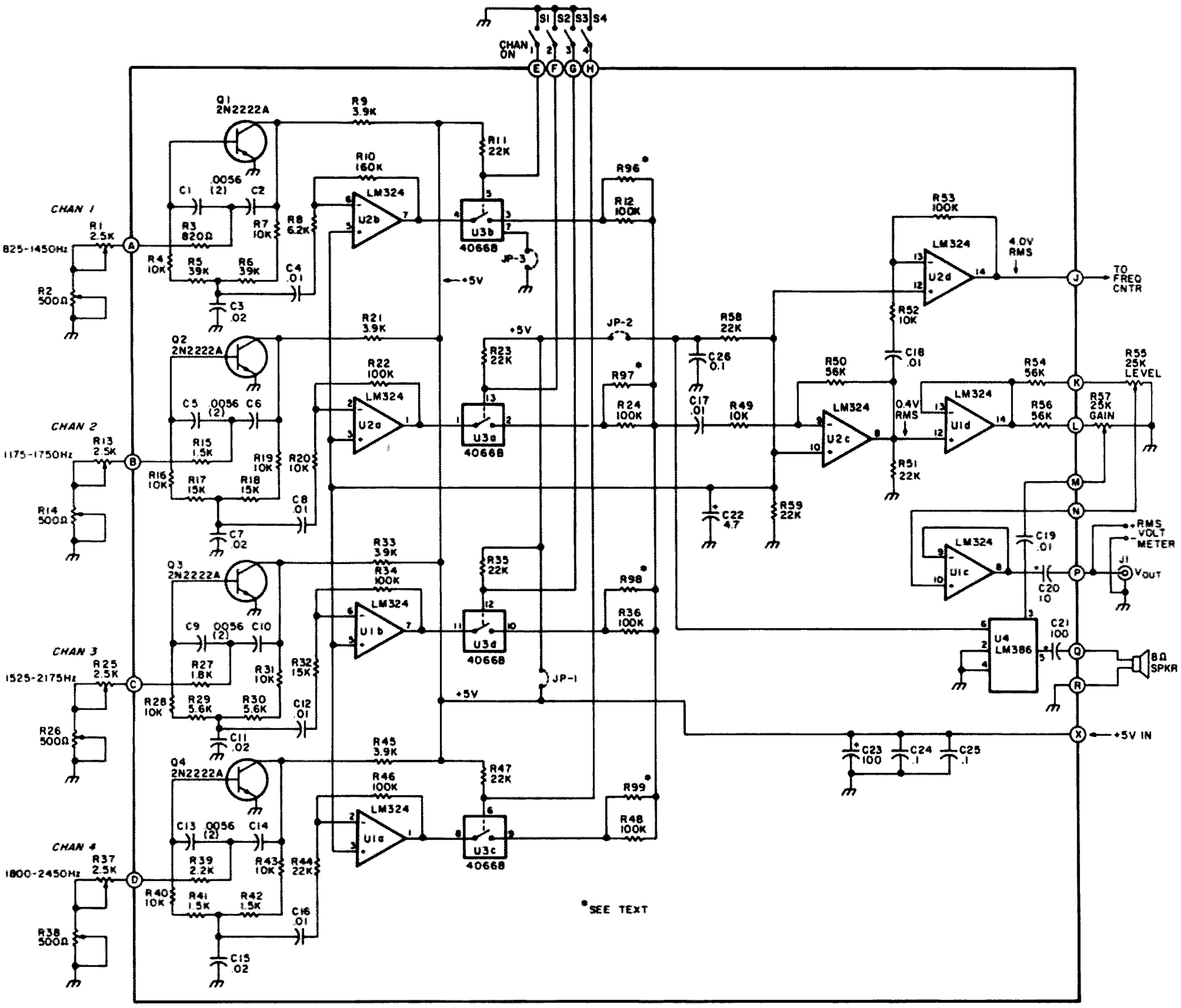

Fig. 1. Oscillator PC board schematic. (©1981, HFB Enterprises)

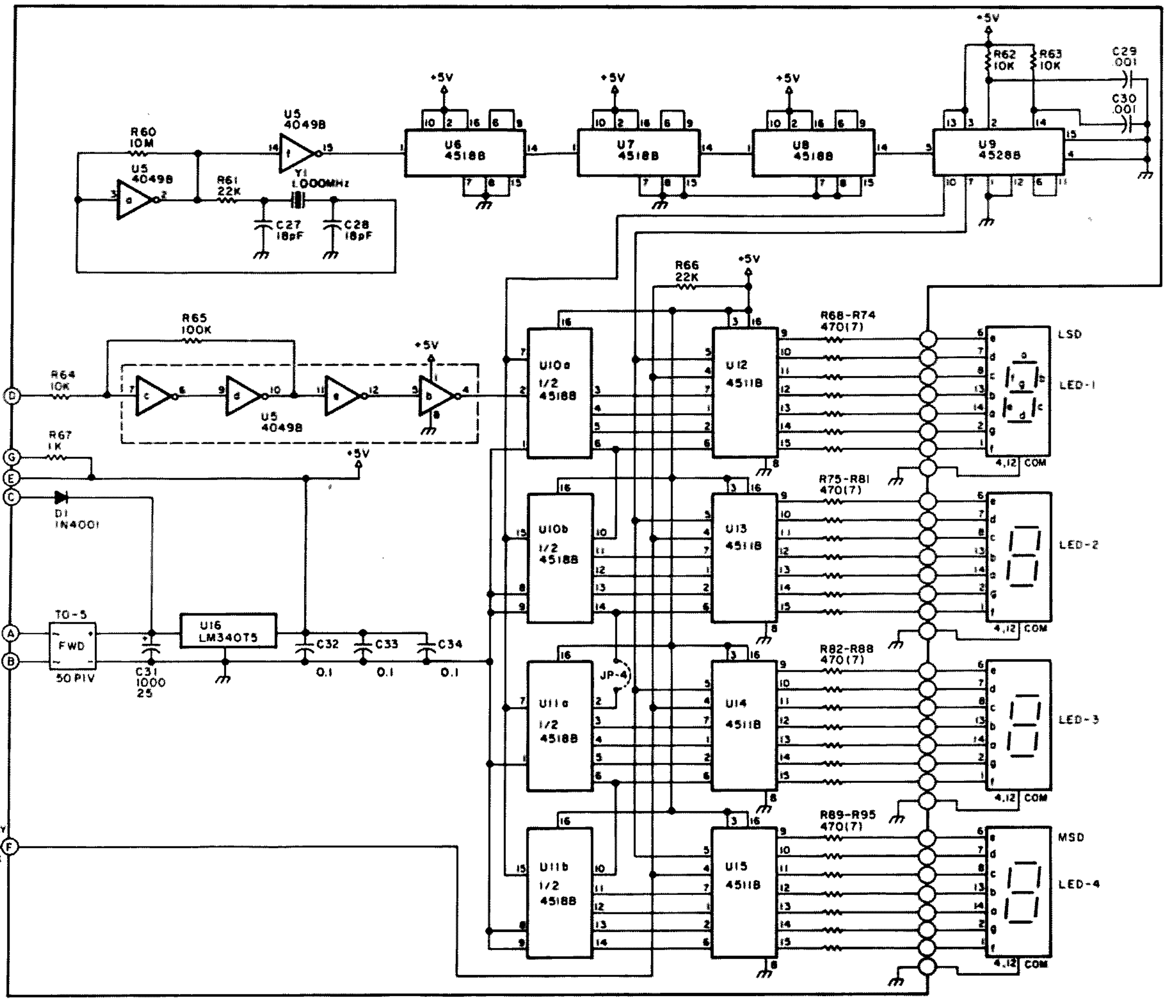

Fig. 2. Frequency counter PC board schematic. (©1981, HFB Enterprises)

computer. Also featured is an integral, direct-reading, 4-digit frequency counter with on-board regulated supply and an on-board audio amplifier. Individual signal-output level and audio-volume controls are provided, and the output signal can supply more than 1 volt rms to a 50-Ohm resistive load.

Low-power CMOS digital integrated circuits and operational amplifiers are used to keep current consumption to a minimum. The four-tone oscillator and frequency counter each are assembled on a 3" × 4" printed circuit board. About 300 mA is required from a 9-15-volt-dc supply when the frequency counter display is on; provisions also are included to blank the display to reduce cur-

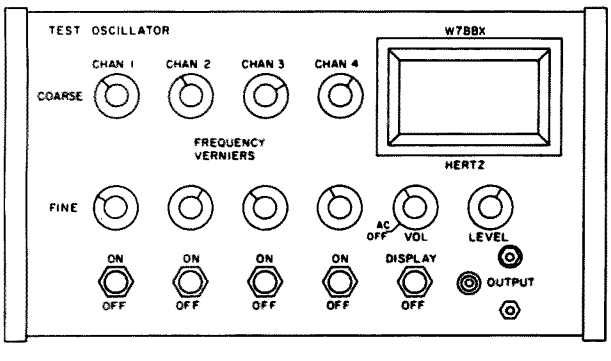

Fig. 3. Front-panel layout.

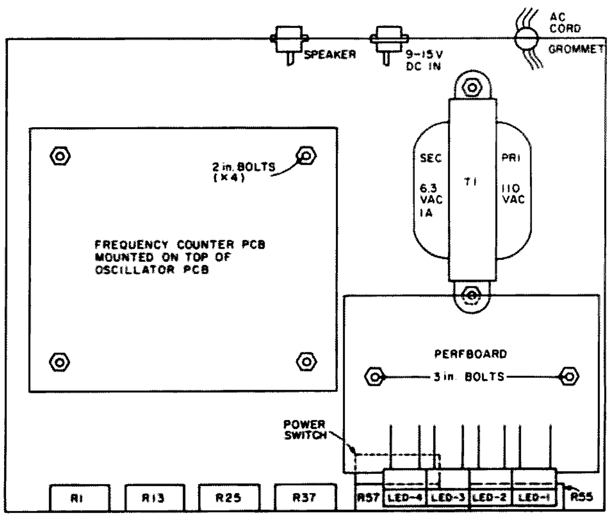

Fig. 4. Chassis layout.

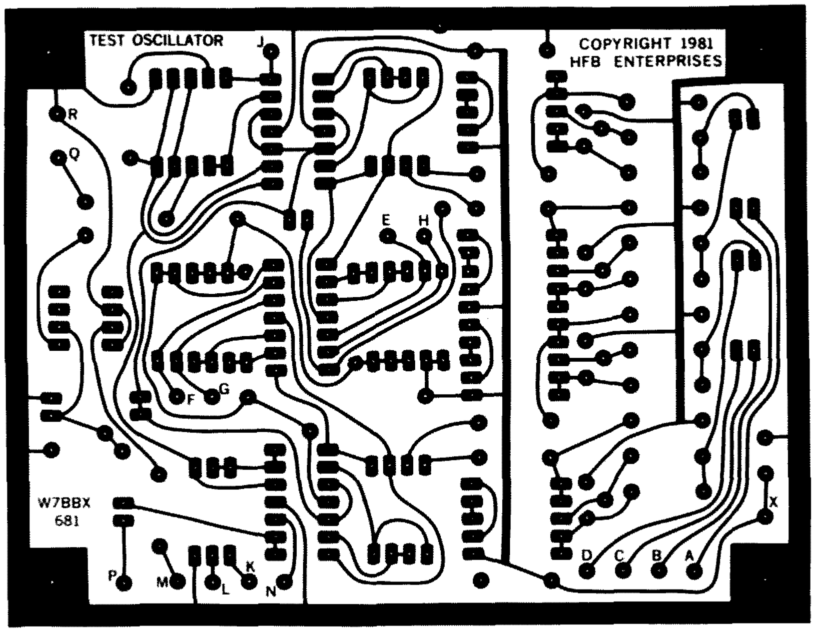

Fig. 5. Oscillator PC board.

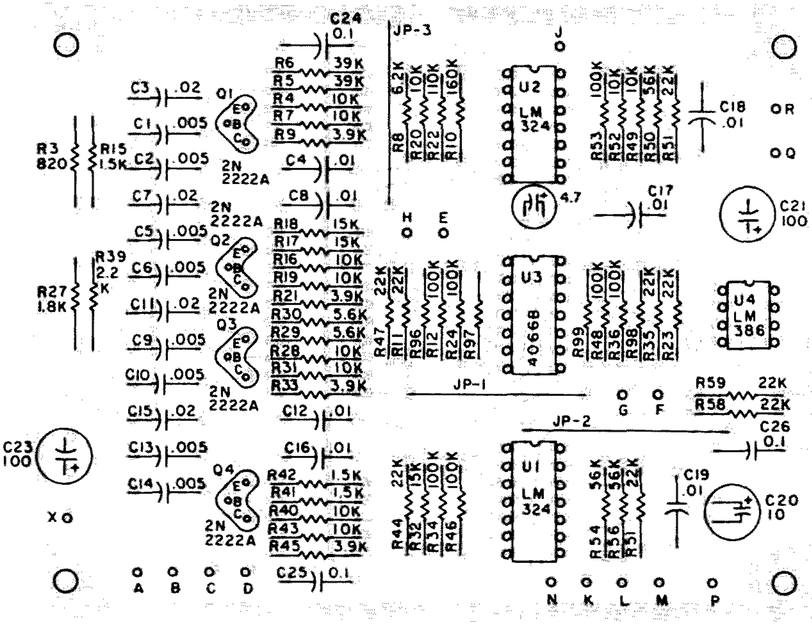

Fig. 6. Oscillator board component layout.

rent requirements to about 40 mA when operating from a battery.

Sine-Wave Oscillators

Four continuously-running twin-tee oscillators (Q1-Q4) generate the sine-wave audio signals. The frequency of oscillation of Q1 is determined by C1-C3 and R1-R7; by comparing these values with the Q2-Q4 oscillators, you can see how changing only resistors R4-R7 alters the center frequency of oscillation. The value of R3 will determine the amount of variation around the center frequency permitted by the coarse- and fine-frequency vernier controls, R1 and R2.

The output of the twin-tee oscillator is taken from the top of C3 and capacitively coupled by C4 to buffer/amplifier U2b. Gain of this amplifier is determined by the ratio of R10 divided by R8. The gain of each of the four buffer/amplifiers is slightly different to accommodate the amplitude drop of the twin-tee oscillators as frequency decreases. Therefore, with the component values shown, pins 1 and 7 of both U1 and U2 will furnish approximately the same output amplitude. The outputs of the four buffer/amplifiers are fed to individual CMOS analog switches (U3). When the control pin 5 of U3b is high (logic 1), pins 3 and 4 are effectively tied together; however, when pin 5 is taken low (logic 0), pins 3 and 4 are effectively open. The resistance between pins 3 and 4 is about 300 Ohms when pin 5 is high, and several hundred megohms when pin 5 is grounded.

With a logic 1 signal on the control pin, either analog or digital signals may be passed through the gate; furthermore, because the gate is bidirectional (effectively only a resistance), either pin 3 or 4 may be used as the input and the other as the output. Each of the four sections of U3 is individually controlled by S1-S4. If desired, S1-S4 may be replaced with a quad latch which can be driven from a computer parallel output port.

The four outputs from the solid-state switch, U3, are then resistively mixed by R12, R24, R36, and R48 and capacitively coupled by C17 to an audio mixer, U2c. The amplitude of each of the four signal lines is equalized by placing an appropriate value resistor (R96-R99) in parallel with R12, R24, R36, or R48. The gain of mixer U2c is set by the ratio of R50 divided by R49. With the components shown, pin 8 of U2c provides 1.08 volts rms to U1d, an isolation buffer with unity gain. U1d drives two output circuits, the audio amplifier, U4, and the output signal buffer, U1c.

The input to the audio amplifier is fed from a resistive voltage divider R56-R57. Neither value is critical; R56 could be replaced by a jumper wire or a 100k-Ohm resistor, and R57 can be any audio taper

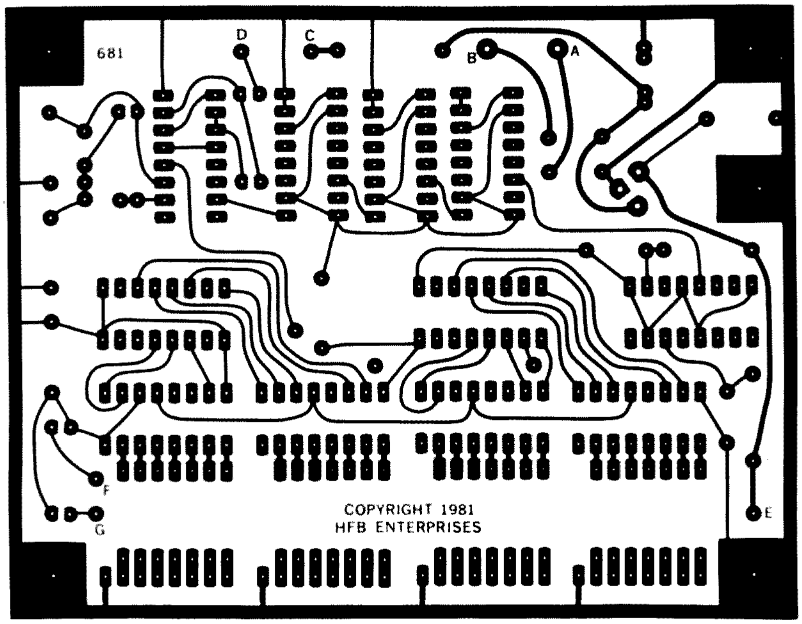

Fig. 7(a). Frequency counter PC board (top).

3. The frequency counter PC board is mounted above the oscillator PC board on 2" bolts up through the chassis floor.

The oscillator PC board is installed first and wired to the panel controls. Don't make the hookup leads so short that you can't lift it off the bolts if required. At this point, you'll have two wires from the oscillator board unconnected, the +5-volt lead (X) and the audio input to the frequency counter (J). With a speaker connected to the rear jack, connect the wire from Point X to a 5-volt power supply and check the operation of each audio channel individually and for mixing of two or more channels. With an ac voltmeter connected to the front-panel terminal posts, check the output level at the center frequency of each of the four audio channels. If the mid-range voltage differs significantly, the channels with lower voltage can be raised to that of the highest-voltage channel by installing an appropriate value resistor at R96-R99.

Disconnect the power supply. Now wire the LED display for the frequency counter; I used a perfboard with 90°-angle IC sockets and color-coded wires soldered to the appropriate LED pins. The same color-code wire should be soldered to the same-numbered pin on each IC socket. Mount the LED display perfboard on 3" bolts so that the LED display is positioned in the center behind the bezel. Lastly, mount the frequency counter PC board on top of the oscillator board and connect to the LED display perfboard, transformer, and oscillator board.

pot with a value of from 10k to 100k Ohms. R56 is included here only to limit the input level to U4 so that it is not accidentally overdriven. The output of U4 is coupled through C21 directly to an external speaker with an impedance of 8 Ohms or greater. For convenience, you may want to mount the speaker inside the test-oscillator cabinet.

The output test signal buffer, U1c, provides final isolation and can, with the components shown, provide a maximum output of 0.5 volts rms (no load), 0.43 volts rms to a 600-Ohm load, or 0.32 volts rms to a 50-Ohm resistive load. If required, additional output can be gained by reducing the value of R54.

In addition to driving U1d, the U2c audio is capacitively coupled through C18 to a separate buffer/amplifier, U2d. The gain of this section is purposely high both to ensure CMOS transition in the following stage and to clip the audio signal peaks to provide some preconditioning prior to being fed to the frequency counter input.

Frequency Counter

The audio signal from point J on the oscillator board is fed to point D on the frequency counter board (see Fig. 2). U5c and U5d form a Schmitt trigger whose output is further conditioned by the CMOS transition characteristics of U5e and U5b. The output of U5b is a digital stream of TTL/CMOS-compatible pulses with approximately a 50% duty cycle; the pulse repetition rate (digital "frequency") of the stream is the same as the analog frequency of the input to U5c.

A 1-MHz oscillator is formed by U5a and U5f. This signal is divided by 100 in each of U6, U7, and U8 to yield a 1-Hz gating signal for the frequency counter. The number of pulses in one second from U5b pin 4 is counted by U10 and U11, decoded by U12-U15, and displayed by LED1 through LED4. At the end of the 1-second counting interval, U9 resets the U10/U11 counters to zero while retaining the previous 1-second interval's count in the U12-U15 latches for a continuous, flicker-free display. Grounding point F will blank the display to conserve power. Point G of the frequency counter board is connected to the lower right-hand decimal point of the least significant LED display to serve as a power-on pilot light.

Power for the entire unit can be supplied either from the ac line or an external battery. Polarity protection diode D1 is included to prevent accidental damage caused by incorrectly connecting the battery. The +5-volt regulator, U16, provides power for both the frequency counter and, through point E of Fig. 2 to point X of Fig. 1, the oscillator board.

Construction

The four-tone oscillator of Fig. 1 is constructed on a 3" × 4" single-sided PC board, and the frequency counter of Fig. 2 is on a 3" × 4" double-sided board. A Ten-Tec MW-8 cabinet (8"W × 4¼"H × 6"D) was selected to allow enough panel room for the frequency verniers, control switches, and frequency counter display bezel. The front panel is shown in Fig.

Applications

The Radio Amateur's Handbook contains an excellent section on the test-

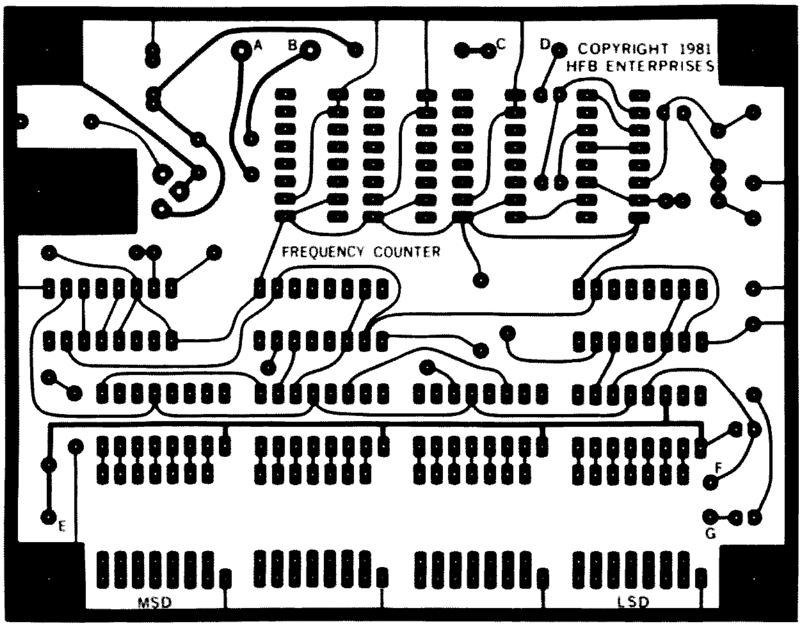

Fig. 7(b). Frequency counter PC board (bottom).

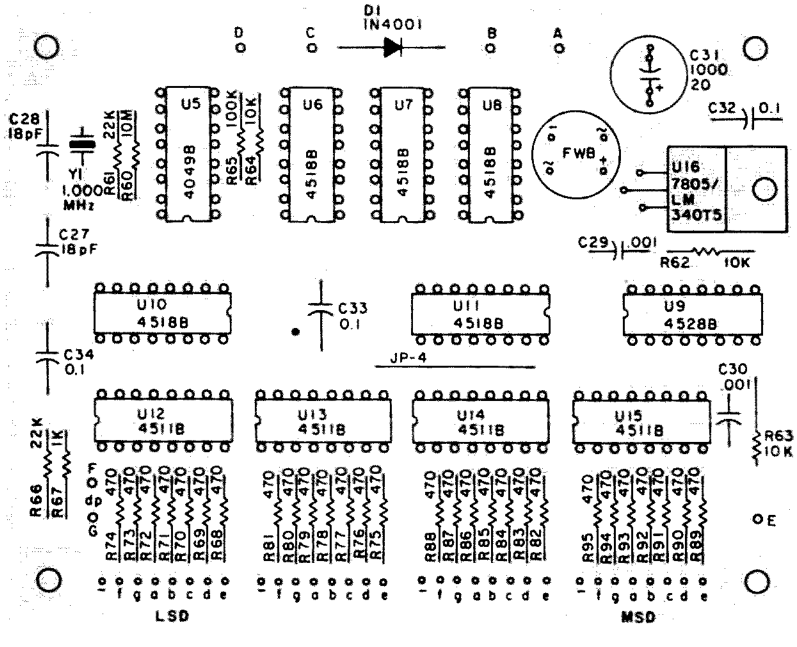

Fig. 8. Frequency counter board component layout.

ing of SSB transmitters using a two-tone test signal to approximate a speech signal. If you have an oscilloscope or modulation display/monitor, the transmitter-modulation waveform can easily be monitored and the modulation level set to get the maximum PEP (peak envelope power) without distortion or "flat-topping" of the audio signal. The four-tone audio oscillator described here is an excellent piece of gear to use for these tests since from two to four independent sine waves can be mixed to form a composite audio test signal. The four-tone oscillator output may be connected directly to the transmitter microphone input since it has a capacitively-coupled output.

Another excellent application is the testing of acoustically-coupled telephone modems for use with computers. The four audio channels can be set individually to the frequencies of the desired mark-space tone pairs for both the originate and answer modes. When connected to the modem inputs, each tone can be enabled separately to fully test the modem without having to reset the oscillator frequencies between mark and space. Simply set each audio-channel frequency vernier to the desired frequency and switch back and forth using S1-S4.

The same procedure can easily be used to test RTTY demodulators. In this case, only two audio channels would normally be required because of the simplex nature of RTTY; the same audio-tone pairs are used in both the transmit and receive directions. In both the computer modem and RTTY cases, you may want to replace S1 and S2 with a single-pole double-throw switch with the center grounded, one side of the SPDT switch going to point E on the oscillator PC board, and the other side of the switch going to point F. With this arrangement, toggling the single switch would then alternate between the preset mark and space tones.

If you're going to use the four-tone oscillator for aligning audio filters or analyzing their audio passbands, you'll appreciate the relatively constant output amplitude across the vernier range of the oscillator. Although there may be some slight variation in amplitude, it can easily be corrected by R55 if a high-impedance (10k Ohms-per-volt or greater) ac VOM or VTVM is used at the audio-oscillator output terminals between point P and ground on the oscillator PC board. With a separate ac VOM or VTVM, you can monitor the audio-filter output voltage easily as a function of the constant-voltage input as the oscillator is swept through the audio range.

You may also want to alter the frequency-determining components of one or more of the twin-tee oscillators for your own particular application. Tone

decoders in the subaudible range and a significantly increased maximum frequency for audio-amplifier testing are only two that come to mind. The twin-tee oscillator design is very versatile in its range as long as both sides of the capacitance and resistance arms remain equal (C1 = C2 and R4 + R5 = R6 + R7). This also ensures minimum distortion of the sine wave. The resistance and capacitance to ground (R1 + R2 + R3 and C3) also will play a part in determining both the center frequency of the oscillator and the range over which it can be tuned. An oscilloscope connected to the oscillator output will be a big help in selecting the right components for minimum distortion.

Parts List

Resistors (1/4 W)
28—470 Ohm
1—820 Ohm
1—1k
3—1.5k
1—1.8k
1—2.2k
4—3.9k
2—5.6k
1—6.2k
14—10k
3—15k
10—22k
2—39k
3—56k
9—100k
1—160k
1—10 megohm

Pots
4—500 Ohm lin
4—2.5k lin
1—25k aud w/Sw
1—25k lin

Capacitors
2—18 pF mica
2—.001 disc
8—.0056 mylar™
7—.01 disc
4—.022 mylar
6—0.1 disc
1—4.7 uF 'lytic
1—10 uF 'lytic
2—100 uF 'lytic
1—1000 uF 'lytic

ICs
1—LM324
1—LM340T5
1—LM386
1—4049B CMOS
1—4066B CMOS
4—4511B CMOS
5—4518B CMOS
1—4528B CMOS

Solid State
1—1N4001
4—2N2222A
1—1A TO-5 FWB
4—7-Seg. LED

Miscellaneous
1—Ten-Tec MW-8 cabinet
1—1 MHz crystal
1—2½" bezel
1—4" 8-Ohm speaker
5—SPST toggle switches
3—RCA phono jacks
1—6.3-V ac, 1-A transformer
1—Ac cord
1—8-pin IC socket
3—14-pin IC sockets
11—16-pin IC sockets
4—14-pin 90° IC sockets
10—Knobs
Misc. mounting hardware

Conclusion

This handy piece of equipment is in near-constant use to test and align other on-going projects. Since the frequency counter reading will be accurate when only one tone is present; tones may be set individually to within 1 Hertz and then mixed to form a composite test signal. One easy-to-include option for additional flexibility is the insertion of an SPDT switch between the oscillator board point J and frequency counter board point D. This allows counting the frequency of an external signal and direct display of its last four digits. ■

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11055	24	$ 4.35	$ 3.90	$ 3.60
11056	28	4.50	4.05	3.75
11057	40	5.95	5.35	4.95
11058	64	10.50	9.45	8.70

RESISTOR ASSORTMENT 82508 - 700 pcs (1 each below assort'd) $22.50
Stock No 82501 10 ea of 10-12-15-18-22-27-33-39-47-56 OHM
Stock No 83502 10 ea of 68-82-100-120-150-180-220-270-330-390 OHM
Stock No 82503 10 ea. of 470-560-680-820-1K-1.2K-1.5K-1.8K-2.2K-2.7 OHM
Stock No 82504 10 ea. of 3.3K-3.9K-4.7K-5.6K-6.8K-8.2K-10K-12K-15K-18K OHM
Stock No 82505 10 ea of 22K-27K-33K-39K-47K-56K-68K-82K-100K-120K OHM
Stock No. 82506 10 ea of 150K-180K-220K-270K-330K-390K-470K-560K-680K-820K-OHM
Stock No 82507 10 ea of IM-1.2M-1.5M-1.8M-2.2M-2.7M-3.3M-3.9M-4.7M-5.6M-OHM
$3.95 each for any assortment

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Stock No.	1-9	10	25
12098	$ 1.28	$ 1.12	$ .95

60/40 ROSIN CORE SOLDER

Stock No	Dia	Length (feet)	Weight (oz.)	Price
50075	.062	9	1.5	$1.16
50076	.062	25	4	2.39
50077	.062	50	8	4.25
50078	.032	33	1.5	1.31
50079	.032	88.5	4	2.47
50080	.032	175	8	4.57

TI WIRE WRAP SOCKETS
Tin plated phosphor bronze contact - 3 wrap

Stock No.	No Pins	1-24	25	100
11301	8	$ .45	$ .40	$ .36
11302	14	.66	.59	.54
11303	16	.72	.64	.58
11304	18	.82	.73	.66
11305	20	1.11	.99	.90
11306	22	1.26	1.12	1.02
11307	24	1.41	1.25	1.14
11308	28	1.71	1.52	1.38
11309	40	2.31	2.05	1.86

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13833	CL3802	4.0-7.0	15±0.7	100	.651x1.2x1.77	24.95
13834	CL3812	4.0-7.0	15±0.7	100	.651x1.2x1.77	24.95
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13809	SOLV30-12	12	4.0A	5-5/8x4-7/8x3-3/16	OVP 4	59.95
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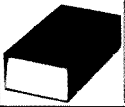

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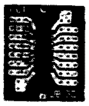

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In order to comply with FCC regulations, all repeaters must have incorporated within them a means of control. If the machine is located in the control operator's shack, the control system can be as simple as the switch on the repeater itself. However, the repeater is usually remotely located well away from the operator's reach, so other means of control must be contrived.

Many types of control systems are in use today, from some as simple as a wire pair to exotic UHF links with tones used as the command medium. The disadvantage of this system is, of course, cost. A control receiver and antenna is needed at the site and every control operator must have a control transmitter which usually isn't as portable as the HT on your belt.

However, let's brighten up the picture a bit. There is a way using resources at hand. The Bell System and friends have provided us with a remarkable communications system which is available to anyone (for a nominal fee) almost anywhere.

There have been many control systems developed using the telephone, and here is one that's inexpensive, easy to build with readily-available parts, and has some very interesting features. For example, this system needs no direct connection to the phone line, has four independent on/off controlled outputs, uses TTL devices needing only a +5-volt supply, and control can be accomplished from any phone, anywhere, at no cost to the user. Now you must admit, this is pretty neat. Fig. 1 shows how we go about it.

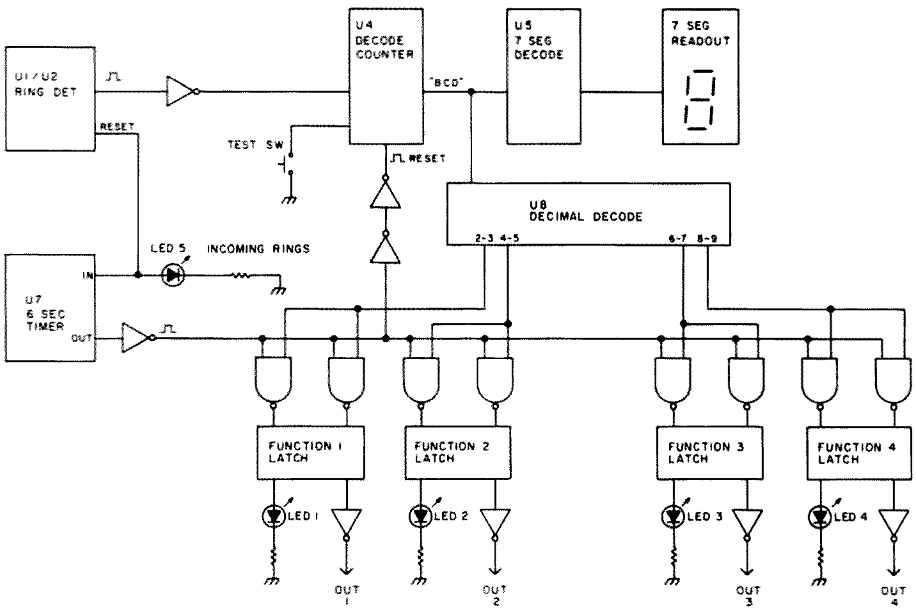

Fig. 1. Wireless-wire remote control system block diagram.

Theory of Operation

In operation, the circuit monitors the phone line, waiting for an incoming ring. When received, the ring is sensed by inductive

coupling to the telephone's internal transformer. The ring-detector circuit converts the rings into a series of logic pulses, one for each ring. These pulses are then counted and stored by a 7490 decade counter. The output from the counter is decoded twice, first by a seven-segment decoder which drives a front-panel readout indicating the status of the counter, and again by a BCD-to-decimal decoder which provides an output on an individual line with each successive pulse.

Another job for the ring detector is to reset a timer circuit with each ring. This timer (a good ol' 555) will fire every six seconds, provided it does not receive a reset pulse from the ring detector. This prevents the timer from firing during a series of incoming rings.

The output lines from the decimal decoder are inverted and connected to one input of individual NAND gates. The remaining gate inputs are paralleled and receive an inverted positive pulse from the timer.

Now we can see that as rings are received, one of the eight used outputs from the 7442, U8, when inverted, will put a high level on its particular output gate. It will remain there until another ring pulse is received, advancing the counter. Or, if the ring stops, the timer is allowed to time out and upon firing, an output will be generated from one of the output gates which will either set or reset the particular output latch.

The latch outputs are isolated from the board outputs by NAND gates connected as inverters. This prevents any noise picked up by the output wiring from getting back into the latches to cause headaches.

Circuit Description

Perhaps the most interesting circuit in the system is the ring detector. It is unique because it needs no direct connection to the phone company wiring.

The whole show starts with a simple tape-recorder pickup coil available at Radio Shack for a few dollars. It comes with cord, plug, and a handy suction cup for sticking it to the telephone.

The coil is connected to the board where it feeds a 741 op amp, U1, wired in a differential configuration (see Fig. 2). This mode reduces the effect of stray rf or noise pickup to a minimum. The output of the op amp feeds Q1, a PNP transistor that converts the output voltage to a level handy to drive the 7413 Schmitt trigger, U2. R1 and C1 serve as a low-pass filter to smooth out the 20-Hz ring voltage, providing U2 with a slowly dropping voltage during the duration of the ring. Diodes D1 through D3 are 1N914 or equivalent.

The Schmitt trigger acts as a NAND gate and provides hysteresis of the input signal. Its output is a clean TTL level of either a high (+5 volts) during a ring or a low (0 volts) between rings. This point is monitored by LED 5, located on the card front, to visually indicate the incoming rings. A pushbutton test switch, S1, also is mounted on the card and is connected to one of U2's inputs to simulate incoming rings for local control and test purposes. The positive pulse from U2 is coupled to the base of Q2 through limiting resistor R2. The incom-

Number of rings	Command
2	Function 1 on
3	Function 1 off
4	Function 2 on
5	Function 2 off
6	Function 3 on
7	Function 3 off
8	Function 4 on
9	Function 4 off

Table 1. Operating code.

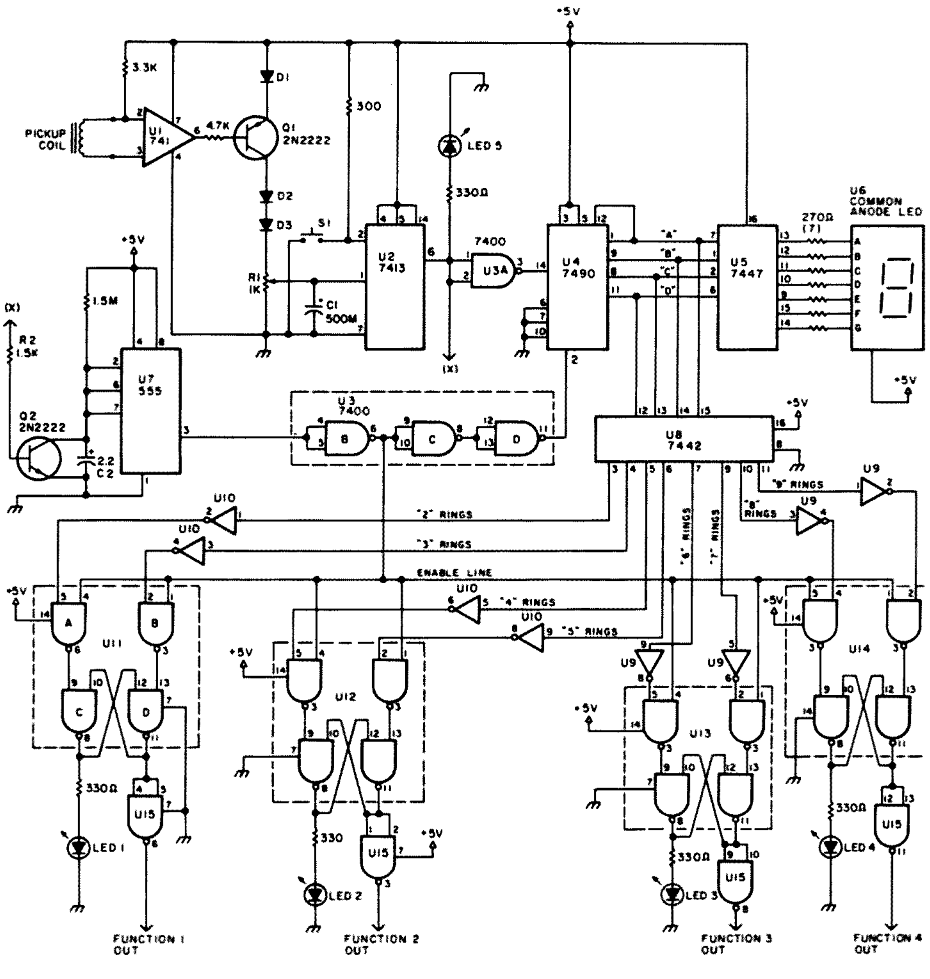

Fig. 2. Schematic diagram of system.

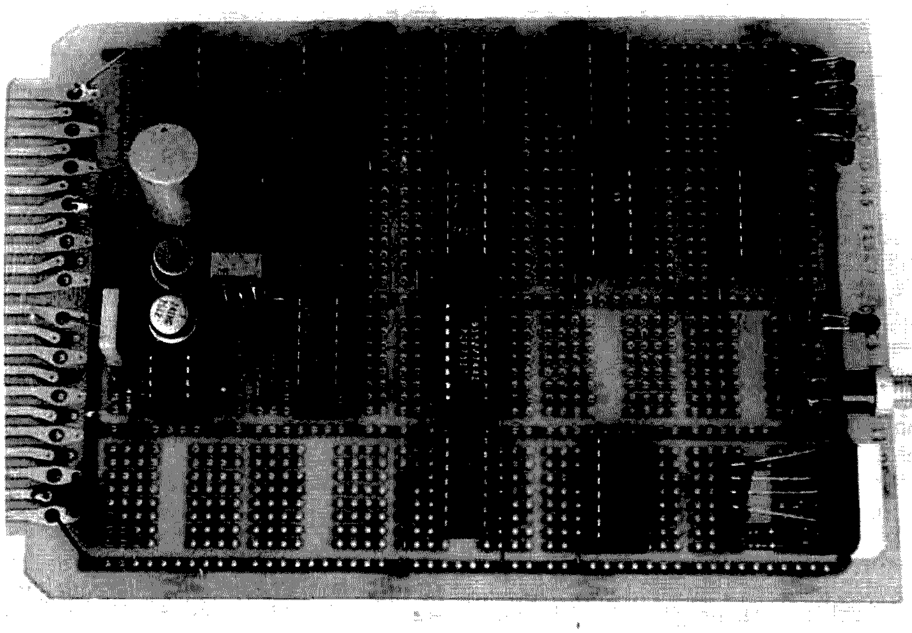

Photo A. Top view of board.

ing ring turns on Q2, effectively shorting out timing capacitor C2 and resetting the timer. The same pulse from U2 is inverted by U3A and steps the counter, U4.

The counter's output, a BCD total of rings received since the last timer firing, is decoded simultaneously by U5 and U8. U5, a seven-segment decoder, and its display, U6, are not actually needed for operation of the board and are there for creature convenience only. It's important to see the status of the counter when testing, and the seven-segment LED will indicate when the timer executes the command by displaying the return to zero.

U8, on the other hand, is essential to the operation of the system for it converts the counter output to a low level on one of its output lines. In operation, decimal outputs 0 and 1 are not used, leaving lines 2 through 9 to do the work.

Now that we've covered the ring detector, timer, and decoders, let's take a look at the schematic, Fig. 2, and follow a command through the steering gates and output latch.

Let's assume the phone starts ringing. The first ring resets the timer and advances the counter to BCD 1. U5 and U6 decode and display the 1 count on the LED. The second ring enters and also resets the timer and advances the counter to BCD 2. At this time, the caller hangs up the phone, the ringing stops, and the timer, which is not being reset by the incoming rings, fires after about 6 seconds. Its output, inverted by U3B, puts a positive pulse on one input of each steering gate. Remember, now, that there are two rings racked up in the counter so the LED displays 2 and only the decimal 2 lead (pin 3) from U8 is low. This signal is inverted and applied to U11A, pin 5. The level here is high and sets the gate up to pass the command pulse from the timer. When the timer fires, the high-going pulse is applied to the other input of U11A, pin 4. During the duration of the timer pulse, both inputs are high, so the output on pin 6 goes low, setting the RS-configured sections of U11C and D. When set, pin 8 of U11 goes high turning on LED 1, a front-panel indicator of latch 1 status. The complementary output from the latch, pin 11, is inverted by U15 and provides an isolated logic-high output at edge-connector channel 1 output which can be used to activate whatever function 1 interface you choose.

If the phone is allowed to ring 3 times, decimal 3 output of U8 (pin 4), after inversion, will activate gate U11B. U11B's output is connected to the reset side of the function 1 latch thereby turning off function 1 when the timer fires.

Note that the timer pulse from U3B continues through U3C and D and is used to reset the counter back to zero. The double inversion is necessary to de-

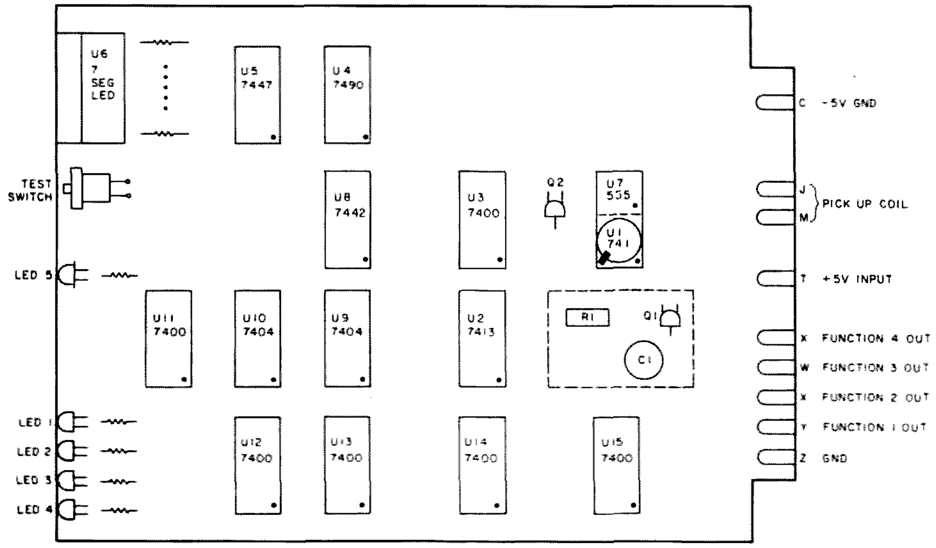

Fig. 3. Parts placement.

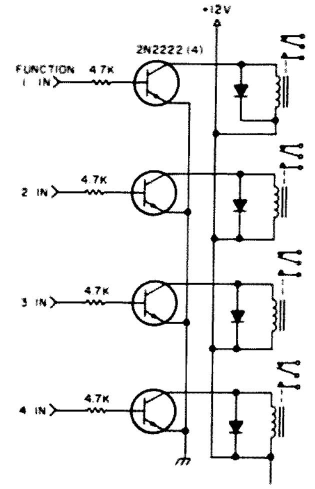

Fig. 4. Relay-control interface circuit.

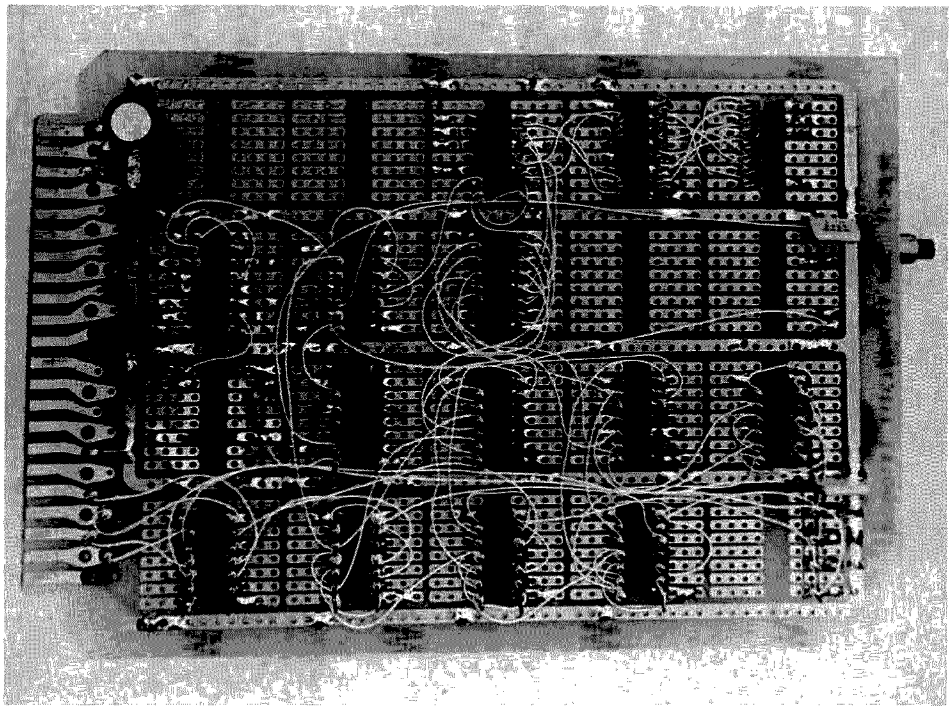

Photo B. Bottom view of board.

lay the reset pulse to the counter to ensure that the command is executed before the count is canceled.

Operation of the three additional function latches is identical except for the amount of rings necessary to select the particular command lines. Table 1 shows the operating code.

Construction

My board was wire-wrapped on a standard 4½"×6" glass board with edge connector attached. I used a board manufactured by Douglas Electronics, 718 Marina Blvd., San Leandro CA 94577. Made of excellent quality material, including gold-plated edge connections, it has room for 20 16-pin DIPs and a convenient power bus arrangement so no Vcc line runs will be over an inch. Designated type 11-DE-6, it's a bit expensive at $16.00, but you get what you pay for.

Parts placement is not critical. My layout is shown in Fig. 3. As with all TTL projects, be sure to scatter a few 0.1-μF disc caps around the power bus to soak up the spikes.

Interfacing

The TTL levels can be used directly from the controller if your operating system is TTL-compatible. If not, some type of interface will be required.

I use a simple relay control circuit, Fig. 4. The relays and accompanying driver transistors are located on another card placed alongside of the controller in the card cage. Some types of miniature reed relays can be driven directly by TTL levels, and if you're really a purist and desire to switch the repeater primary power, a solid-state relay driven directly by TTL can be used.

Phone Requirements

It's obvious that this type of system has some drawbacks. It cannot differentiate between control-operator calls and wrong numbers. We've had no problems in the time this system has been in use, but there are a few things to keep in mind when ordering your phone. Get an unlisted number for obvious reasons and ask for a new number, one that has never been issued. Imagine the frustration possible if you get a reissue of a number used by recently defunct "Pietro's Pizza Palace." It's also good practice not to use the same phone line for autopatch and control because the control operator who tries to dump a nuisance patch will get greeted by a frustrating busy signal.

Wrap-Up

Although the inductive ring detector is new, this system has been in use for about five years with excellent results. Previously, we used a direct connection to the phone line which also worked well. However, we worried what Ma Bell would say if she knew.

When powering the controller, use a well-regulated supply good for about an Amp to be safe. Another good idea is to float the input to the regulator on a battery, as momentary power interruptions quickly upset the output latches.

Hookup and Adjustment

Pot R1 must be set to put the input to the Schmitt trigger just above the trigger level, about 1.5 volts measured at pin 1 of U2. Action of the ring detector can be adjusted by bringing the pickup close to the body of a transformer-type soldering gun while triggering it. You may be surprised at how far the pickup can be from the gun and still get reliable action. Attach the pickup to the phone case using the suction cup. Exact location can be determined by moving it around the phone while it is ringing and watching the "incoming ring" LED.

What to control is left up to your imagination. Some of the control functions we use are: function 1—repeater on-off; function 2—autopatch on-off; function 3—brag-tape disable; and function 4—squelch adjust.

So get your wire-wrapper out and get going. When you're done, you will have a versatile and reliable addition to your system.

Thanks go out to Jim W3BBS for his encouragement and Joe N3JD for the photography. ■

Timothy Daniel N8RK
7 Peabody Drive
Oxford OH 45056

Up and Coming: Direct-Broadcast Satellites

The only thing not up in the air in this business is the satellites, so this budding technology is not just pie in the sky.

Ask three different people about direct-broadcast satellites (DBS) and you are likely to get three different answers. First, there are the entrepreneurs. To them, DBS is the golden opportunity of the 80s, a chance to make big bucks. Next, there are the local broadcasters and cable TV operators. They consider television direct from the satellite to be a threat, especially since the spacecasters will have limited local responsibility. Finally, there are the engineers. The slide-rule and soldering-iron set consider direct broadcasting to a be a noble challenge requiring powerful transmitters and low-cost yet sensitive receivers.

What does DBS mean to you? That depends. But don't go on to the next article in hopes that DBS will go away. Why not find out a bit more as *73* enters its second year of satellite TV coverage?

Before going too far, it is only proper that we acknowledge that a form of satellite broadcasting already exists. But any substantial similarity between the current TVRO craze and DBS ends there. Gone is the need for a 10-foot dish in the backyard and a $1000 receiver in the living room. Central to the concept of 1990s-style DBS is low cost and small size. That way, spacecasters hope to attract an audience as broad as the country itself.

Just about the only aspect of DBS not up in the air are the satellites themselves. Even though this is an industry in its infancy and today's plans could very well line tomorrow's wastebasket, several things can be said with a good deal of certainty.

The direct-broadcast service will use geosynchronous satellites, meaning that like today's TVRO birds, they'll appear fixed in the sky. All that a US viewer will have to do is point his or her dish to the appropriate point on the southern horizon. No tracking or movement of the antenna will be required once it is locked onto the selected satellite.

We also know that the DBS signals will be in the 11-12-GHz region, where frequencies have been allocated for such purposes. This will require new technology since relatively little is available in the way of low-cost consumer electronics at those frequencies. The choice of the 12-GHz "Ku" band almost makes the present day 4-GHz satellite-TV gear look like it is meant for dc!

A third "fact" is that DBS offerings are expected to supplement rather than replace the current system of local broadcasting and cable television. You might want to wait a while before climbing up on the roof to take down the old VHF-UHF aerial.

Pie in the Sky

Imagine a business with 20 million customers, each of whom spends $500 for a receiver and shells out an additional $10 per month for the privilege of unscrambling signals. It doesn't take a calculator to figure out that DBS equals big money, probably in the billions of dollars per year. And, as you might expect, a lot of people are already looking for a piece of the action. Participants in the DBS free-for-all range from big guns like RCA, CBS, and Western Union to a handful of basement tinkerers bent on building a better mousetrap, receiver style. Someplace in the middle are outfits like Advance, Inc., and Home Broadcast Television, hardly household names—at least not yet.

Money-making methods vary. Firms like RCA and Western Union, already experienced in satellite technology, would like to act as

DBS: IS THERE A DISH IN YOUR FUTURE?

Shortly after this article was written the FCC granted approval to Satellite Television Corporation's plan to construct a direct-broadcast satellite-television system.

Satellite Television, a subsidiary of Communications Satellite Corporation, was the first firm to apply for spacecasting rights and is the first firm to get approval. The STC proposal, which calls for four satellites, suggests that three channels of scrambled programming could be activated by 1986.

Eight other applications for direct-broadcasting service were scheduled for FCC action by the end of 1982. A September 24, 1982, *Wall Street Journal* report goes on to say that no DBS hopeful will receive orbital or frequency assignments until after a hemispheric conference in mid-1983.

US Home Earth-Station Sales

	1982	1984	1987	1990
Backyard Terminals				
Unit Sales (thousands)	25	75	120	5
Installed Base (thousands)	41	161	506	611
Revenues ($ millions)	175	375	360	15
Rooftop Terminals				
Unit Sales (thousands)	—	216	2000	5000
Installed Base (thousands)	—	290	3582	15582
Revenue ($ millions)	—	650	1420	2270

(Source: International Resource Development, Inc.)

Fig. 1. International Resource Development, Inc., shows a growing market for "backyard" TVRO terminals through the mid-1980s. By the end of the decade, the "rooftop" terminals will begin to predominate.

carriers, leasing satellite transponders to broadcasters. Other groups, like United States Satellite Broadcasting Co., will need to seek out technical partners to complement their skill in producing programs and selling advertising. A third segment of DBS hopefuls would like to act in a manner similar to cable-TV suppliers. They would purchase most of their programming and generate income from rent on decoder boxes or royalties paid by local distributors.

The markets for direct broadcasting are as varied as the potential suppliers. CBS has requested three channels. One slot would serve as a feed to local CBS stations and individuals unable to receive local broadcasts. The remaining two channels are needed to distribute programming directed at businesses like cable TV and movie theaters. CBS signals would, in all likelihood, be scrambled to prevent unauthorized reception.

Other proposals, like the one from National Christian Network, suggest reaching a large audience with costs offset by advertiser support. In this instance, there is little to be gained by scrambling the signal.

Crystal Balls

Giving a precise estimate of the size of the DBS pie and how it is to be divided is as difficult as it is foolhardy. You can get a general idea by turning to expert researchers. For example, after consulting the woolly worms, International Resource Development stated, in a release for a $985 market report, that "over 15 million US homes will have rooftop DBS terminals by the end of the decade." An announcement publicizing a $1500 report from Strategic Incorporated is slightly more conservative, predicting (1) that DBS won't get a firm start until 1985-1986, and (2) a 1990 sales figure of 160,000 antennas for DBS.

Fig. 1, from International Resource Development, Inc., shows not only the forecasted growth of DBS, but also the effect that it will have on the TVRO industry. Sellers of the backyard terminal can expect a growing market through the mid-1980s but will feel the DBS pinch by 1990. Graphics from Strategic Incorporated (Fig. 2) show that home antennas may constitute a whopping 96 percent of the small Earth stations sold in 1990 yet make up only 45 percent of the dollar volume as a result of the much lower per-unit cost of DBS terminals.

Whither TVRO?

Where does this leave the potential backyard owner and the dozens of firms currently in the TVRO market? There have been no signs that distributors currently using the 4-GHz satellites will abandon them in the near future. To do so would place an enormous burden on the cable-TV industry.

The home TVRO market, which insiders pegged at about 50,000 terminals in 1982, should continue to grow through the mid-1980s. Potential growth stoppers would be federal regulations restricting or prohibiting "unauthorized" reception or a widespread move towards scrambling signals. So far, few suppliers have considered it worthwhile to invest in encryption to lock out the home segment. With time, the suppliers may overcome their reluctance to "deal direct" with the home viewer and offer some sort of plan for authorized home reception.

The entrepreneur who sees the rosy market predictions and wants to join the home-terminal fray faces a tough road. Garage and basement operators are quickly falling by the wayside as firms grow and attract outside capital. The homemade dish on the back of a pickup and the marginal receiver that characterized many early dealers just don't hack it anymore. Ambitious selling and truly innovative products will still catapult the small-time operation upward, but the days of quick profit, if there ever were any, are now over.

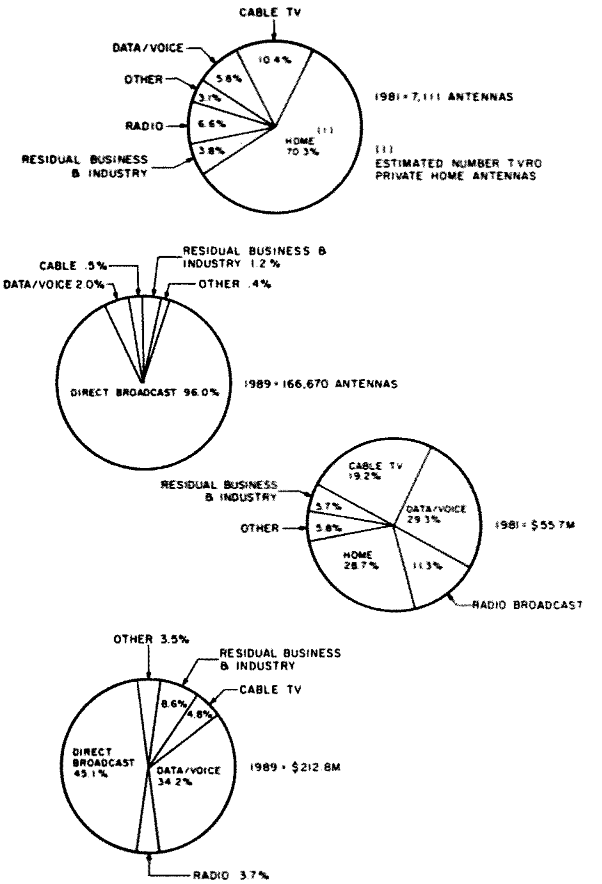

Fig. 2. Research by Strategic Incorporated suggests that DBS sales will capture much of the unit total for the Earth-station industry but consist of less than half of the dollar total.

Jobs

Dismiss all those dreams of the big bucks? No, not necessarily; just recognize that DBS is not going to be an "afterthought" industry with the hobbyist roots that the present-day TVRO field has. A number of the manufacturers have already caught on to this and are claiming that their antennas, designed for 4-GHz reception, will work just fine at 12 GHz. A few companies are even tinkering with Ku-band circuitry. But no matter what technical standards are finally accepted for DBS and no matter who the program suppliers are, there will be a good market for knowledgeable engineers and technicians. After all, someone has to design, install, and maintain those twenty million terminals. ■

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Part II of this article, next month, will focus on the technological challenge of DBS.

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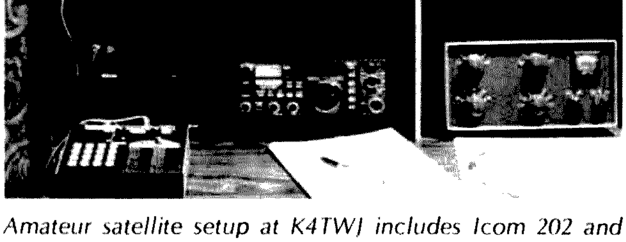
Work the Russian Robot Ops

The robots aboard Russia's two new satellites are cantankerous and challenging. Here are some tips on how to work them.

The recent addition of several Russian spacecraft into the amateur radio satellite program truly has created a flurry of excitement on the HF and VHF bands. In addition to introducing many newcomers to amateur satellite activities, these birds are also renewing widespread interest in mode A communications (2-meter SSB/CW uplink, 10-meter SSB/CW downlink). If you would like to relive the sheer fun and enjoyment of your early days in ham radio—those times when every contact held special meaning and gave you a feeling of accomplishment—you've only to join the action on our amateur radio satellites.

The staggered orbits and comparatively high altitudes of RS (Radio Sputniks) spacecraft afford a communications range and pass-operating time roughly equivalent to the now-classic OSCAR 6 and OSCAR 7 satellites: approximately 1700-km altitude and 25 minutes. Numerous intercontinental QSOs have been conducted each day via the RS satellites, and you can join this excitement with a minimum of effort.

The RS satellites exhibit very high sensitivity, eliminating the need for sophisticated antenna systems or high-power uplink signals. As an example, I recently made fine contacts during an RS pass while using low power (10 Watts) and a J vertical for 2 meters. Mode A communications are the easiest way for HF-laden amateurs to join today's space activities, and the automatic QSOing robots aboard RS5 and RS7 are an absolute blast to contact.



Amateur satellite setup at K4TWJ includes Icom 202 and 40-Watt amplifier for uplink, Icom 730 for downlink. 12-volt power for the 40-Watt amplifier is pulled from the Icom 730's PS15 power supply. SSTV capability included. The programmable Morsematic keyer was used for contacting RS5 and RS7 robots. SF radio desk with upper shelf holding 2-meter gear proves a great convenience for satellite operations.

RS Satellites and Orbits

Two prime attractions of the RS satellites are their straightforward band-to-band frequency relations and their orbital-calculation simplicity. As shown in Fig. 1, each satellite receives signals within a 50-kHz spectrum of 2 meters and linearly relays them within a 50-kHz spectrum of 10 meters.

Each spacecraft's beacon can be used for determining when that bird is within communications range and for indicating when its translator is on/off. The beacon continuously transmits a series of letters and numbers, called information channels. Transmissions containing KØØ indicate the transponder is off; KØ5 to K99 signify that the transponder is operational. Equipped with his own copy of the previously-mentioned frequency-relation chart for

RS5 and RS6		RS7 and RS8	
Uplink (MHz)	Downlink (MHz)	Uplink (MHz)	Downlink (MHz)
145.910	29.410	145.960	29.460
145.920	29.420	145.970	29.470
145.930	29.430	145.980	29.480
145.940	29.440	145.990	29.490
145.949	29.449	145.999	29.499
Beacon	29.450	Beacon	29.500

Fig. 1. Frequency-relation chart which can be used for guiding operations during a satellite pass. An RS6 uplink signal on 145.928 MHz, for example, would be relayed on 29.428 MHz (± Doppler). Allow ±3 kHz on all RS downlinks for Doppler shifts.

a particular RS satellite, the operator is well on his way to enjoying some exciting space-age communications.

The next item of consideration is an orbital-calculation method for accurately plotting a specific satellite's pass. As a matter of convenience, I suggest rounding out each craft's orbital period from 119.xx minutes to an even 2 hours, and each orbital incrementation from 29.xx to an even 30 degrees. These changes are of minor consequence provided they are used in conjunction with reference-orbit information listed each month in the amateur magazines. An OSCARlocator (with RS curves) is also highly desirable, especially when attempting to catch early morning north-to-south passes in the United States.

Assuming a satellite enthusiast is located in the mid-US, his no-problem communications range falls between 70 and 110 degrees. (This information is shown on most world maps.) Assuming a particular day's reference orbit for a selected bird is listed as 220 degrees at 0630 GMT, simply subtract 2-hour and 30-degree steps until the craft falls within range: 220 − 30 = 190 at 0430 GMT, 190 − 30 = 160 at 0230 GMT, 160 − 30 = 130 at 0030 GMT (almost within range), and 130 − 30 = 100 degrees at 2230 GMT (the previous GMT day): a perfect afternoon pass.

Finally, an antenna placement/operating chart is drawn for the selected pass. Since a typical "high in sky" pass lasts approximately 25 minutes and since a couple of minutes can be expected between equator crossing (EQX) and acquisition of beacon signals (AOS), a typical chart will look like Fig. 2. This chart and the frequency-relation chart are then used to "automatically" direct operator actions during the pass (spotting frequencies, incrementing beam-antenna position, etc.). The operator is then free to enjoy communications fun.

Time	Activity	Beam Position
2230	EQX	South
2232	AOS	South
2234	CW	SSW
2236	CW	SW
2238	SSB	West
2240	SSB	West
2242	PASS MIDDLE	West
2244	CW/SSB	WNW
2246	CW	WNW
2248	CW	NW
2250	CW	NW
2252	LOS	NW

Fig. 2. A typical antenna placement/operating chart drawn for a planned RS pass, indicating planned activity and antenna movements. Since this information will be used only one time it can be written on a piece of scrap paper. The uplink antenna in this example is tilted approximately 30 degrees to bypass dual rotor needs.

As RS satellites are quite sensitive, they require only a few Watts ERP (Effective Radiated Power) for successful operations. *Please, gang, bear that fact in mind and control your 2-meter power accordingly!* Transponders on some RS satellites have been continuously knocked off by amateurs running excessive 2-meter ERP. In order to prevent agc clamping and attenuation of others' signals, your satellite-returned signals should *always* be slightly weaker than the beacon (approximately 40-Watts ERP).

Working the Robots

Two of the Russian satellites, RS5 and RS7, carry automatic QSOing robots which conduct separate amateur radio activities approximately 100 kHz below their spacecraft's transponder—see Figs. 3(a) and 3(b). The robot will call CQ, ID (either RS5 or RS7), announce its 2-meter CW listening frequency, and stand by for calls (bedlam, which I will discuss presently).

Satellite	Uplink Receive	Downlink Transmit
RS5	145.826 MHz	29.331 MHz (± Doppler)
RS7	145.835 MHz	29.341 MHz (± Doppler)

Fig. 3(a). Frequencies used by the RS robots for contacts with Earth-based amateurs. Frequencies may vary ±3 kHz with Doppler shift.

Robot:	CQ de RS5 QRU on 145.826 MHz $\overline{\text{AR}}$
Amateur:	RS5 de K4TWJ $\overline{\text{AR}}$
Robot:	K4TWJ de RS5 R QSO Nr 740 RST579 OPR
Robot:	Robot...etc...K
Amateur:	RS5 de K4TWJ R QSO RST579 QTH ALA OPR
Amateur:	Dave...etc...K
Robot:	K4TWJ de RS5 QSL 73 CQ de RS5 QRU...
Robot:	etc...$\overline{\text{AR}}$

Fig. 3(b). QSO format used for contacting robot operators aboard RS5 and/or RS7 satellites. Speed must be between 16 and 20 wpm, and keying must be exact.

Assuming an amateur contacts the robot, he receives a signal report and QSO number, etc., which can be used for QSLing the unique space-type contact. Following a subsequent reply and exchange of 73s, the robot again calls CQ and begins further QSOs. As this article is being written, heavy pileups and ill-informed operations on the robot's 2-meter listening frequency are causing jamming and confusion. Simply stated, *all* stations must take turns calling and working the robot. Transmissions *must* be held to one station at a time, otherwise Morse transmissions become a series of unintelligible dashes or continuous carriers.

The robot's receiving bandpass is approximately 5 kHz, yet any (or all) signals load into memory and are relayed on 10 meters with the same pitch. Thus you can hear the 2-meter input exactly as the robot hears it. If all stations attempting to contact the robot use FM-repeater tactics (transmit only when other stations are not transmitting—an easy task since satellite operations are full duplex), confusion is eliminated and all can enjoy contacts.

Even with those situations dealt with, robot contacts are yet a challenge: RS5 may tell you to send faster (QRQ) or send better (QSD). Despairingly, you load the complete QSO format into a programmable keyer of variable speed and plot a wee-hour pass to avoid QRM. That time, RS5's robot only listens (you hear your 10-meter-relayed signals, but where's the robot?), and RS7 follows a few minutes later calling CQ! The Russians can truly be proud of their designing and programming of these robots. They're clever, inspiring, challenging, aggravating, and fun. If you manage to wrangle a contact, you're a fairly good operator.

Satellite Equipment

There's a good chance you already possess the basic equipment for RS-satellite operations, namely an HF rig with full 10-meter coverage and an all-mode 2-meter rig. You've only to combine these units at one operating location to join the excitement of amateur space communications. Although the RS satellites usually produce a slightly stronger downlink signal than OSCAR 8, a relatively sensitive receiver is desirable (TS-830, TS-130, IC-730, FT-102, etc.). An outboard receiving preamplifier is also quite beneficial, but

not mandatory. Some of the presently-popular 2-meter rigs suitable for RS activities are Yaesu's FT-480R, Kenwood's TR-9130 and Icom's IC-251A. Portable units such as Yaesu's FT-290R or Icom's IC-202 are also grand, although non-QRP enthusiasts may want to add a high-gain antenna or small rf amplifier (operating power can be borrowed from the HF transceiver's 12-volt supply, since very low current is used when that unit is receiving).

The most popular antennas for 2-meter satellite operations are twist or crossed yagis which contain an equal number of horizontal and vertical elements plus a phasing harness for circular polarization. Due to the sensitivity of the RS satellites and the gain of vertical J antennas, however, I've recently experienced quite acceptable results while using KLM's new JV-2 J antenna. That thing really works! Most amateurs merely use crossed dipoles or their triband beam for receiving 10-meter satellite signals. In fact, the RS birds can easily be worked mobile if desired!

Conclusion

The RS amateur satellites represent a true era in both space-age communications and Phase II (low orbit) operations which can be enjoyed by almost every radio amateur. If you're just getting started in amateur satellite activity, I suggest operating RS6 and RS8. The transponders aboard these satellites are somewhat better than RS5 or RS7, and they exhibit less heavy fade. Whichever way you go and whatever gear you use, you will find satellite communications a refreshing new experience in amateur radio. It is indeed tomorrow's frontier in today's world. ■

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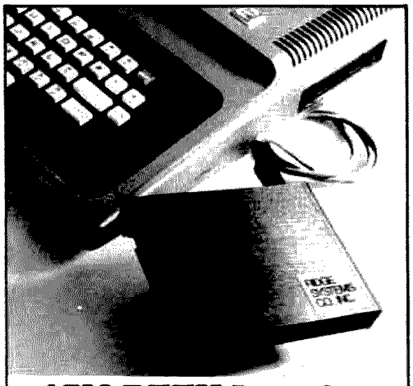

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Ham Radio Hits the '82 World's Fair

When the gates in Knoxville opened, would WA4KFS be ready? Here's the inside story of the World's Fair station.

While the health pavilion was being finished, local hams installed two towers, tribanders, a 2-meter antenna, and dipoles.

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Photos by WD4MQQ

The theme was energy, and amateur radio generated plenty of it—rf and human—during a successful six-month run at the 1982 World's Fair in Knoxville.

SSTV contacts to Europe, the opportunity to send radiograms to the folks back home, rag-chewing on RTTY, and a lot of conversation about the excitement of ham radio were among the activities fair visitors found at the Tennessee Wireless Association exhibit.

Thanks to the tireless work of a group of East Tennessee hams and the generosity of US amateur radio dealers and manufacturers, our worldwide, high-technology hobby continued in Knoxville the long tradition of ham radio at world's fairs.

Officials of the City of Knoxville's health pavilion, where the amateur station was located, estimated as many as half the fair's approximately 11 million visitors could have seen the amateur radio exhibit during the May to October exposition. It was a magnificent showcase for amateur radio.

Plans for bringing amateur radio to the '82 fair began about a year before the event opened. Many of the original group that met at the Knoxville and Oak Ridge hamfests early in 1981 to talk about the idea of ham radio at the fair went on to assume major responsibility for the effort.

The group incorporated itself as the Tennessee Wireless Association, a nonprofit organization char-

Operators from throughout the US and many foreign countries stopped by to operate the station. A commemorative certificate and QSLs were available from the Tennessee Wireless Association.

tered for the sole purpose of sponsoring an amateur radio exhibit at the fair. Under TWA president Ed Dunn W4NZW, the group's first order of business was to approach fair officials about obtaining a site for the station. Virgil Davis KA4RPA, a TWA officer, talked with Knoxville mayor Randy Tyree and secured a location in the city's health pavilion. Health care under emergency conditions was the theme of several exhibits in the pavilion, and the mayor and city officials felt the station would be appropriate there because of the emergency-communications aspect of the amateur service.

The site was superb. The health pavilion was a striking geodesic dome in the center of the fair site, near the Sunsphere, the fair's theme structure. An additional benefit was being located in a high-traffic area near the pavilion's entrance.

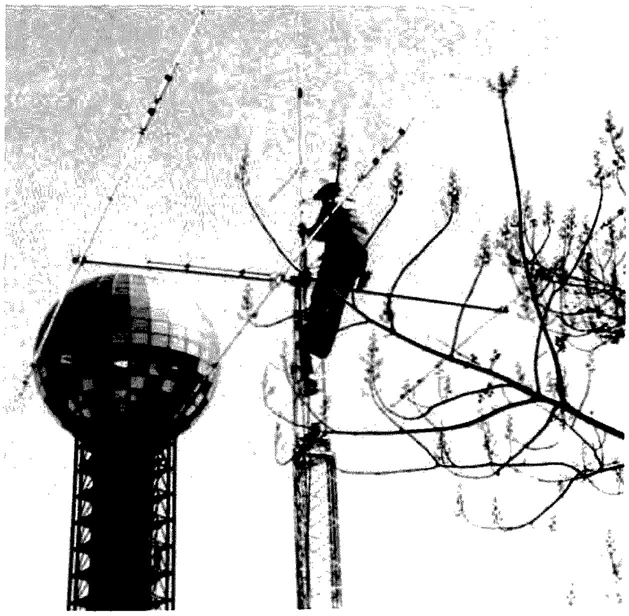
With the exhibit space tied down, TWA officers turned their attention to lining up equipment which would demonstrate the diversity of amateur radio. Ten-Tec, Inc., located in nearby Sevierville, was asked to supply HF rigs for three stations. The company agreed, and Tom Salvetti WD4FVU of Ten-Tec accepted the job as equipment coordinator for TWA.

Amateur dealers and manufacturers responded generously to Salvetti's calls, and approximately $20,000 worth of state-of-the-art gear was loaned and soon on its way to Knoxville.

L. B. Cebik W4RNL, who has written a book on station design, was called on to produce a layout making the most efficient use possible of the 105-square-foot space. Three stations, two designated for general operating and one for specialized communications, were planned.

Although equipment needs were largely met by dealers and manufacturers, funds for installation and operation of the station were needed. Eleven area radio clubs and more than 60 individual amateurs responded, and Jerry Goodchild K4DZR, TWA secretary/treasurer, reported that approximately $2000 was donated to support the station.

Jerry also accepted, with the help of station trustee Chip Coker KD4C, the job of scheduling control operators for the station. About 40 hams each month worked shifts of three to eight hours as control operators. The station was staffed almost all of the 12 hours per day the six-month fair was open.

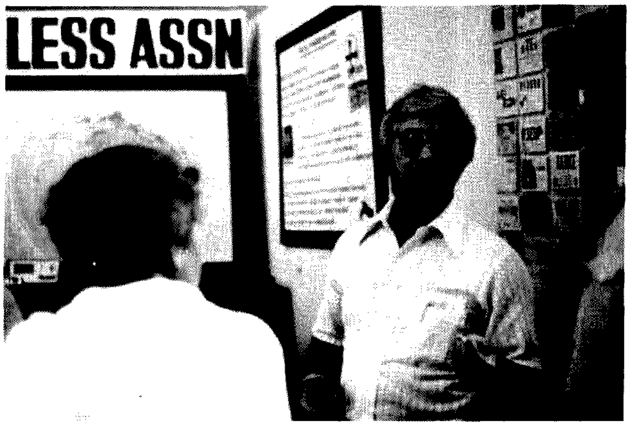


George Child N4BCS installed the 2-meter antenna atop one of the two crank-up towers in the shadow of the Sunsphere.

TWA directors talked about asking the FCC for a special callsign for the station, hoping that Knoxville's hosting the first world's fair in the South would persuade the commission to relax regulations on special calls. Deciding that prospect was dim, Chip KD4C offered the use of WA4KFS, for which he is trustee. Perfect—the phonetics would be "Knoxville Fair Station."

A year-long planning effort by TWA paid big dividends when the time came to install the station. Construction at the fair site was on a tight schedule, with several buildings being ready only hours before the May 1st opening. While work continued on the health pavilion, TWA erected its two 50-foot towers and rotors from Hy-Gain/Telex and Texas Towers. Aboard were a Hy-Gain TH-3 and a V-2 for 2 meters and a KLM KT34A. Dipoles

Three complete HF stations with SSTV and RTTY made up the amateur radio exhibit at the Knoxville World's Fair. Information on amateur radio for non-hams was available at WA4KFS.



With QSLs in the background, Charlie Price WB4VFP explained the many facets of amateur radio to the public.

for 40 and 80 meters were cut, and feedlines from Times Wire and Cable Company were strung and ready to be hooked to the rigs.

The three stations were built around Ten-Tec Omni C transceivers and Hercules solid-state linear amplifiers. Matching tuners, vfo's, keys, and mikes were from Ten-Tec, with MFJ providing memory keyers and clocks. KDK Distributing of Nashville supplied KDK 2036 transceivers for 2 meters. All the gear was housed in stylish consoles from S-F Amateur Radio Services of California.

The latest RTTY equipment was sent to Knoxville by Hal Communications, and SSTV gear came from Robot Research. Both slow-scan and Teletype® attracted a lot of attention from non-hams who stopped by the exhibit.

RCA and Smith-Victor Sales supplied the SSTV camera, monitor, and tripod, and Overman International, which has a manufacturing plant in Knoxville, provided chairs for the station, which was fully accessible to handicapped operators.

A crowd of 82,000, including President and Mrs. Ronald Reagan, enjoyed opening day ceremonies on May 1st. Shortly after the official festivities, WA4KFS went on the air. Pileups were common, as hams around the world wanted an '82 World's Fair QSL card or a special certificate for working the station and 10 other Tennessee hams from May to October.

Amateurs coming to Knoxville were provided with World's Fair information via ham radio. A 2-meter information station was built and placed on the air by Robin Rumbolt WA4TEM. By keying the station on simplex and giving their call, hams received information on parking, shuttle bus service, and lodging. Area repeaters were monitored by operators who could give directions and answer questions about East Tennessee and the fair.

Many amateurs heard of WA4KFS from the 2-meter information station, but a large number said they knew about the exhibit before coming to Knoxville, thanks to the work of publicity director Steve Kercel AA4AK. Some hams spotted the tribanders and followed the coax into the pavilion. All visiting amateurs were asked to sign the guest log at the reception counter and were given the opportunity to operate the station.

And operate they did—all modes, all bands. Some kept skeds they'd made in advance, others checked into nets, some looked for DX. Many added considerable skill to the art of ragchewing.

Control operators answered thousands of questions from non-ham fair visitors and helped hundreds fill out radiograms, which were moved by Anita Teffeteller NG4J, one of the nation's top traffic handlers. Brochures about the station with tips on how to become a ham were given to those who stopped by for a chat.

Several control operators said they found conversations with fair visitors—American as well as foreign—interesting and educational. The foreigners came from Australia, South America, New Zealand, South Africa, Europe, and many other parts of the world.

If you worked the World's Fair station and want a QSL, send an SASE to Harvey Cross W4PKM. You can get the special certificate for working WA4KFS and 10 other Tennessee stations by sending $2 and log confirmation to Sarah Hickey N4EFA.

TWA, the 1982 World's Fair, and the amateur community express their gratitude to the manufacturers and distributors who made the "Knoxville Fair Station" possible. Those firms were: Hal Communications, Hy-Gain/Telex, KDK Distributing, KLM Electronics, MFJ, Overman International, RCA, Robot Research, S-F Amateur Radio Services, Smith-Victor Sales Corp., Ten-Tec, Inc., Texas Towers, and Times Wire and Cable Co.

Thousands of people at the fair saw amateur radio at its finest, and East Tennessee hams who served as control operators and repeater monitors threw in a large dose of southern hospitality for good measure.

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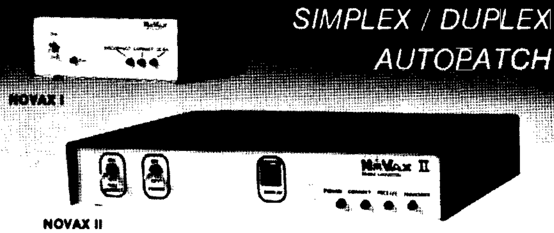

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One of the simplest ways to add the bfo function to a converted CB set was described in my article, "CB to CW?—converting the Hy-Gain board," in the July, 1982, issue of *73*. That technique is to leave the transmitter carrier oscillator on during receive so that it beats against the received signals. It is cheap and easy, but does have the drawback of reducing the receiver dynamic range since the bfo signal travels through the entire i-f path before reaching the detector. The rest of that rig turned out so well that the project really deserved a proper bfo to bring the receiver performance up to par. The circuit described here did that job nicely and should also be of interest to anyone wanting to add CW or SSB reception ability to a converted AM-type CB set having a 455-kHz i-f.

The modified circuit consists of a straightforward 455-kHz bfo and buffer used together with a simple product detector in lieu of the existing diode AM detector.

Photos by W1GSL

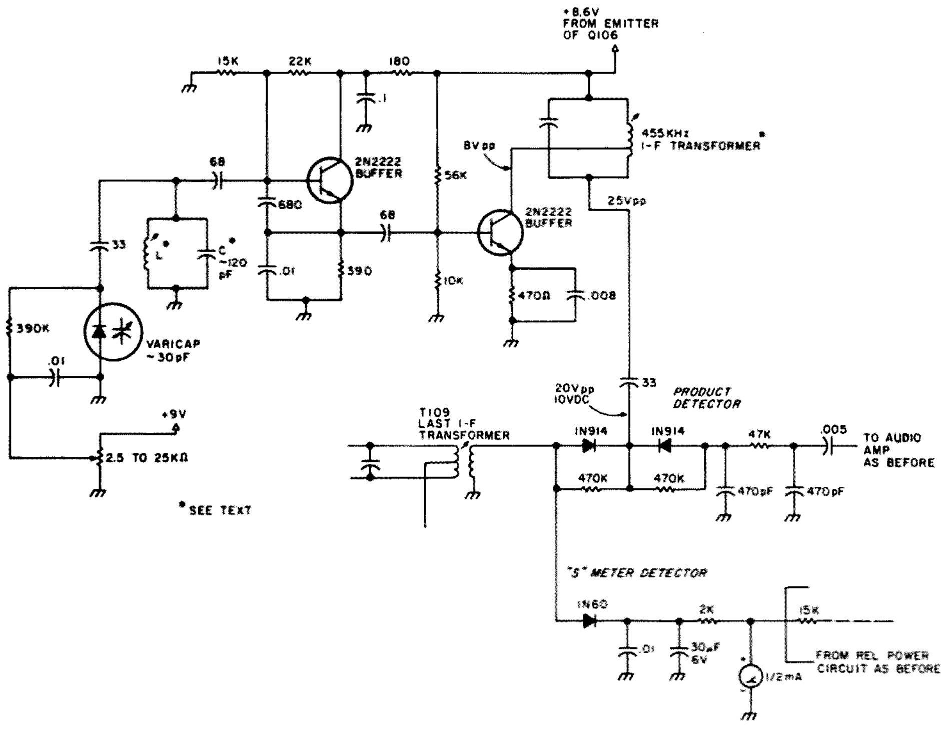


Fig. 1. Schematic diagram of bfo and detector circuits.

"Before" and "after" testing at my home QTH and several local CB hot spots showed a dramatic improvement. The receiver is still capable of copying a .1-μV signal, but the occasional spurious responses are gone. In addition, the bfo frequency is adjustable and can be used for variable receiver offset. The transmitter carrier oscillator provides a signal for transmit frequency spotting and the separate bfo circuit has even made it possible to reconnect the S-meter. One philosophical drawback is that the bfo is a free-running oscillator that introduces the possibility of drift to an otherwise crystal-controlled receiver. The circuit components were chosen so that the warm-up drift is only several hundred cycles; that isn't objectionable given the ability of accurately spotting the transmitter frequency. The transmitter itself is still fully crystal-controlled and (pardon the pun) rock stable.

The Circuit

The circuit diagram for the bfo and detector is shown in Fig. 1. 2N2222 transistors were used in this version, but any NPN i-f transistor from an old transistor radio should work just as well. It is a rare transistor these days which won't work at 455 kHz.

The oscillator coil is fashioned from part of an old tube-type i-f transformer. At first, a miniature 455-kHz i-f can was used as the tank circuit, but the thermal stability was terrible. Simply placing a fingertip on the side of the shielded coil introduced enough temperature change to cause a several kHz frequency shift.

Assuming the temperature coefficient of the ferrite core was at fault, I turned to the older style large i-f can since the inductance there is achieved by using more wire and less ferrite. The top section of the transformer was removed for use as a coil as shown in the sketch of Fig. 2. The coil was paralleled with enough capacitance (120 pF in my case) to get a 455-kHz oscillation with the slug almost backed out of the coil. That step ensures that any change in the slug permeability with temperature will have minimum influence on the oscillator frequency.

In addition, most of the capacitors in the oscillator are polystyrene dielectric types used because of their reputed stability. This step may not really be necessary from a drift standpoint, but it certainly doesn't hurt. The 10-minute warm-up drift of the receiver is only 300 cycles, and that includes drift due to several crystal oscillators as well as the bfo. The bfo frequency can be shifted over a 3-kHz range with a variable capacitance diode controlled from a front-panel potentiometer.

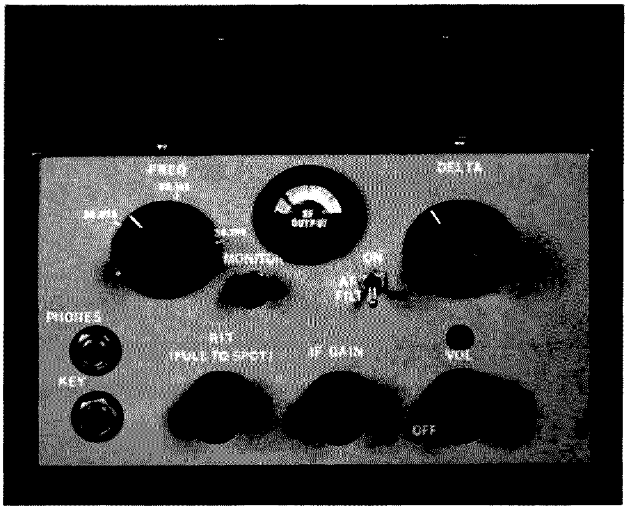
The oscillator is followed by a buffer stage tuned by one side of the miniature i-f transformer. The transistor collector drives a tap on the coil and the detector drive is taken off at one end. This steps up the available drive signal from 8 to 25 volts peak-to-peak. The drive level is not critical, but in general the bfo injection should be about 10 times the expected signal level. If a number of transformers can be salvaged from old radios, a suitable one can be selected with the aid of a simple voltmeter circuit like that suggested in Fig. 3. Use an ohmmeter to find which windings have a tap, then put that coil in the circuit and check the output voltage with the meter. Don't forget to try swapping the dc feed and output ends of the coil to find which hookup gives the most output level. Any drive above 10 to 15 volts peak-to-peak (3.5 to 5.5 Vrms) will be satisfactory.

The two-diode product detector works like a pair of SPST switches which make and break the connection between the i-f output and the following audio amplifiers at a 455-kHz rate. The 33-pF coupling capacitor charges up to the peak value of the bfo sine wave and that makes the final buffer tuning easy—just hang a high impedance dc voltmeter on the junction of the two diodes and tune the buffer for maximum. The larger this voltage, the more signal the detector can handle without overloading and the less you will have to use the i-f gain control.

Since now only off-the-air signals are coming through the i-f stages, a simple envelope detector is incorporated to drive the S-meter. With the .5-mA meter and the resistor values shown, the sensitivity seems about right. Since there is no agc in use, the meter reads in a linear instead of logarithmic fashion. That limits its usefulness somewhat but didn't seem serious enough a problem to merit the complication of a meter amplification circuit. For those interested in a more accurate meter action, I would recommend looking into agc operation as well.

Construction

It is best to place the bfo circuit close to the detector physically. In my rig, the above-board space in that area was occupied by the active audio filter modification, so the bfo circuit was built on a small board and mounted underneath the chassis. The product detector circuit is easy to fit on the main board and the connection to the bfo can be made short and direct. This helps to prevent the bfo from coupling back into an earlier section of the 455-kHz i-f strip.



The bfo control (labeled RIT) is mounted where the sidetone level pot used to be. That control (now called MONITOR to save space) is mounted just below and left of the meter.

As shown in the photograph, the bfo frequency adjust pot (labeled RIT) is mounted in the hole formerly occupied by the sidetone level control. That control is replaced by a miniature pot and knob mounted at the former location of the transmit offset switch. The circuitry for offsetting the transmitter is removed from the 10.695-MHz oscillator, as now the receiver can be offset by means of the bfo control. The bfo pot used has a pull-on, push-off switch attached and that is used to turn the 10.695 oscillator on to permit spotting the transmitter frequency with the receiver.

There is a frequency inversion in the receiver conversion process; be sure to wire the bfo pot so that a clockwise rotation lowers the control voltage (and

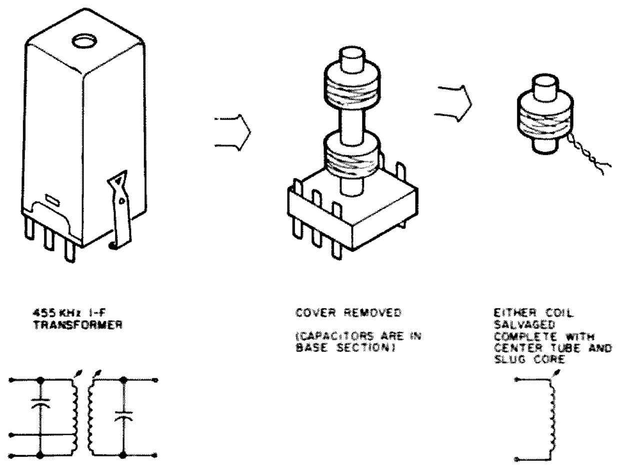


Fig. 2. Details of salvaging the coil from an old 455-kHz transformer.

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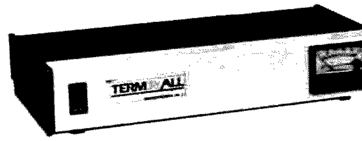

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with it the bfo frequency). This will result in clockwise knob rotation moving the receiver up in frequency as you would normally expect.

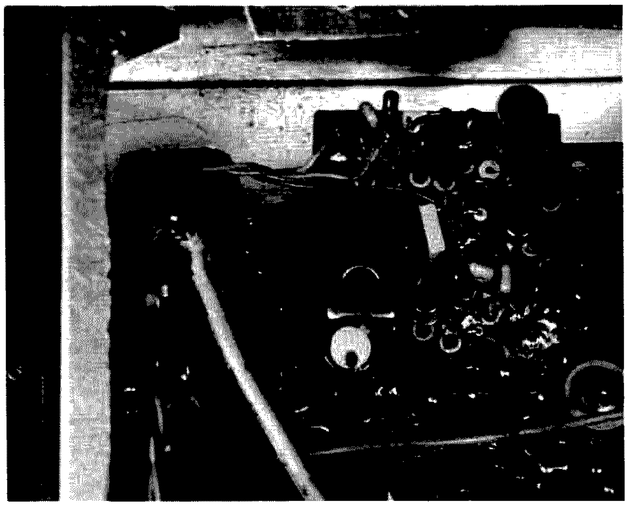
Operation

There was a time when the typical amateur receiver had a different calibration scale for each band. Now just about every receiver has a single 500-kHz tuning range which is switched to cover each band. These tunable i-f receivers contain a set of crystal-controlled frequency converters which move the selected segment of the radio spectrum to the input tuning range of a single-band receiver. In this 10-meter receiver, the bfo tuning provides exactly the same tunable i-f feature on a smaller frequency scale. Because the i-f passband of this receiver was designed for AM reception, it is about 10 kHz wide and can pass quite a few CW signals. The bfo and product detector can be thought of as the front end of a direct-conversion receiver which is able to tune across this 10-kHz band segment and pick out the desired signal. In the complete CW transceiver, the transmitter frequency always appears exactly in the middle of the i-f tuning range, so in practice most transceiver tuning is done with the channel switch and delta tuning control while the bfo control is used to provide a RIT (*R*eceiver *I*ncremental *T*uning) function.

Most contacts are made with both stations on the same frequency; the receiver is easily set for this condition by pulling out the RIT knob (that's how I labeled the bfo control) to turn on the transmitter carrier oscillator. The RIT control is then turned to tune in the transmitter frequency and produce a desired tone in the audio output. The knob is pushed back in to turn off the spot signal; when an incoming signal is tuned via the channel selector and delta tuning controls so as to produce the same beat note, the transmitter will automatically be zero beat with that received signal. There is one caution to remember when using this procedure. As with all direct-conversion receivers, the detection process will produce a note on either side of zero beat, so a little care is necessary to ensure that the proper side is chosen. Actually, this is quite easy. If the RIT knob was rotated clockwise (or counterclockwise) from being zero beat with the spot signal, then the delta tuning control should also be rotated clockwise (or counterclockwise) from being zero beat with the received signal. Generally, the bfo will be offset 800 Hz from the transmitter by peaking the beat note in the audio filter. Then the RIT control is only used as necessary to dodge QRM or follow the other fellow's frequency drift.

Conclusion

This last modification makes a good rig even better. The independent receiver tuning is appreciated at least as much as the freedom from occasional CB overload. The bfo addition also opens the door to one last area of interest: i-f derived agc. Either the S-meter detector or one similar to it could be used to control the gain of the receiver in much the same way as Hy-Gain intended. A possible drawback of this scheme would be agc action caused by signals adjacent to the desired one in the wide i-f passband. Perhaps some readers will enjoy experimenting along this line. ■



The bfo and buffer circuits are built on a small board mounted below the front right-hand corner of the circuit board. The volume control is visible just to the left of the added board. The disgraceful saw marks on the lower lip of the main chassis happened when the chassis top was removed to mount the main board.

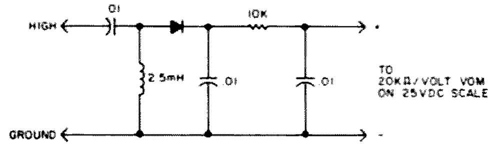


Fig. 3. Simple rf voltmeter which can be used to measure detector drive level.

Julie Collins KL7RD
Alaska 99757

The Denali Connection

Disaster struck these two hams in the backcountry of Alaska. Only a tenuous radio link to civilization could save them.

Although I passed my Novice code test and exam in November of 1980, my first contact was not until April, 1981, five months later. Even when it happened, I had no real enthusiasm about being on the air. I felt a sense of grim despair, perhaps, but no enthusiasm.

This may seem peculiar to the many hams who turned on their rigs and dove into the airways the minute they received the anticipated envelope from the FCC. Well, when I got my letter, I glanced at it and stuffed it casually into my pocket before wandering on home from the post office. That little stroll took nearly two hours, for the post office is six miles from my home. I was on foot with a heavy pack, I was breaking trail through the snow, and it was 35 degrees below zero.

I have lived in the Alaskan bush all my life, and with no telephone and once-weekly mail, instant communication can be an extremely precious commodity. Hence, the radio license is the most feasible and dependable means to find help in an emergency, to relay your whereabouts to your anxious family, or to let the folks know you just shot a moose and the winter's meat is hanging.

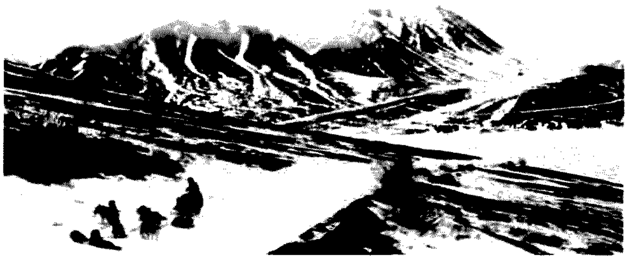
Unfortunately, the simple fact of the matter is that I just wasn't cut out to be a ham. I didn't have much trouble picking up the code, but copying frustrated me and the bookwork

Photos by Miki Collins WL7AOM

Our home in central Alaska is located on a remote lake north of Denali. The big log cabin is studded with various radio antennas which my father has set up.

As far as the eye can see, there is nothing but snow and mountains. Spend a few days in a place like this and you forget civilization can still exist.

Miki Collins WL7AOM gives the dogs a break while she ties down the load in the sled. Bouncing over bare tundra like this was only part of the pile of troubles we had on this ill-fated trip through Denali National Park.



We had a good team, but after a few days they began to grow run-down. We rested them often, especially while climbing over passes. Stony Hill is in the background.

really got me. I didn't have friends or instructors; I just taught myself from books. When you start out hating math, despising physics, and abhorring electrical principles, you aren't doing so hot.

Once I began to understand it a little better it was a lot more interesting, but even so I just wasn't cut out for it even though both my parents and my brother have ham licenses. I didn't become a ham because I wanted to. I did it because I had to.

I was attending college when I got my license and had no use for it at that time. It sat in my pocket, its privileges not exercised. Until, that is, that fateful day in early April when my sister Miki and I ran out of time.

Generally speaking, around here running out of time is synonymous with running out of dog food. On this particular occasion, we were embarked on a 10-day dogsled trip through Denali National Park. (Denali is the Alaskan name for Mt. McKinley.) With something like 150 miles to go with our 8-husky team, it was naturally quite a disappointment to break one of our only pair of skis the first day out, for this would considerably diminish our speed.

Undaunted, I set up our tiny 80-meter rig, stringing the long antenna through the scrubby spruce bordering the Teklanika River with the intention of letting our folks know that our progress might be delayed. My first contact! Or was it?

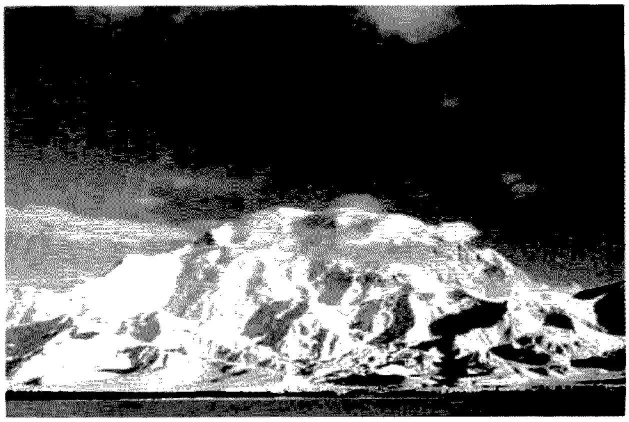
All the suspense and exhilaration of getting on the air crashed down when the tuning knob broke off in my hand and, as it was nearly dark, I could not hope to fix it that night. By morning, my already dampened enthusiasm for the wide world of radio had plummeted and I resolved to leave the nasty set in the bottom of a tattered burlap bag.

On the third day out, we used the broken ski to jury-rig a broken sled runner. The fourth day, our eight sled dogs got wind of a grizzly bear fresh out of hibernation and led us on a tumultuous chase for two miles along the glare ice of a creek before we pulled them under control.

Six more days of increasingly difficult travel saw us less than 100 miles out. Blizzards, deep soft snow, and open creeks slowed our progress as much as the broken sled runner. By the tenth day, we were quite out of dog food. The sled was shot, broken from crashing down 30-foot snowbanks, sliding down steep gullies, and crossing rocky glacial outwash plains. The snowshoes were shot, making trailbreaking nearly impossible, and the dogs were shot—tired, run-down, hungry, and discouraged. We were shot. The trip was shot.

Miki and I pulled off the broad creek we had been on and set up camp in a grove of spruce. My sister built a fire. I dug out the radio.

The 80m call for help.



The 20,320-foot Mount Denali rises about 17,000 feet up from a fairly flat base on the north side where we were traveling. This mountain has the peculiar ability to reflect radio signals so that any two points that can see a particular face of the mountain can communicate by 2 meters; a knife-edge effect allows communication across the top of the mountain.

I swear I didn't believe I could make it work. I am by no means an electrical genius. Aside from this, my sister and I had been totally alone for 10 days. We didn't even know President Reagan had been shot and seriously wounded nearly a week before. We had spoken to no one but each other.

When you are alone in the woods or on the tundra for any length of time—even as little as ten days—and when you are surrounded not by humanity but by natural wonders, when the dominant theme in your life is the magnificently towering Mount Denali, then you begin to suspect that you are the only human being in existence. You are nothing but a bit of human dust floating through the broad expanse of natural wonders—you are alone, dependent on yourself, your ingenuity, and your strength to keep you alive. There is no one else—no one else at all. Civilization and the magic of radio just don't exist.

That's why I didn't place one jot of faith in my ability to communicate with the outside world. Inwardly, I cursed the great and powerful FCC for giving me the privileges of using a medium I felt I knew nothing about. I was, in my humble estimation, unqualified, incompetent, and inadequate. But I had no choice. If I didn't make contact, we could well have another 50 miles to go with hungry dogs, breaking trail at one mile an hour or less through snow that was knee- to hip-deep.

So I tried. For one horrible instant it occurred to me that I might have forgotten my callsign, but no, I was WL7AOL, and my father, whom I was calling, was KL7IS. For another horrible moment, the battery seemed dead, but no, after warming it by the fire, it sparked to life.

The line from the radio to the antenna was just a couple of feet long, so I stood up in the dogsled holding the radio near the antenna. Jamming the tiny plug into my ear, I began awkwardly poking the tiny button-key. I had to use my thumb since the fingers of one hand were occupied with the ear-plug which kept slipping out, and those of my other hand were supporting the radio. *KL7IS, KL7IH* ... oops ... *KL7IS* ... uh ... *DE* ... Good heavens! What was W? Oh yes! *WL7AOL.* I pushed the switch to receive, my thumb icily cold.

I planned to listen a minute or two before calling again, and again, and again, for five or ten minutes before giving up until nightfall when I was more likely to raise someone. But hardly had I turned over the switch when to my astonishment there was a prompt reply! Glory be! It was a faint signal but steady, sneaking softly from the ear-plug into my ear.

The radio was slipping from my fingers and the ear-plug from my ear, but I was so stunned I could only choke and sputter. When I had recovered from my shock, I shoved the radio hastily to Miki, snatched up a map—the only available piece of paper—and with trembling fingers scribbled madly on the back. Daddy was sending slowly, but the best I could do was take down the dits and dahs as such and translate later. Then, shoving the map to Miki and snatching back the radio, I painfully sent out my message, not only to Daddy but to hams all over the great outside who might be monitoring.

The following day we were picked up by bush plane and flown home with our dogs. And that is the story of my first contact. It epitomized the very reason I went for my license—so that I could communicate in times of need.

It will never be a hobby with me; I will never enjoy DXing, bunny hunts, or other ham sports, but ham radio will serve a purpose for me just as it does for many hams in less isolated areas: the purpose of communication. ■

Jerome T. Dijak W9JD/2
215 Tareyton Drive
Ithaca NY 14850

Error Protection for Your Digital Transmissions

Block coding can make your signal 100% error-free. . . hopefully.

In a previous article ("Computers and HF," *73*, January, 1981), I discussed the direction I thought amateurs should go in developing inter-computer data communications techniques on the amateur bands. (By "data" here I mean 8-bit ASCII characters which may be making up formal messages, a digital TV image, computer graphics, or anything else.) In my opinion, the best course is to pursue frequency shift keying schemes since diversity reception of the mark and space frequencies may be used to gain interference immunity. Since small computers are to be used at each end of the communications link, error-detecting or error-correcting codes should be used to allow error-free reception of the basic data even over a communications channel which produces transmission errors. Central to the success of these schemes will be block coding of the basic data and the ability of the receiving computer to request retransmission of data blocks that were garbled.

In this article I will discuss in some detail one implementation of an automatic repeat request (ARQ) inter-computer link using error-detecting block coding. This discussion is intended to form a basis for conducting experiments with this technique (with special FCC approval).

Background

We are trying to design a system that will allow error-free transmission of data over a radio channel degraded by noise, fading, and interference from other stations. The most important characteristic of this channel is that we can expect it to produce transmission errors. We must therefore design our system to recognize when errors have been encountered and to somehow correct them. We will assume that our channel is at least good enough to allow error-free reception *occasionally*. The computers will then keep trying to transfer their data and retransmit that data destroyed during periods of interference on the channel. Though we will be able to get our data transferred without errors even on a very degraded channel, many retransmissions may be required. This means that the worse the channel is, the longer it will require to transfer (without errors) a given size file.

Error-Detection Coding

The first thing we must be able to do is transmit our data in such a way that the receiving computer can positively determine when it has received it correctly and when it has not. We do this by error-detection coding. There are a number of schemes for doing this, and I will not attempt to explain all of them. Each scheme has its own advantages and disadvantages, but in my opinion, the best scheme for our purposes is the "checksum" method.

With this method, the sending computer breaks down the data into blocks with a certain number of characters in each block. Then it numerically adds all the characters together (thinking of them merely as 8-bit binary numbers). This 8-bit sum, called a "checksum," is then transmitted at the end of the data block. When the block is received by the receiving computer, it adds together all the characters in the block as *it* received them and compares this sum to the checksum that it received over the link. If the two sums match, the receiving computer can be fairly sure that it received all the characters with no errors in the block, but it cannot tell which characters have been garbled.

Automatic Repeat Request

Once we have the capability to determine when we have received good data blocks and when we have received garbled data blocks, the next step is to get the sending computer to retransmit the garbled ones. This is done by a system called automatic repeat request (ARQ).

The sending computer will normally send a number of data blocks in one transmission. At the end of its transmission, the sending computer waits for response from the receiving computer which will indicate if it needs any of the blocks retransmitted due to errors. The sending computer will then begin a new transmission and include at the beginning a repeat of blocks requested by the receiving end. These repeated blocks will be followed by new data. This process continues until all data has been transferred.

During the reception of the data blocks, the receiving computer keeps track of the blocks that are received error-free. At the end of the transmission, it sends a short message back to the sending computer acknowledging the blocks that it received correctly (an ACK message). The sending computer then assumes that all other blocks were not received correctly and repeats these in its next transmission.

If for some reason the ACK message back to the sending computer is garbled, the sending computer will simply assume that all blocks in the previous transmission were garbled and will repeat them all. This is safer than allowing the possibility that some garbled data blocks might not be repeated when required. If blocks that have already been correctly received are again encountered by the receiving computer, they simply will be ignored. The important thing is that we receive every data block correctly at least once.

This process obviously requires some "intelligence" in the terminal equipment at both ends of our communications link. This will take the form of a computer and suitable program to accomplish the required arithmetic, buffer storage, and record keeping. These tasks will not be difficult to do with a small computer, but they are much beyond the capability of an ordinary TTY machine. (This is why straight TTY machines are referred to, with no disrespect intended, as "dumb" terminals.)

Block Length

We need to be careful about the chosen length of our data blocks. If, for example, our channel on a given day is producing errors about twice per minute on the average and we have chosen a block length that requires 3 minutes to transmit one data block, it is obvious that we may never be able to receive even one block error-free. The sending computer will be forced to continually repeat the first data block of the file, and the file may never be completely transferred. (Our communications system, in this instance, would have broken down.) On the other hand, if we chose data blocks to be so short that they only required 100 milliseconds to transmit, we would be able to transfer many data blocks error-free over our example channel.

If we make the blocks too long, we find that we seldom receive error-free blocks and we spend too much time retransmitting. If we make the blocks too short, our overall rate of data transfer ("throughput") is reduced under good channel conditions because we are spending too much of our time transmitting checksums instead of data characters. If we could reliably predict what our channel would be like all the time, it would be possible to find a block length that was the most efficient all the time. But on some days you may have a telephone-quality channel, and on other days the interference may be severe.

For this reason, I am recommending that the block length be variable and under the control of the sending computer (and/or operator). This will allow the block length to be optimized from one transmission to the next, if desired, simply by experiment. One would normally want to begin with a fairly short block length (perhaps 16), and then increase it if few retransmissions are necessary. If, at another time, the retransmission rate gets too high, the block length could simply be shortened on the next transmission.

Signal Format

There are a few other details we must consider in order to make our scheme workable. We require three types of data structures: (1) a block of text characters, (2) an acknowledgment block, and (3) a block of characters to signal the end of transmission.

Fig. 1 shows how a text block would be constructed. It may be preceded by any number of ASCII SYN characters as fillers. The STX (ASCII Start of Text) character flags the start of the block. Following STX are a variable number of 8-bit data bytes. The number of bytes may vary between individual blocks in a given transmission, but it may not exceed 256. The end of data in a block is signalled by the ETX (ASCII End of Text) character. Immediately following the ETX is the 8-bit checksum and then the 8-bit block label.

The checksum is formed by numerically adding together each data byte and discarding any register overflow. Each data block of a transmission must be uniquely identifiable, so we add the block label. The sending computer will sequentially assign 8-bit labels to each data block it sends. These will allow the receiving computer to identify the blocks it has received correctly, and also allow it to properly sequence the data blocks after they have all been received correctly.

Fig. 2 shows how an acknowledgment block would be constructed. It also may be preceded by any number of SYN characters. An ACK (ASCII Acknowledge) character flags the start of an acknowledgment block. The contents of the block are the block labels of the text blocks received correctly during the previous transmission. We will allow a variable number of labels, up to 256, in one ACK block. The end of the block is flagged by an ETX character. No error-checking will be done on the ACK blocks, so no checksum or block label is transmitted.

Fig. 3 shows how an end of transmission would be indicated. The ASCII ETB (End of Transmission Block) character will be used to indicate to the receiving computer that it may begin transmitting. To ensure that at least one ETB is received even with interference, it will be sent 5 times. After recognizing the ETB character, the receiving computer will wait until the loss of receive signal is detected and then begin transmitting.

We want to allow the use of many different types of computers to process this code. Since different computers will require different amounts of time to perform the arithmetic and bookkeeping operations necessary to process data blocks, we cannot know for sure how much time must be allowed between blocks. To make sure we don't make it impossible for some computers to keep up, a vari-

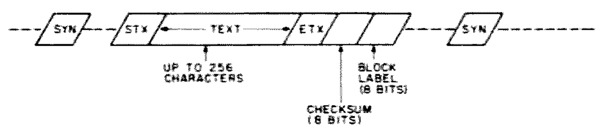


Fig. 1. Text block.

Fig. 2. ACK block.

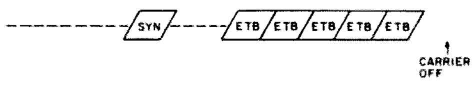


Fig. 3. Transfer of link control.

able number of SYN characters will be transmitted between data blocks. Depending upon the speed of the receiving computer, any number between 1 and 10 SYN characters might be required to allow adequate processing time at the receiver. The number of SYN characters transmitted between blocks can be varied to suit the sending or receiving operators. A certain minimum number of characters will be necessary to allow the receiving computer enough processing time, but any number of additional SYN characters will not disrupt the scheme, since the receiving computer will simply wait until it encounters an STX character to start processing the next data block. The only effect of sending more SYN characters than actually needed will be to reduce data throughput below the optimum for that combination of computers.

Another reason to allow varying the number of SYN characters is that we want to be able to use this scheme over a variety of actual data rates. Since the computer processing time will remain fixed while the character transmission time may change considerably, it will be advantageous to use fewer synchronizing characters at the lower data rates and more at the higher data rates to allow the same processing time at the receiving computer.

This system does not lend itself well to informal conversation at low typing speeds and would primarily be of use after initially establishing contact with another station and mutually deciding that a large block of data (perhaps 100 formal messages) is to be transferred. At this point, both stations would switch to the block-encoded mode to transfer the data.

Once in the block-encoded mode, we would begin a transmission with a leader of SYN characters perhaps 5 seconds long. The remainder of the transmission would consist of ACK or text blocks. We will require that the text blocks be transmitted sequentially, but we will allow the ACK blocks to appear anywhere during the transmission. Since we will not be using error-detection on the ACK blocks, it will be a good idea to send the ACK blocks more than once to make sure they are received correctly. Between blocks any number of SYN characters may be transmitted. The last block of the transmission will be followed by several SYN characters and then the five ETB characters to signal the end of transmission.

Diversity

How can diversity operation help us in this scheme? If a receiving interface is available where the mark and space frequencies can be detected independently, the receiving computer can treat the two frequencies as separate signals, and we get two chances for each data block to be received correctly. If either the mark or space channel produces an error-free block, the receiving computer can ACK that block. This can greatly reduce the number of retransmissions under moderately degraded conditions and greatly increase throughput.

Summary

I have described one of several possible methods to achieve error-free transmission of digital data over a very imperfect radio channel by using error-detecting coding, ARQ, and computers at each end of the radio link. I hope these ideas will help to get some experimenting underway in this direction.■

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The circuit converts the 16-, 19-, 25-, or 31-meter bands to AM standard-broadcast frequencies. Simply insert the converter between your car antenna and antenna input.

Maybe you prefer your shortwave listening indoors. Then you will need a low-cost surplus car radio (Olson Electronics, 260 S. Forge St., Akron OH 44327) and a 12-volt power supply (Radio Shack). The car radio is well shielded and will not pick up AM standard-broadcast interference.

The converter schematic is shown in Fig. 1. The simple Pierce oscillator circuit uses a 2N5397 JFET to restrict oscillator output noise. No tuned circuits, other than the crystal itself, are used in the oscillator. The 3N204 MOSFET mixer provides low noise, good dynamic range, and moderate gain. Mixer gain must be high enough for antenna noise to mask the car radio internal noise. On the other hand, mixer gain must be low enough so that overloading of the car radio by strong signals is not a problem. Thus, the higher-gain 3N211 is not recommended here.

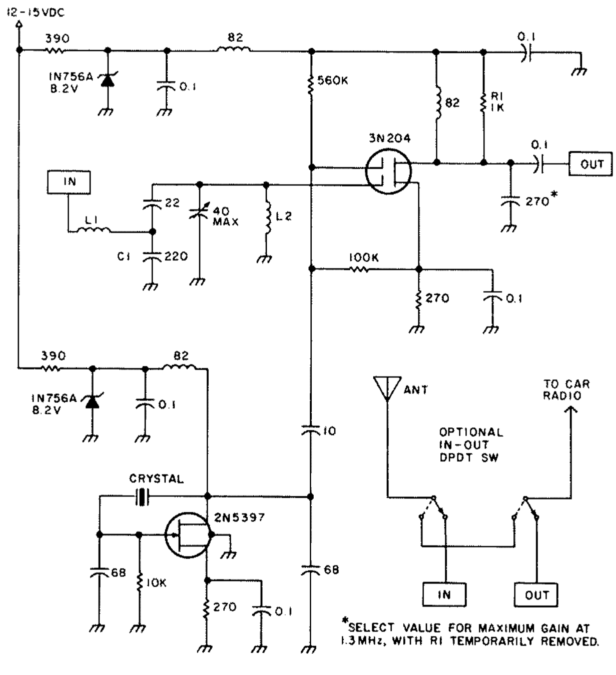

Fig. 1. Schematic for the converter for shortwave listening.

Temperature tests show the converter performance to be virtually constant over the range −40° C to 85° C. Oscillator frequency drift, for a 16.3-MHz AT-type crystal, is less than ±1.5 kHz over this temperature range.

Crystal* frequencies are selected so that one crystal can be used for two shortwave bands. Signals from these two bands do not overlap. The mixer input circuit selects one of the two bands. Table 1 lists the values of L1, L2, and the crystal frequency for each band.

*AT-element, fundamental mode, parallel-resonance, 32-pF load capacitance. Jan Crystals, PO Box 06017, Ft. Myers FL 33906. Cost is approximately $5.00.

The values of L1 should work well with GM windshield antennas. Regardless of the antenna type, L1 should be selected for maximum signal strength at center band. L1 and C1, in addition to matching the antenna to the mixer, act as a low-pass filter at TV and FM broadcast frequencies. This filtering function is very important since unattenuated signals from powerful VHF stations can produce undesirable mixer products at the converter output.

A 19-meter version of the converter is mounted under the dashboard of my Chevrolet. Standard broadcast

SW Band	Xtal Freq.	L1	L2
16m	16.3	1.5	1.8
19m	16.3	1.8	2.2
25m	11.0	2.7	3.9
31m	11.0	3.9	5.6

Frequency in MHz.
Inductance in microhenries.

Table 1.

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feedthrough causes no significant interference with shortwave signals. More specifically, a 1-kW station at 1.1 MHz is not detectable beyond a half mile from the station antenna. For negligible feedthrough, the converter must be contained in an aluminum box. Also, a shielded cable (Radio Shack) must connect the converter to the car radio. To avoid generator/alternator whine, the converter box must be securely fastened and grounded to the metal frame of the dashboard with sheet-metal screws. To control ignition noise, resistor-type spark plugs must be used in the car engine.

The converter circuit is constructed on top of an unetched, copperclad PC board. No etching or cutting of the board is required. Circuit grounds are soldered directly to the board. A few ¼-Watt, 4.7-megohm resistors, with one end of each soldered to the PC board, are used as standoffs. The crystal socket is epoxy-glued to the board. Inductors must be at least one inductor diameter from the PC board. All inductors must be separated by at least two inductor diameters. Naturally, all circuit leads are kept short.

All resistors in the schematic are ¼-Watt carbon with values in Ohms. All inductors are molded rf chokes, unshielded type, with ¼-inch-length bodies and values in microhenries. Integer values of capacitance are in pF, and the corresponding capacitors are ceramic or dipped mica. Decimal values of capacitance are in μF, and the corresponding capacitors are ceramic.

One final note. Experience indicates that, after installing the converter, one should tune the car radio while keeping one's eyes on the road. ■

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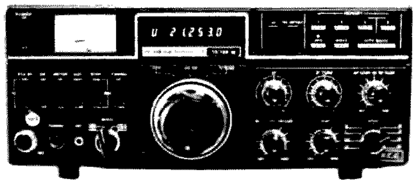

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Dennis Pharr WD5JWY
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This article will describe a low-cost alarm circuit that is activated by a simple touch of the hand. Its operation depends upon a source of 60-Hz signals that is present in virtually all homes wired with standard 110 V ac. The sensitivity of the alarm is adjustable and easily varied to suit the particular 60-Hz environment. The alarm requires no installation; it is simply hung on the doorknob by a hook formed from heavy-gauge copper which is connected to the input circuit. When the doorknob is touched, the alarm will sound.

Circuit Operation

Operation of this circuit is fairly simple. Referring to Fig. 1, when the doorknob is touched, a 60-Hz signal is applied to the gate of FET Q1. This signal is then amplified a small amount and applied to the trigger terminal (pin 2) of U2, which acts as a one-shot. The output of U2 then goes high, causing the output of the Set/Clear flip-flop, which consists of U3A and U3B, to go high also. The high on the output of the Set/Clear flip-flop enables audio oscillator U4 which acts as the alarm. The alarm will continue to sound until it is reset by depressing push-button S2.

Also built into the circuit is a delay feature which will allow the alarm to be used while you're away from your house or apartment. The delay portion of the circuit, made up of Q2, U1, and U3C, allows you to activate the alarm and go out the door while still handling the doorknob.

Operation of the delay circuit is also quite simple. When power is initially applied to the circuit, a trigger pulse is generated by Q2 which causes the output of U1 to go high. The high on the output of U1 is inverted to a low by U3C and applied to pin four of U2. This low on pin four of U2 disables the alarm for approximately thirty seconds, with the components specified. This should be plenty of time to exit the door. If you don't wish to include the delay feature, simply leave out Q2, U1, and U3C and connect pin four of U2 directly to Vcc.

Quiescent current drain of the circuit is about fifteen milliamperes with the nine-volt battery specified; therefore, two nine-volt batteries in parallel or six penlight cells in series should be used for powering the alarm.

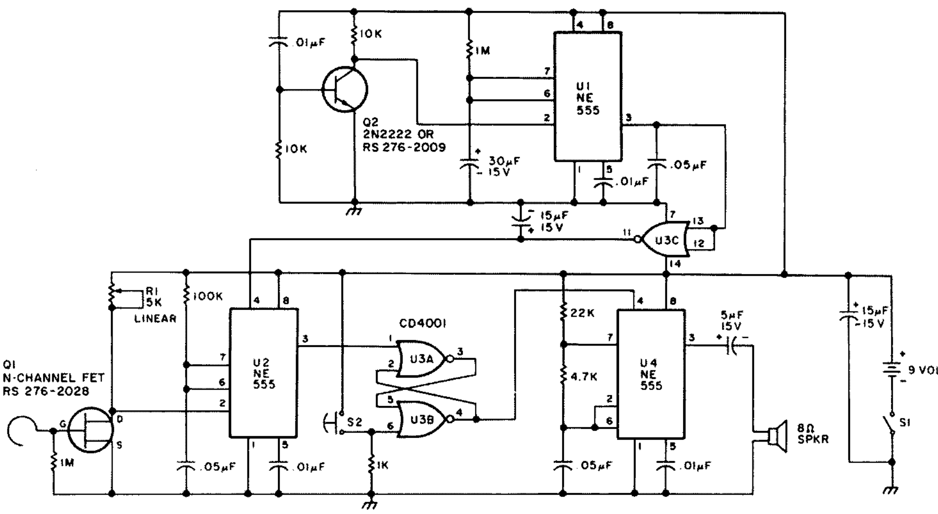

Fig. 1. Schematic diagram of touch alarm.

Construction

The circuit can be built most easily using perfboard-type construction. Sockets should be used for all the ICs, should replacement become necessary. A plastic case similar to those sold by Radio Shack can be used for housing the unit, and a piece of #14 gauge, or heavier, bare copper wire may be used for the touch element. The wire should be bent into a hook shape for hanging on

the doorknob. R1, the sensitivity adjustment resistor, should be a panel-mount-type potentiometer instead of a trimpot mounted on the perfboard, as this will greatly ease adjustment when the alarm is to be used.

Test and Adjustment

The alarm may be tested for proper operation without hanging it on a doorknob. To do so, first adjust sensitivity control R1 for minimum resistance and then apply power. If you have included the delay circuit, you will have to wait approximately thirty or forty seconds before the alarm will arm itself. Now, while touching the pickup element, adjust R1 towards maximum resistance. At some point, while adjusting R1, the alarm will trigger and go off. To reset the alarm, momentarily depress S2. I must mention here that depressing S2 will only reset the alarm; it will not activate the delay. To reactivate the delay, power must be momentarily interrupted by opening and closing S1. Also, after the sensitivity has been increased, the alarm will sound when power is applied. To prevent this, hold down the reset button while applying power. R1 will have to be readjusted when the alarm is hung on the doorknob, as this changes the sensitivity of the input circuit.

Summary

This alarm would probably be most useful to those living in apartments and could easily be thrown into a suitcase for use in motel or hotel rooms when away on trips. But, wherever used, it will provide a sense of security otherwise unknown.

If you have any questions or comments concerning the operation of the alarm, an SASE to me will bring a prompt reply. ■

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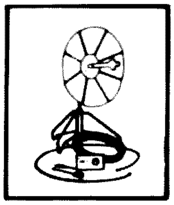

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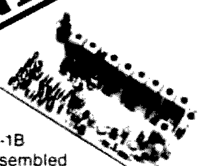

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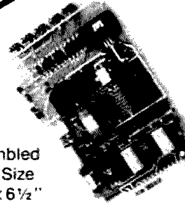

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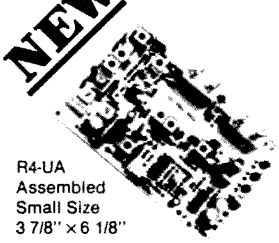

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Ron Hornberger KB9SP
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Get the DX Edge

There are ways to stand out in the pileups for Spanish-speaking stations. One is to speak their language.

Do your present operating activities make your heart beat faster and your nerves tingle from excitement? If not, you could be in a bit of a rut.

Novices seldom have this problem, but many other hams later find that they need to try other avenues of their hobby. Operating an exotic mode like slow-scan television is one approach; another is chasing certificates. My choice is talking with hams of the Spanish-speaking countries.

Why try the Spanish language? For openers, the Spanish-speaking people are among the most gracious people in the world and are very patient with beginners speaking their language. They bend over backwards to overlook errors and always enthusiastically encourage beginners. A knowledge of Spanish gives you an edge in working Mexico, Central America, South America, the West Indies, Spain, the Canary Islands, the Balearic Islands, and the North African cities of Ceuta and Melilla. (These are Spanish enclaves on the coast of Morocco.) And that constitutes a lot of DX!

Spanish is a good beginner's language. It often is pronounced nearly as it is spelled. For example, the F sound is always spelled with an F. It does not have spelling nightmares as does English, in which an F sound can be represented by gh (in enough) or by ph (in phone). Another advantage is that when the other operator hears you attempting to use his language, he often will try his hand at speaking English. It's a bit like fishing—you throw out your lure in the form of spoken Spanish and reel in your catch in the form of a contact in English.

Most hams begin their hobby as Novices working other Novices, and this is a good way to begin using Spanish. The Novices from Spain are licensed to use voice communication from 29,000 kHz to 29,100 kHz. Their callsigns begin with EC instead of EA. During the fall, spring, and winter months, they can often be worked from about 1200 UTC until 2000 UTC in the midwestern United States.

Spanish Novices exhibit that universal trait of Novices everywhere—enthusiasm. A contact with them is not the usual one of "You are 5 × 9 in Madrid, QSL via the bureau and QRZed." They usually will answer with an excited tone in their voices, often with a rapidly spoken "OK, OK, OK!" For many this may be their first DX contact, and they will QSL direct. Their QSLs are often beautiful postcards of their QTH, with the technical information stamped on the back. I always look forward to checking my mail for a new postcard with interesting stamps. They may also send a red ribbon with a yellow center stripe, which represents the Spanish flag.

After working a stateside Novice station, you always enjoy working that same station again when he has upgraded. You will get an even bigger kick doing this with Spanish Novices. One day I called CQ in Spanish on 15 meters and was answered by an EA whom I had worked several months earlier when he was a Novice EC. He remembered me, described my QSL card, and noted what a great pleasure it was to have another contact. You don't get that from a DX pileup!

If you have ever wanted to be a DX station but you live in Chicago or Los Angeles or Detroit or operate low power with something less than a gain antenna, take heart; the Spanish Novices consider

Reader Service for facing page ✓5 →

you to be good DX. I know, because one day after returning home from work I found 10 meters to be open into Spain. I answered a CQ in Spanish, and at the end of the contact I had a new experience: Several Spanish stations shouted my callsign! It was a bit nerve-wracking at first, but I got used to being a hotly sought-after DX station. In one hour I worked about a dozen stations, exchanging complete QSL information, and could have worked more, but the band went dead.

If you enjoyed the challenge of working all 50 states in the US, why not try your luck at working all 50 provinces in Spain? When you have all 50 confirmed, you can apply to the U.R.E., Box 220, Madrid, Spain, for a certificate. If you are having a hard time working the EA9s from the North African Spanish enclaves of Melilla and Ceuta, you might try the EC9s in the Novice bands. There also are quite a few EC6s from the Balearic Islands and EC8s from the Canary Islands. They might even consider you to be DX, especially if you know Spanish.

Incidentally, if you are a person with a bit of imagination, get an atlas and a guide book or travel book about Spain and look up the cities in Spain that you work. It's like an inexpensive vacation. I use the guidebook by Baedeker which lists the main cities in alphabetical order with color pictures, a short description, history, and a list of fiestas and events. It's a bit expensive at about $11.00. Rand-McNally has a good pocket-size one for about $4.00. Both are available at most bookstores.

Also on the 10-meter band from 28,900 kHz to 29,000 kHz are the Novices and Intermediates from Argentina, and they are allowed to use voice communication here. They can be worked almost anytime that 10 meters is open, and their operating hours are close to ours, since their local time is 3 hours behind UTC. The calls of Argentine Novices begin with LU, as do the calls of higher-licensed Argentine stations.

You can start working these Spanish-speaking stations with just a few basic words and phrases. First, most consonants are pronounced similar to ours. The vowels are pronounced clearly and distinctly. Pronounce A like the English *ah*, E like our *ay* in *say*, I like the i in *machine*, O like our *oh*, and U like oo in *cool*.

You already know the Q signals and have only to pronounce them as letters of the Spanish alphabet. QSB is pronounced *coo-aysay-bay*; QSL is *coo-aysay-aylay*; QTH is *coo-tay-ahchay*; QRM is *coo-airray-aymay*; QRA (which means "my name is ___") is *coo-airray-ah*.

Know the numerals 0 to 9 and a few useful phrases (see box). A typical contact might go thus: *Esta es W1AW*, this is W1AW; *gracias*, thanks; *su reporte es cinco nueve*, your report is 59; *QRA Hiram*, name is Hiram; *hay QRM*, there is QRM; *QTH Newington, estado de Connecticut*, location is Newington, state of Connecticut; *habla despacio*, speak slowly; *cambio*, over.

This article touches on only the essentials, and its main purpose is to promote interest in working Spanish-speaking stations. Several aids have appeared recently which are shortcuts to a proficiency in using Spanish on the ham bands. *The Radio Amateur's Conversation Guide* by OH1BR and OH2BAD lists, in eight languages, 147 sentences relating to ham talk, and this is available from Transelectro-America, 2301 Canehill Avenue, Long Beach CA 90815. It has a dictionary listing ham-related words, also in eight languages. For example, if you need to find the Spanish phrase for "frequency shift keying," just look it up in this dictionary.

The book has quite a few spelling mistakes, at least in the Spanish section, and is a bit expensive, but it has some interesting cartoons and the dictionary is unique. Tapes in each language are available for $6.00 each, and buying the Spanish one certainly would be a wise investment. Another tape, "Hola CQ" is available with 15 pages of text from the ARRL for $7.00.

The basic goal is not to learn a lot of grammar and a large general vocabulary. When you are on the air, you likely will not be asking a Spanish repairman the cost of a new carburetor for your car, but you would be informing a Spanish-speaking operator that his modulation is good or bad. Learn a little grammar and a small specialized vocabulary and have a good time.

I did study Spanish about 15 years ago for two years and had some success with the written language, but the spoken language would drive me to find the nearest interpreter for anything more complex than "Buenos Dias." I have been using Spanish over the air for over a year now, and with the help of the conversation guide, I can make it through a contact even if I don't understand everything. Much like learning the code, practicing Spanish makes perfect.

The FCC says one of the reasons that the Amateur Radio Service exists is "the continuation and extension of the amateur's unique ability to enhance international goodwill." I think I know what these words mean. One day after eight hours of hassles and harassments at work, I came home and turned on the rig. I made contact with a Novice from Argentina. We made the usual exchanges of name, QTH, and reports. Then I heard some words that I had not heard at work that day which translated into: "Magnificent, I congratulate you for your very good Spanish!"—the first kind words I had heard all day! And I knew that my goodwill had certainly been enhanced that day.

I hope that your goodwill also will be enhanced as a result of talking with Spanish-speaking countries; besides, it's a lot of fun! *Siete tres!* ■

Spanish Words and Phrases

Spanish	Pronounced	English
cero—	*say-roh*	zero
uno—	*oo-noh*	one
dos—	*dose*	two
tres—	*trace*	three
quatro—	*kwah-troh*	four
cinco—	*sink-ho*	five
seis—	*say-iss*	six
siete—	*see-ay-tay*	seven
ocho—	*oh-cho*	eight
nueve—	*noo-way-vay*	nine
hay	*eye or I*	there is
gracias	*grah-see-ahss*	thanks
habla despacio	*ah-blah des-pah-see-oh*	speak slowly
codigo postal	*koh-dee-goh poh-stal*	zip code
apartado postal	*ah-par-tah-doh poh-stal*	PO Box
cambio	*kam-bee-oh*	over
direccion	*dee-rek-see-own*	address
su reporte es	*soo ray-por-tay ess*	your report is
mi	*mee*	my

R. R. McKay N8ADA
317 Ernst Avenue
Dayton OH 45405

Power-Line Protection: The Weak Link

Solid-state equipment may be extremely reliable, but just microseconds of overvoltage can change that.

Most amateurs take precautions to prevent damage to their homes and equipment from lightning strikes or near strikes on their antennas or towers. Few of them, however, are as well protected from the other common source of problems—power-line surges. These surges frequently result from strikes on power lines and can cause transients of thousands of volts in ordinary 110/220 household systems in the vicinity of the strike.

Pulling the plug on ham equipment during electrical storms has been one way of solving the problem. However, many hams participate in weather nets during severe storms, so pulling the plug on the rig is not the answer. Also, pulling the plug on everything in the house is a difficult way to live. It's much better to put one of the new transient voltage suppressors on your line, relax, and know you are safe from anything except a direct hit.

Most amateurs who grew up in the vacuum-tube era have paid little attention to transients as most electrical and electro-mechanical devices with tubes can withstand large instantaneous overloads with little apparent damage.

The advent of the solid-state age has brought with it a new set of problems. Solid-state equipment is extremely vulnerable to transients. Voltage surges above rated values, even though only microseconds in duration, will destroy this circuitry. Many baffling failures of solid-state equipment, when thoroughly investigated, have been found to be due to transients which no one knew existed.

Fortunately, the technology that brought us these solid-state wonders has also brought us protective devices to compensate for their weakness. The devices, called transient or surge protectors, are basically metal-oxide varistors. Recent improvements in composition and fabrication have allowed the development of a whole family of devices for overvoltage protection.

Surge protectors designed for home electrical systems are now available at most electrical supply houses. The units are intended for use in service-entrance boxes and fit into standard knockout holes. They will provide protection for household circuits against surges capable of damaging common electrical equipment.

The protection unit is connected across the line as shown in Fig. 1. Connection is simple; anyone with a basic understanding of electricity can connect it. Open the main breakers when installing the unit. The protector remains in a non-conducting state under normal conditions. Voltages exceeding 175 V cause the unit to conduct, diverting the transients to ground. The action is somewhat similar to that of the common zener diode. The unit returns to a non-conducting state when the voltage returns to a level below its critical breakdown value.

Not only ham equipment, but also most of the new things we buy for our homes, from clocks to ranges, now include solid-state devices. So a suppressor on your incoming line could save more than just your ham gear.

Manufacturers recommend placing a protection unit as far ahead of your household wiring as possible for maximum protection. However, your local power company may have ideas on placement. Mine would not allow placing the protector ahead of the main breakers. You can argue with them, but camp lanterns are tiring and they won't run our refrigerator or my ham rig. So, do what they say. Connected this way, a severe surge could wipe out the main breakers but the individual circuits are still protected. It's a small investment in peace of mind. ■

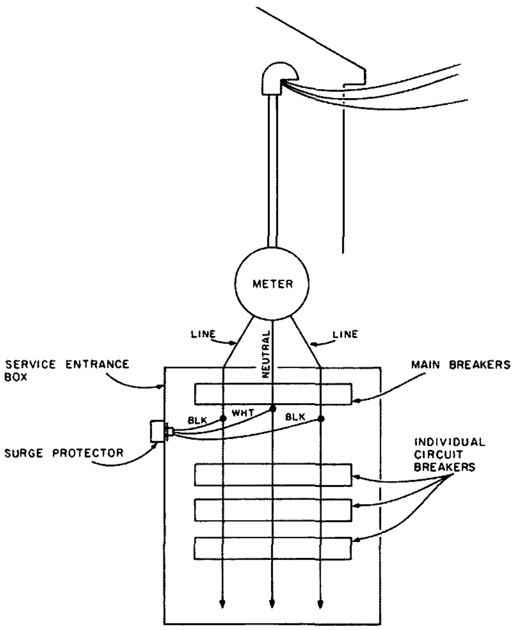

Fig. 1.

Reference

General Electric, *Transient Voltage Suppression Manual*, 2nd Edition.

Bob Baird W7CSD
3740 Summers Lane
Klamath Falls OR 97601

Higher Voltage, Less Weight

A voltage quadrupler that weighs ounces? You bet—and cheap surplus capacitors make it possible.

Voltage doubler, tripler, and quadrupler circuits were in the books way back in the days of vacuum-tube rectifiers. But with the vacuum tube, we had problems of separate insulated filament supplies and/or limited insulation between an indirectly-heated cathode and its filament. Solid-state diodes took care of this problem very neatly, but the day of the high-capacity capacitor for a reasonable price had not yet arrived. So, the admonition always was, "This is a good circuit for a very limited load. The voltage vs. load characteristic is terrible!"

Well, all of the above shortcomings have been pretty well overcome. Six-hundred-uF, 360-working-volt photoflash capacitors have appeared on the market recently at various bargain prices. I was able to buy 10 for $7.50.

Now we have all of the necessary ammunition. Let's see what we can do with it. First of all, in the interests of safety, we need a circuit where the ground side of the ac line is also the negative terminal to our power supply, if there is to be no transformer. This rules out the full-wave doubler and any quadrupler that might be derived from it. The full-wave doubler has been a favorite for converting a 700-volt TV transformer to 1500 volts dc. With a transformer, you can earth ground at any point you want, but with just the ac line, one side already is grounded. A floating ground in electronic gear is a very dubious thing. It's possible to tie all negative returns together, insulated from a grounded chassis, and then go to the chassis through a by-pass capacitor. There have been some commercial electronic devices that have done this, generally with a plastic cabinet surrounding the unit. *Let's not do this!*

Fig. 1 (a) shows the standard-voltage multiplier circuit. At the risk of duplicating most handbooks, the first negative half cycle on the hot side charges C1 to peak voltage (in the case of 120-volt line, $E = 120 \times \sqrt{2} = 170$ volts). On positive half cycle, the line is +170 in series with C1, which makes 2E, thus charging C2 to 2E. The next half-cycle ground side is +E with respect to the hot side. This is in series with C2 and the third diode, thus charging C3 to 3E. The next half-cycle hot side is +E with respect to ground and in series with C3 to make 4E, and C4 is charged to 4E, etc. This can go on indefinitely as long as no current is drawn from the supply, but if the capacitors are large enough, you can get close to the no-load value with considerable load.

Now, it will be noted that we need capacitors with increasing voltage values. For a quadrupler, for instance, we need a capacitor capable of withstanding about $170 \times 4 = 680$ volts. This will take two of the aforementioned 360-volt caps in series. So, let's use C2 a second time instead. Just return from C4 to the plus side of C2 instead of to ground. Also, return C3 to the plus side of C1 instead of to the hot side of the line. With these modifications we get Fig. 1 (b), and no capacitor has more than 2E across it. 2E = 340 volts, and the working voltage of the caps is 360, so we are safe. Our voltage regulation may not be quite so good with this modification, but it is still better than many people would have guessed.

Fig. 2 shows the charac-

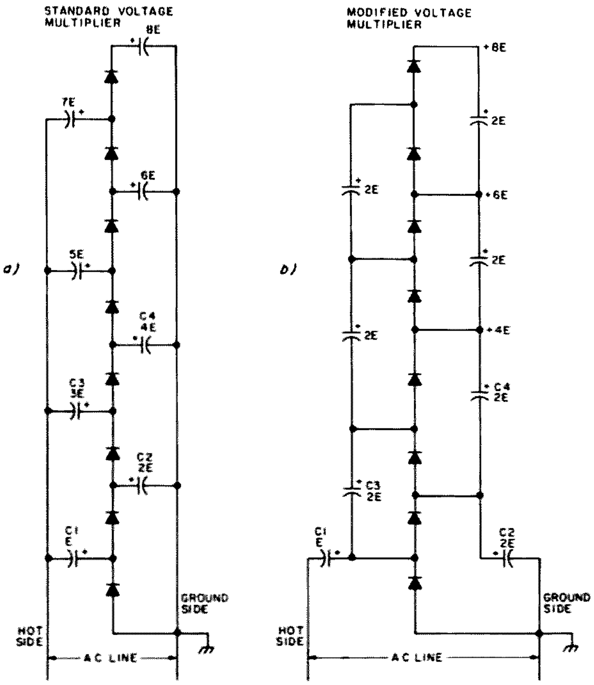

Fig. 1.

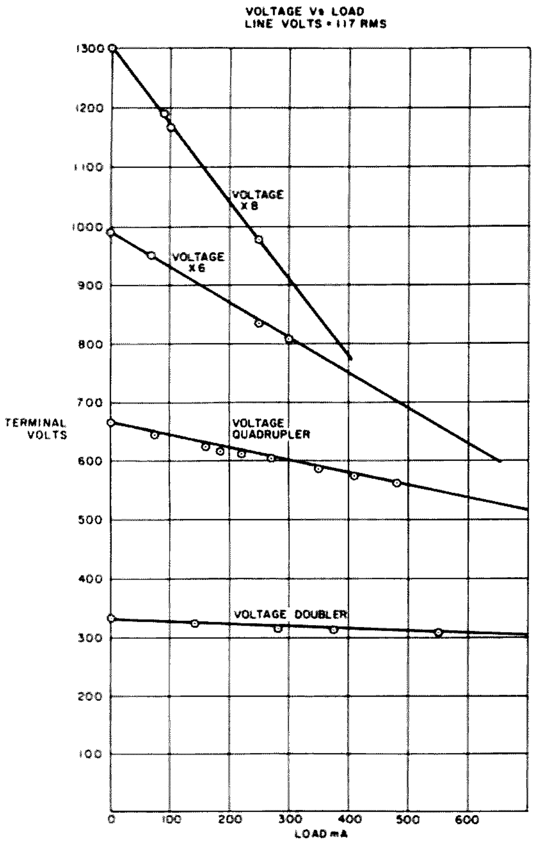

Fig. 2.

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✓164

teristics of voltage vs. load for a doubler, a quadrupler, times six, and times eight. The quadrupler seems most interesting. This voltage would be enough for a sizable linear and, with speech peaks to half an Amp, might not go much below 600 volts. The times eight supply would deliver about a quarter of an Amp at 1000 volts. This might fit someone's needs. This is a power supply weighed in ounces!

Now let's look at a few practical aspects. How do you get this thing fired up? I used 1000-piv, 2.5-Amp diodes because I had them. Then I brought the voltage up slowly with a variac to run the tests. Once you are up to line voltage you are in business, but don't throw it on the line point blank or the surge current of the capacitors will wipe out your diodes.

On a second power supply, a quadrupler, I put 250 Ohms in series to charge up the capacitors and then shorted it out with a switch before putting any signal into the linear amplifier I used for a load. But you *must* remember to open that switch before you turn on the power the next time! A 30-second thermal time delay could be installed to take care of this.

A second must is that you must carefully polarize your power plug. If you have three-pronged plugs in your wall, determine which pin is hot and which is cold. An NE51 can be made into a tester very easily. Solder a short piece of hookup wire to the center contact. Hold the brass base in your fingers and insert the wire into one pin of the wall plug. If the neon lights, that is the hot side. (Of course, a light bulb wired between one pin and the earth ground will tell you the same thing.)

The same procedure goes for two-pin plugs, but you *must* mark them and always plug in in the proper way. If you are going to plug the supply in in several places, you need to check each plug. Journeymen electricians have been known to get the hot and cold wires reversed even in modern three-pin plugs.

The advantages of the transformerless power supply are obvious. In addition to the savings in bulk and weight, you can mount the whole thing on a piece of perfboard and put it inside the unit you wish to use it with—600 volts for something like $5.

If you live in ZL-land or some country that has two-wire service with 240 volts to ground, a voltage quadrupler has possibilities for something pretty big. ■

Original Data

Doubler		Quadrupler	
mA	**Volts**	**mA**	**Volts**
0	330	0	663
140	323	75	643
280	316	160	623
375	313	185	616
550	308	220	611
		270	602
		350	585
		410	573
		480	561

x6		x8	
mA	**Volts**	**mA**	**Volts**
0	987	0	1300
70	950	104	1170
250	834	90	1190
300	807	250	976

Table 1.

✓See List of Advertisers on page 114

Ed C. Miller N7APE
306 W. Court St.
Weiser ID 83672

Make Room for More Agc

Automatic gain control is useful in many applications. With this simple circuit, you'll never have to be without it.

What with avc, alc, agc, etc., we have some form of automatic control over the gain or output of a lot of circuits. Still, there is a place where there's room for some more automatic gain control. That's in a speaker amplifier. There are many times when we use a small speaker amplifier to up the level of an output designed for headphones, where the amplifier is used to monitor two or more circuits, or where the amplifier is used with some special equipment that has large output variations. In these cases, manual gain can have a drawback or two—forgetting we've cranked the volume down or up, missing something, or shocking our eardrums.

Here's a circuit for a small speaker amplifier with automatic gain control that is both simple and flexible. It's simple because it uses one IC, one FET, a couple of diodes, and a few standard resistors and capacitors, with no complicated setup adjustments. It's flexible because it allows for a wide range of release times set only by a resistor and/or capacitor.

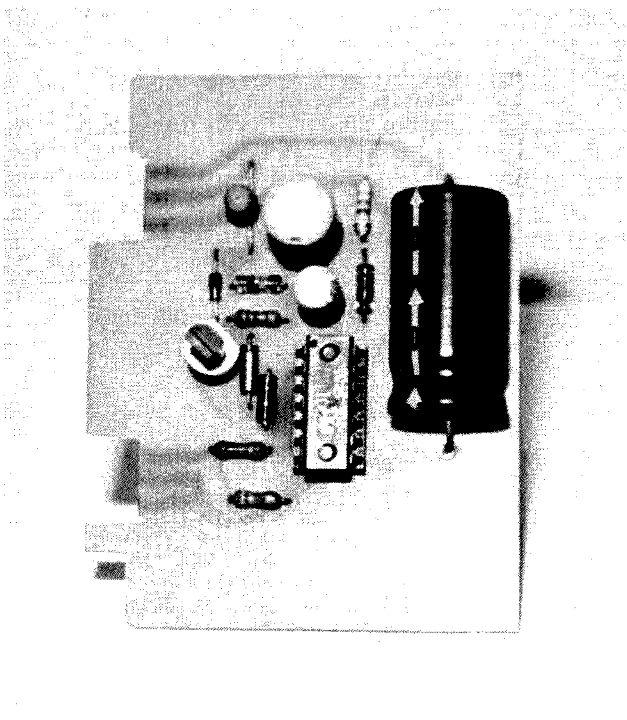

Fig. 1. This photo shows the simplicity of the speaker amplifier to be used in a modular receiver.

There are two primary methods to automatically control the output level of an amplifier stage. One is to vary the gain of the amplifier (remember the 6L7 tube); the other is to operate the amplifier at normal gain and introduce a variable loss pad at its input or output. The latter is the simplest when many of the parts may be coming from the junk box. In the unit shown, the loss pad is at the input to the amplifier where the signal level is small. This reduces the distortion introduced by the variable impedance leg of the pad—in this case, an FET. Distortion is further reduced by applying a proportional signal through the FET to the inverting input of the amplifier.

Layout is not too important. It should be remembered that the LM-380 is a high-gain IC and the input wires should be as short as possible and not be run in close proximity to the output circuitry. Most P-channel JFETs will work in this design—some better than others. My first grab in the junk box got a T-1812, so it was used for the performance measurements. Similar performance was obtained with several other types that were tried. JFETs with pinch-offs that are considerably removed from those of the T-1812 might require another value for the zener diode.

Note that diode D1 is germanium and D2 is silicon. Germanium is used at D1 because it requires less voltage to conduct, increasing the first step voltage of the voltage doubler signal rectifier. This same characteristic would be desirable for D2, the voltage doubler's second stage, but even more we need a diode with high reverse resistance. In order to get a release time of about 4 seconds, we need a large RC combination. To keep the attack time short, C should be less than 3 uF, which means an R value of about 2 megohms. The reverse resistance of D2 should be some 5 to 10 times this value. Almost any silicon signal diode such as the 1N914 or 1N4148 will meet this criterion.

Figs. 3, 4, and 5 show the

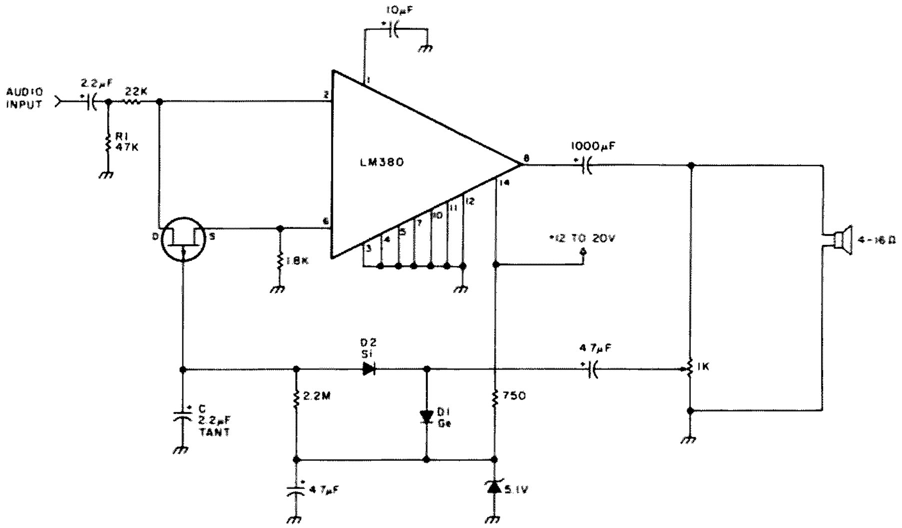

Fig. 2. Schematic.

frequency response, compression characteristics, and distortion at various levels of compression. These were all measured at 125 mW output, which seemed to drive a 6-inch-high efficiency speaker at the volume I wanted in my shack.

The potentiometer sets the output level at which compression starts. When its arm is at the ground end, the compression circuit is, in effect, disabled. Although no input control is shown, one could be inserted by replacing R1 with a 50k pot to permit monitoring a variety of levels greater than the compression range of the amplifier. If the output is too much with the FET you're using, a resistor in series with the speaker is the simplest way to bring it into line. It will affect the fidelity a little, but not enough to bother in communications service. The resistor value can best be determined experimentally and probably will be between 4.7 and 100 Ohms. A variable speaker pad also would work well.

There are many reasons why it pays to build this compression circuit into almost any audio amplifier that uses an LM-380. For one, it takes nothing away from its normal operation—when the arm of the pot is at the ground end, you have a standard amplifier. The small amount of time, money, and space that it takes to add this circuit gives big rewards in keeping the output at a consistent, comfortable level.

Try it. You'll like it. ■

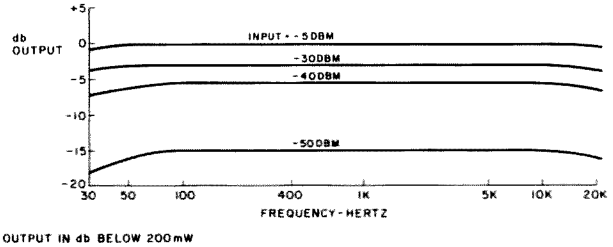

Fig. 3. Frequency response vs. input.

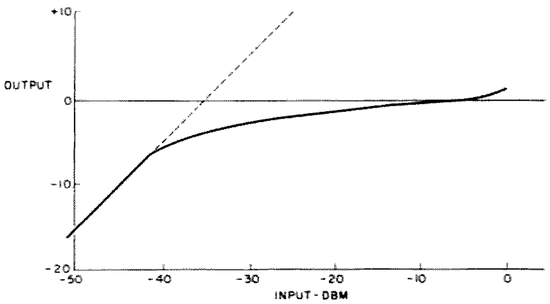

Fig. 4. Compression characteristics.

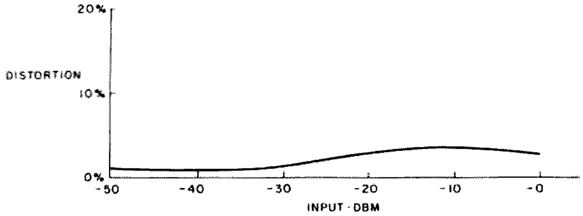

Fig. 5. Distortion.

AZDEN.

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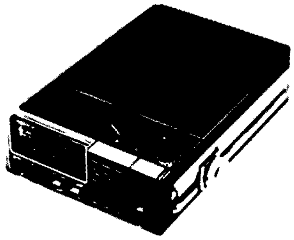

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Donald G. Wiseman K5CA
4816 33rd Street
Dickinson TX 77539

You Can Troubleshoot Mobile Noise

K5CA tells what to do when a signal is 5-7 and the noise is 5-9.

Over the years ham radio interests, along with methods and equipment, have continued to evolve. Early in ham radio history the desire to convert heavy fixed-station receiving and transmitting gear to use in vehicles appeared, resulting in the first "mobile" operations. This modification process was difficult enough considering weight, size, and power requirements, but along with these came a whole new realm of problems.

Fixed-station operation has always had problems with the noise and interfering signal environments. Great as these problems have been, at least they are generally consistent and geographically contained. Mobile operation, however, not only is affected by all these noise problems, but also adds the new dimensions of vehicle-generated noise and noise from changing locations. Although today we have developed much more reliable, more sophisticated, and easier-to-integrate equipment for mobile use, the old noise problem continues.

Unfortunately, rf noise comes from many sources and when in motion, practically all of these come into play at one time or another. To be honest, there's little that can be done about many of the noises encountered—high-noise power lines, ignition radiation from other vehicles, spurious signals from other transmitters, etc. In some of these cases, a good-quality noise blanker provides help. In others, patience and operating skill are the only solution. By the way, although the mobile high-frequency systems (SSB, CW, etc.) have classically been the ones to be the most bothered by noise, the "noise-free" VHF/FM systems so popular today also have their share of noise problems. This article attempts to provide a summary of noise conditions that any of our radio equipment is subjected to in mobile use and to provide a related approach to minimize the noise effects.

There is a class of noise which is very disturbing in mobile operation and for which there is some reason-

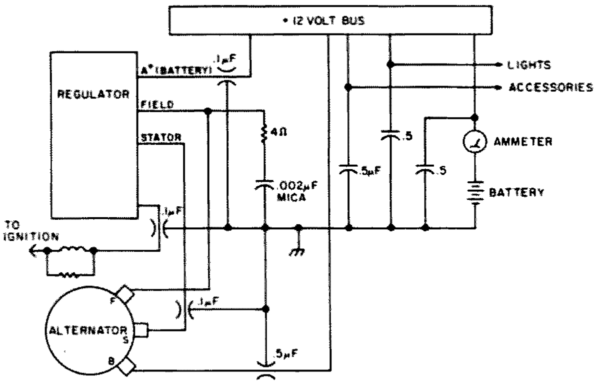


Fig. 1. Electrical power system.

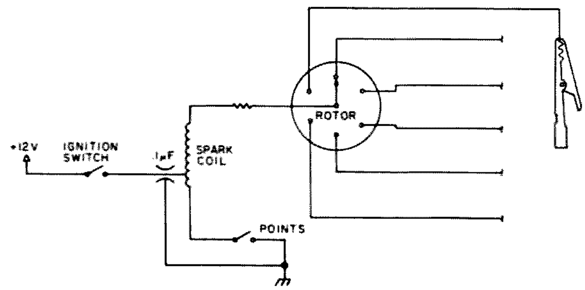


Fig. 2. Ignition system.

able solution. This class of noise is that generated within the vehicle where the station is installed. Right off the top, even using the best equipment and techniques, some noise may persist. However, to wage a solid battle against the aggravation of vehicle noise, the approach outlined here may be of real value. This approach is not new; many publications have presented such information in the past, and several were consulted in putting this article together.

The secret to lowering rf vehicular noise levels is:

- Identify the noise and the noise source.
- Eliminate the noise at the source if at all possible.
- Minimize noise-conducting and/or radiating paths.

When working on noise problems, you may find several distinct noises present. Work on these starting with the loudest/strongest first, then proceed downward through the list by next strongest one at a time. The following approach may help to identify the source of each noise.

Perform a vehicle-in-motion test. Run the vehicle in an area large enough to maneuver, but away from fixed noise sources (buildings, power lines, etc.).

Run the auto at moderate speeds; while moving, place the transmission in neutral and turn the ignition switch to accessory. If the noise goes away as you coast, it's most likely coming from the ignition system. (Be careful with this test, especially if you have power steering.) If the noise is a varying-pitch whine and stops with the ignition off, it's probably coming from the alternator. If the noise has a clicking or popping sound without any particular frequency and it disappears with the engine at idle or off, it's probably produced by the voltage regulator. A hash that has some variation with engine speed but doesn't come from the charging regulator indicates you have a Ford (Ford uses an electromechanical instrument regulator which is a notorious noise source).

In normal driving situations, the following noises and related sources may be noticed. While in motion, a sharp popping noise which doesn't seem to vary with engine speed probably comes from "tire static." (This may come and go as the road surface changes.) A rushing noise with an associated popping indicates a general auto high-static condition. This generally occurs when close by a thunderstorm. A jiggly, scraping noise indicates the production of body static caused by metal elements of the vehicle not electrically connected and rubbing together.

In order to put some systematic approach into play to help identify and combat these noises, Table 1 was prepared. In addition, to outline the typical auto electrical system, Figs. 1 and 2 were developed. These schematics indicate the particular components and hookups which may require attention.

Good luck in identifying and eliminating or reducing your particular vehicle noise problem. Keep in mind that although noise is an aggravation for us in mobile operation and the fixes may take some time and effort, the result is well worth it. Happy motoring! ■

Noise Sound	Possible Source	Steps
Popping changing to hash as engine speed increases	Ignition	Use new resistor spark plugs.
		Check all ignition cable for loose or poorly-crimped connections (solder where possible).
		Install resistors in distributor/coil lines and spark-plug lines. Use resistance ignition wires if available.
		As a last resort, install shielded ignition system (kits available, listed in *QST*).
Whine which changes pitch with engine speed	Alternator	Use a 0.1-uF coaxial capacitor in series with the alternator armature (A) lead.
		For "hard" cases, place a parallel tuned trap (with heavy wire) in series with the A lead. Tune to the operating frequency.
Irregular clicking	Regulator	0.1-uF coaxial capacitor in series with battery (B) and armature (A) leads.
		A series .002-uF mica capacitor and a 4-Ohm carbon resistor from the field (F) terminal to ground.
Irregular clicking	Vehicle wiring	0.1 coaxial capacitor in series with battery lead to ammeter; .5-uF coax capacitor in lead to gas gauge; .5-uF coax capacitor in lead to oil signal switch; .5-uF capacitor across headlight and taillight leads and other accessory lines.
Popping noise which changes with road material	Wheel static	Install front wheel hub static discharge springs (from auto parts houses).
Same	Tire static	Inject anti-static powder in tires.
Popping, scratching noise following jolts as the auto moves	Body static	Tighten all screws and bolts.
		Bond major auto elements to each other with heavy braid and lugs (engine, firewall, frame, fenders, hood, exhaust pipe, etc.).
Hashy Fords	Instrument regulator	Replace with 5-volt electronic module regulator.

Table 1. Mobile noise reduction.

Louis I. Hutton K7YZZ
12235 S. E. 62nd Street
Bellevue WA 98006

Electronics vs. Creepy Crawlers

Build this ultrasonic oscillator and drive pests crazy. Your pet hamster, too.

One thing you will find out when you become interested in electronics or have ham radio as a hobby is that eventually your curiosity will expand to investigating all sorts of electronic devices. This includes accessories for the ham shack, microwave downconverters, radar speed detectors, cable TV gadgets, and other interesting items. This article describes a gadget which has recently appeared on the electronics scene and really caught my attention as something I needed very badly in my ham shack.

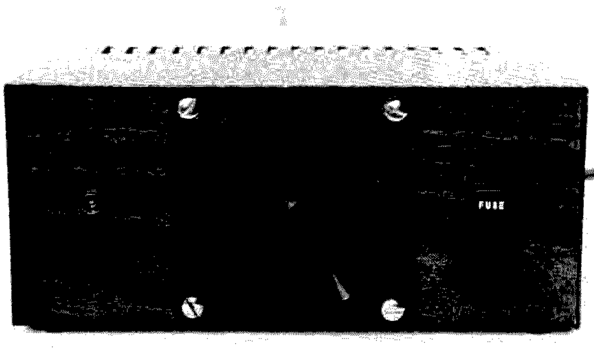
Now, I don't know about your ham shack, but mine is firmly delegated to a room in the basement of my house. The only problem is that since it is at ground level, all sorts of unwanted creepy crawlers invade my shack and take up residence in my ham gear. For many years, pet supply and garden stores have sold all sorts of products to rid a home of those pesky bugs and such. Well, now the electronics industry has taken on the challenge and thinks this is the answer on how to run those bugs out of my ham shack.

Circuit Description and Construction Notes

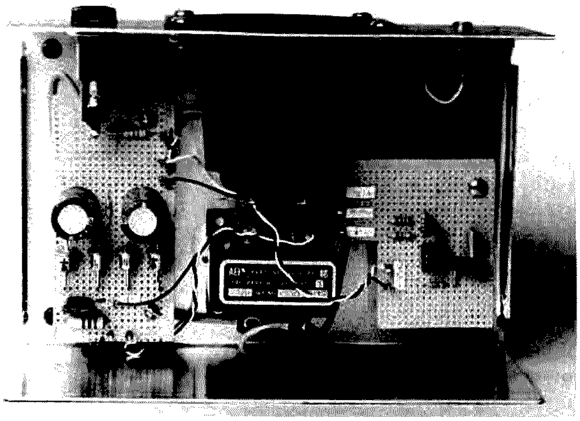
Low-intensity ultrasonic sound waves have been used to repel insects and small rodents. Square waves and pulsed waves have been tested and square waves are reported to be most effective in the 30-45-kHz frequency band. The ultrasonic sound waves are intended to damage the insects' nervous systems. The goal is to drive those creepy crawlers right out of the house. The ultrasonic sound waves are shifted in frequency 60 times per second to cover all of the communication frequencies of the most common pests (how about that—legal jamming!).

The ultrasonic sound emitted by the unit is above the hearing range of people, dogs, cats, and birds. It is reported as not affecting plants, TVs, and radios, but will bother gerbils, ham-

Photos by Betty Hutton



Front view of unit.



Component layout for the ultrasonic bug-chaser.

sters, and other pet rodents.

Several commercial models of bug-chasers have recently appeared on the market (see box). The schematic diagram shown is typical of such units and is designed to generate a swept square wave from 30 to 45 kHz. The LM555 IC is wired as an ultrasonic oscillator driving a piezoelectric speaker of the hi-fi super-tweeter type. The output of the oscillator is swept by a 60-Hz signal from the ac input of the bridge rectifier. The LED acts as a pilot light to let you know the power is on, as the only noise you will hear when this unit is running is a slight buzzing noise coming from the speaker.

An oscilloscope is necessary to observe the square-wave signal on pin 3 of the LM555 oscillator. My unit is built in a cabinet 3-1/2" × 7-1/8" × 5-11/16" (Radio Shack #270-269). The speaker is a 3.5-inch Piezo Super Horn (Radio Shack #40-1381). The oscillator and power supply were built on two small perfboards and bolted on metal standoffs to the chassis floor. No effort was made to design a PC board or to miniaturize the design. The front, bottom, and rear of the cabinet were covered with simulated wood-grain shelf paper to improve the appearance of the unit.

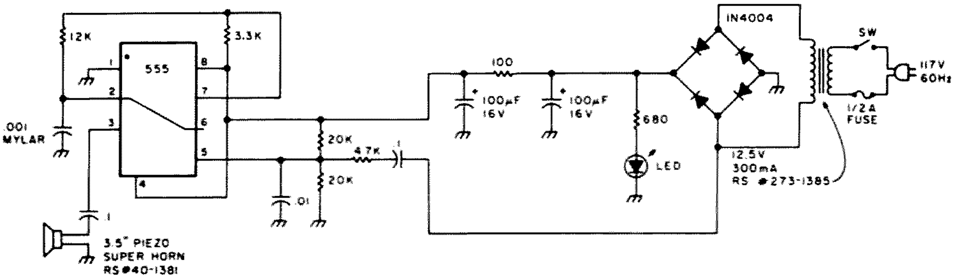


Fig. 1. Ultrasonic bug-chaser schematic.

Operation

I set my unit in one corner of my ham shack facing out into the room so that the ultrasonic sound waves would fill the room by bouncing off the walls, floor, and ceiling. Things like curtains, rugs, and upholstered furniture will absorb the sound waves. You should expect it to take several weeks before the full effect of the irritating ultrasonic sound waves will get to the bugs. I have had several visitors in the shack and they soon note the slight buzzing noise coming from that strange-looking box on the shelf. When told what it is, they unanimously say they want to build one for their own ham shack. Try it; the only thing you will have to lose is those pesky creepy crawlers. ■

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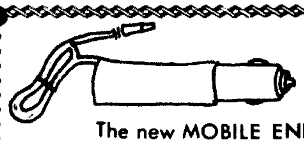

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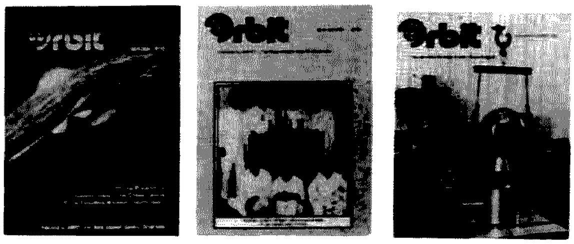

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Slimming and Trimming the R-1000

In crowded conditions, the 6-kHz filter may not cut the QRM. Here's the way out.

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Living overseas and not being able to have at your disposal the type of news and entertainment available in the United States causes many to try shortwave listening to receive news features from home. Our family's habit is to listen to broadcasts of the Voice of America and the Armed Forces Radio and Television Service (AFRTS) in addition to broadcasts from other countries for news and information about current events in the States.

Being in East Africa and tuning the shortwave bands, one quickly notices that Africa is the focal point for hundreds of powerful shortwave broadcasts which result in crowded band conditions and interference between rival programming. Sometimes it is almost impossible to separate from pileups weaker signals like AFRTS not normally beamed to East Africa.

With this background, I purchased the Kenwood R-1000 communications receiver for shortwave listening. The R-1000 is an advanced general-coverage receiver providing continuous coverage from 200 kHz to 30.0 MHz. It features a PLL synthesizer and a digital display for both frequency readout and the built-in clock and timer. It also includes an rf attenuator, a noise blanker, and capabilities for receiving LSB/CW, USB, and AM. For AM, either ceramic filters for 6-kHz or 12-kHz bandwidth are selectable for AM-narrow or AM-wide reception.

Crowded band conditions here in East Africa preclude the use of the 12-kHz filter; the 6-kHz filter is sufficiently wide for good fidelity for shortwave music programs. However, a narrower bandwidth is required for many AM situations, and it is to this end that circuit changes were made.

The plan is to utilize the 2.7-kHz SSB ceramic filter for both the SSB and AM-narrow modes, while the 12-kHz filter normally used for the AM-wide mode is replaced by the 6-kHz AM-narrow filter. The 12-kHz filter will be left on the receiver circuit board, but will not be used. These changes can be made by the addition of one silicon diode (1N914 type) and one wire and the removal of two existing wires. These changes can be accomplished in less time than it takes to explain. No holes are drilled, so the R-1000 can be returned to its original configuration at any time.

Here, then, is a step-by-step record of these changes:

1. First, remove both the top and bottom covers from the receiver. The speaker leads can be easily slipped off the speaker terminals.
2. Remove 2 wires, white/brown and white, from terminal #1 of the AMW mode switch, and tie these leads off, taping the ends to prevent shorts. Terminal numbering (on the Mode switch) is derived from the R-1000 Service Manual and is not clearly marked on the switches themselves. However, terminal #1 on the

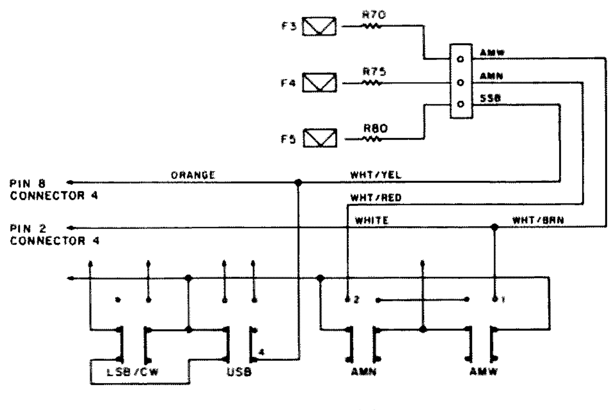

Fig. 1. Before modification.

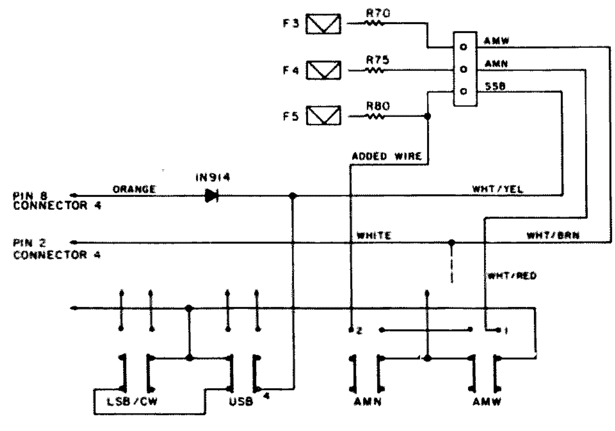

Fig. 2. After modification.

AMW mode switch is the one to which the wire pairs white/brown and white are terminated.

3. Remove the white/red wire from terminal #2 of the AMN mode switch and solder to terminal #1 of the AMW mode switch. Again, identify terminal #2 as the one to which the white/red is terminated.

4. Add a wire from terminal #2 of the AMN mode switch now vacant as a result of step 3 above, and dress it near the vfo case, running it through the slot formed between the vfo case and the receiver circuit board to the top side of the chassis. Connect this new wire to resistor R80. The connection should be made on the lead of R80 nearest to connector #3 (see Fig. 3). There should be enough room between the surface of the circuit board and the insulated portion of R80 to make the solder connection.

5. On the bottom side of the receiver, locate, within a bundle of wires running from the Mode switch near the Band (megahertz) switch, the orange wire running between terminal #4 of the USB mode switch (this is the only orange wire on the USB Mode switch). Then find terminal #8 of connector #4 on the top of the chassis. Pull the orange wire away from the wire bundle at a point near the Band (megahertz) switch and cut the wire at a point just behind the Band (megahertz) switch. Strip about ¼" of insulation from both ends of this wire and solder a 1N914 or equivalent diode between the two ends of the orange wire. The cathode should be closest to the USB Mode switch and the anode facing terminal #8 of connector #4 (see Fig. 2).

6. Replace the leads on the terminal of the speaker and install the top and bottom covers of the receiver.

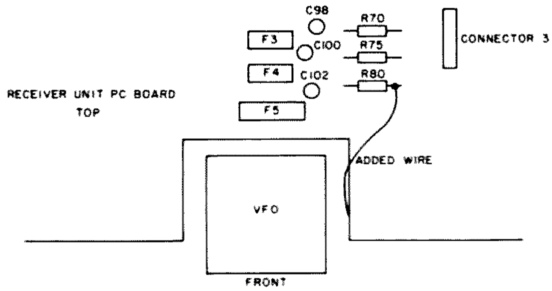

Fig. 3. Receiver unit PC board (top view).

Pressing the AMW position on the Mode switch now selects the 6-kHz bandwidth filter for AM-wide reception. Pressing the AMN position selects the 2.7-kHz bandwidth filter for AM-narrow reception, while the SSB position remains as before.

The end result is a receiver with bandwidth sufficiently wide for good fidelity during listening periods when interference is light. During periods of high interference or in crowded band conditions, the bandwidth of the new AM-narrow mode is extremely sharp, providing an increased ability to separate closely bunched signals. The SSB operation of the receiver is unaffected by these changes.

There are other ways to accomplish the same modification. One could purchase from Kenwood an additional SSB ceramic filter and substitute it for the currently installed AM-narrow filter. But this would be more expensive, and, I believe, more work. These changes improve the operation of an already fine piece of radio equipment. ■

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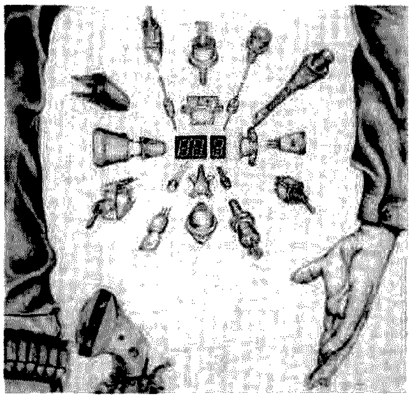

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Have you been bitten by the ten-meter FM bug? Do those Hy-Gain CB boards look interesting? Here is your chance to do a little bit of building and have a lot of fun. Since the actual rf conversion of the Hy-Gain boards has been well described in past *73 Magazines*,[1] I will only deal with this digital-scanning frequency selector.

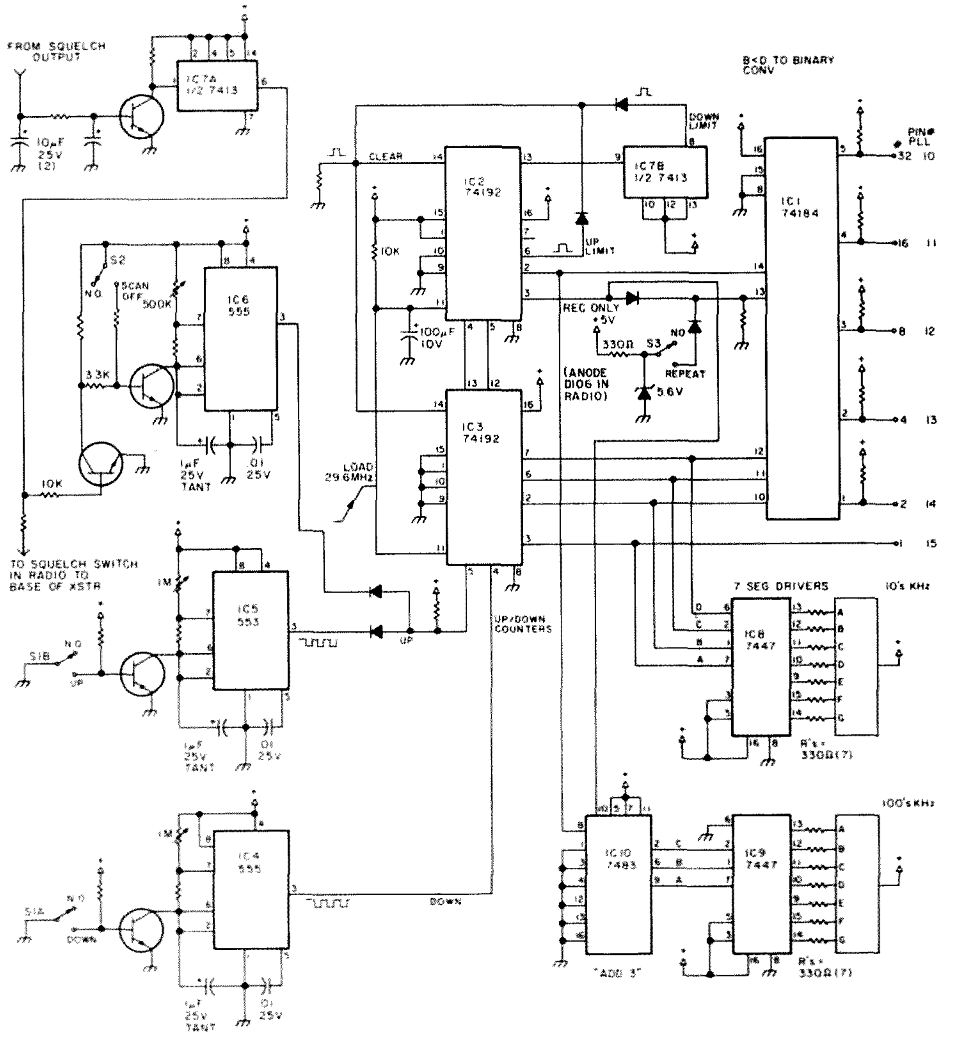

Fig. 1. All transistors—2N3904. All unmarked resistors are 1k Ohms. All + are 5 volts. All diodes—1N4148.

This circuit will give you direct frequency readout. Example: 60 = 29.60 MHz, and so on. There are 40 channels available at 10-kHz increments with a repeater offset for 20 of these channels. A squelch-operated scanner allows you to search the band without lifting a finger.

The crystal in the radio which is 11.8066 MHz has to be changed to 12.69166 MHz. This crystal can be obtained from Jan Crystals in Ft. Myers, Florida. Pins 8 and 9 of the PLL-02 have to be tied to plus 5 volts (preload to binary 192). Pin 10 must be separated from pin 9. This is the conversion that differs from the original in the reference. It is important to get a CB board with a 16-pin PLL chip. The ones with 18 pins require changing the chip to a PLL-02 and rewiring.

The best way I found to build this is shown in Fig. 2. I use perfboard with the holes spaced at .1 inches. The parts are not critical, but an LS series IC can be used to reduce current drain. Five volts must be provided and a 7805 IC can be mounted on the TA7205P heat sink on the radio.

Refer to Fig. 1 for the fol-

lowing circuit details. IC1 is a BCD-to-binary converter. The PLL-02 IC in the radio requires a binary code to select the frequency we want. But to make it easier for us to select the frequency, it is converted from BCD. IC2 and IC3 are up/down counters that provide the sequence counting and the memory for the selected frequency. The counters are driven from IC4, IC5, and IC6, which are gated astable multivibrators. IC7a is used as a Schmitt trigger which is driven from the squelch output. A dc signal must be fed to this so that a high level (greater than one volt) will raise up the base of Q120 in the radio, thus squelching the radio. IC8 and IC9 are BCD decoder/drivers for the LED readouts. The pinout of the readouts depends on what type of common anode displays they are. IC10 is a binary adder. This circuit "adds" 3 to any number found at the output of IC2 (0 to 4). This will let the LED display read the operating frequency, not just a channel number. For example, when the outputs of IC2 and IC3 are all zero, the frequency of the radio is 29.30 MHz. But without IC10, the readout would read "00". But with the "3" added, the readout reads "30".

S1a and S1b is a momentary SPDT center-off toggle switch. When the switch is closed in either direction, it turns off the transistor associated with it and this allows the up or down multivibrators to operate. S2, the scan switch, when closed prevents the squelch circuits from starting the IC6 multivibrator, which is used to run the scanning section. The repeat switch, S3, when open does nothing to the radio. But when closed, it will add 100 kHz to the operating frequency on receive only. When the PTT is pushed, the radio will transmit on the displayed frequency. The anode of D106 in the radio provides about 7 volts in receive only, which makes this offset possible. A special note: This offset circuit works only between 29.30-29.39 and 29.50-29.59 MHz. But the repeater inputs are between 29.51 and 29.59 MHz.

Another feature of this circuit is that when the radio is turned on, the frequency will be 29.60 MHz, which is the international simplex calling frequency. This is done by slowly bringing up pin 11 on IC2 and IC3 during power-up.

In closing, I would say that the use of this circuit really adds polish to these converted CB boards. I would like to thank Charlie DeVoe WA2IUJ for building one of these, to show it could be repeated, and for his opinion of its operation.

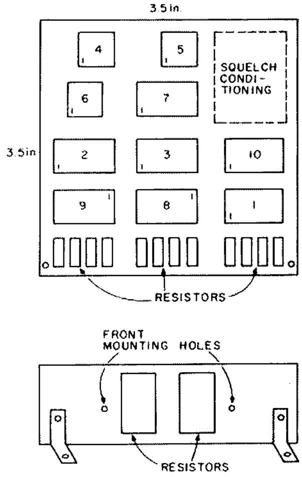

Fig. 2.

I welcome any comments, and I will reply to any questions when an SASE is enclosed. ■

Reference

1. Howard Knickerbocker K1DCS, Andrew Weise N1XN, and Robert Stielau W1WRO, "CB to 10 FM—best conversion yet?", *73 Magazine*, January, 1980, p. 117.

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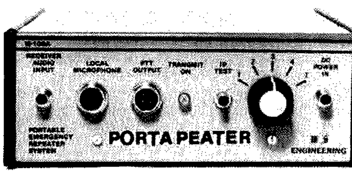

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SATELLITES

AMATEUR SATELLITE NEWS

CQ CQ Earthside de STS-9

Well, maybe not, but there is a good chance that amateur radio will be among the astronauts' leisure-time activities aboard STS-9, the ninth flight of NASA's Space Shuttle. Dr. Owen Garriot W5LFL, one of four STS-9 crew members, will operate a small 2-meter FM rig, if all goes according to plan.

Actually, though the proposal has plenty of support from the amateur community, NASA has yet to grant its final approval. W5LFL himself is said to be pushing for the ham activity, and there is plenty of backing from the ARRL, AMSAT, and a number of prominent individual amateurs.

Yet to be decided is the format of the space-borne amateur festivities. A free-for-all operation would likely result in the greatest pileup of all time, complete with frayed nerves and rising tempers. A much more organized method will no doubt evolve—perhaps even a series of one-way transmissions from W5LFL to the thousands of us listening on the ground.

Iskra—Again!

Cosmonauts aboard Russia's Salyut 7 space station have once again launched an amateur satellite. Iskra 3, like its predecessor Iskra 2, was literally tossed out the back door by the cosmonauts, who pushed it through an air lock normally used to jettison refuse. The satellite was launched last November 18 and features a telemetry beacon on 29.583 MHz.

If the example of Iskra 2 is the norm, Iskra 3 may be short-lived. Iskra 2 survived only eight weeks in orbit following its May 17, 1982, launch before plunging back into the atmosphere. And what of the never-mentioned Iskra 1? If the Soviets know, they aren't telling.

Orbital Calendars

Once again this year, Project OSCAR, Inc., has produced an orbital calendar for amateur satellite users. The 1983 version contains the time and longitude of every northbound equatorial crossing for each of the amateur satellites carrying a communications transponder: OSCAR 8, RS5, RS6, RS7, and RS8. It's a real time-saver.

The calendar is available in the USA, Canada, and Mexico for a $10 donation ($12 elsewhere). Send a mailing label, along with your check or money order, to: Project OSCAR, Inc., PO Box 1136, Los Altos CA 94022.

Thanks to *Amateur Satellite Report* and the *W5YI Report* for portions of this month's news.—Jeff DeTray WB8BTH, *73* Staff.

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2	0007	81	0149	104	0149	107	0157	107	0110	93	2
3	0011	82	0144	104	0134	105	0147	106	0107	93	3
4	0016	83	0138	104	0118	103	0138	105	0104	94	4
5	0020	84	0133	104	0103	100	0128	104	0101	95	5
6	0024	85	0128	104	0048	98	0119	104	0059	96	6
7	0029	86	0122	105	0032	96	0109	103	0056	97	7
8	0033	88	0117	105	0017	93	0059	102	0053	97	8
9	0038	89	0112	105	0001	91	0050	101	0050	98	9
10	0042	90	0106	105	0145	119	0040	100	0047	99	10
11	0046	91	0101	105	0129	116	0030	99	0044	100	11
12	0051	92	0056	105	0114	114	0021	98	0042	101	12
13	0055	93	0050	106	0059	112	0011	97	0039	102	13
14	0059	94	0045	106	0043	109	0001	96	0036	102	14
15	0104	96	0039	106	0028	107	0151	125	0033	103	15
16	0108	97	0034	106	0012	105	0141	125	0030	104	16
17	0113	98	0029	106	0156	132	0132	124	0028	105	17
18	0117	99	0023	107	0140	130	0122	123	0025	106	18
19	0121	100	0018	107	0125	127	0112	122	0022	106	19
20	0126	101	0013	107	0110	125	0103	121	0019	107	20
21	0130	102	0007	107	0054	123	0053	120	0016	108	21
22	0135	103	0002	107	0039	120	0043	119	0013	109	22
23	0139	105	0156	137	0023	118	0034	118	0011	110	23
24	0000	80	0151	138	0008	116	0024	117	0008	111	24
25	0005	81	0145	138	0151	143	0014	117	0005	111	25
26	0009	82	0140	138	0136	141	0005	116	0002	112	26
27	0013	83	0135	138	0120	139	0154	145	0159	143	27
28	0018	84	0129	138	0105	136	0145	144	0156	144	28
Mar 1	0022	86	0124	139	0050	134	0135	143	0153	145	1
2	0027	87	0119	139	0034	132	0125	142	0151	146	2
3	0031	88	0113	139	0019	129	0116	141	0148	146	3
4	0035	89	0108	139	0004	127	0106	140	0145	147	4
5	0040	90	0103	139	0147	155	0056	139	0142	148	5
6	0044	91	0057	140	0131	152	0047	138	0139	149	6
7	0048	92	0052	140	0116	150	0037	138	0136	150	7
8	0053	93	0047	140	0101	148	0027	137	0134	150	8
9	0057	95	0041	140	0045	145	0018	136	0131	151	9
10	0102	96	0036	140	0030	143	0008	135	0128	152	10
11	0106	97	0031	140	0014	141	0158	164	0125	153	11
12	0110	98	0025	141	0158	168	0148	163	0122	154	12
13	0115	99	0020	141	0142	166	0138	162	0119	154	13
14	0119	100	0015	141	0127	163	0129	161	0117	155	14
15	0124	101	0009	141	0112	161	0119	160	0114	156	15
16	0128	103	0004	141	0056	159	0109	159	0111	157	16
17	0132	104	0158	172	0041	156	0100	159	0108	158	17

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received at 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine Street, Peterborough NH 03458.*

ARLINGTON HEIGHTS IL
FEB 6

The Wheaton Community Radio Amateurs will hold their hamfest on February 6, 1983, at Arlington Park Race Track Expo Center, Arlington Heights IL. Tickets are $3.00 at the entrance and $2.50 in advance. Doors will open at 8:00 am. Flea market tables are free and plenty of floor space will be available. There will be a large commercial area (including a computer section), awards, and clear, paved parking. Talk-in on 146.01/.61 and 146.94. For general information, call W9JTO at (312)-231-9524. For advance tickets, send an SASE to WCRA, PO Box OSL, Wheaton IL 60187.

MANSFIELD OH
FEB 13

The ARRL-approved Midwinter Hamfest/Auction will be held on Sunday, February 13, 1983, beginning at 8:00 am, at the Richland County Fairgrounds, Mansfield OH. Tickets are $2.00 in advance and $3.00 at the door. Tables are $5.00 in advance and $6.00 at the door. Half tables are available. Talk-in on 146.34/.94. For additional information or advance tickets, contact Harry Frietchen K8HF, 120 Homewood Road, Mansfield OH 44906, or phone (419)-529-2801 or (419)-524-1441.

MARLBOROUGH MA
FEB 20

The Algonquin Amateur Radio Club will hold its annual flea market on Sunday, February 20, 1983, at the Marlborough Jr. High School, Marlborough MA. Admission is $1.00 and children under 12 will be admitted free. The doors will open at 9:00 am for dealers and 10:00 am for buyers. Refreshments will be available. Tables reserved before February 12, 1983, are $7.00; any remaining tables will be $10.00 at the door. Talk-in on 146.01/.61 and 146.52. For table reservations or more information, contact Algonquin ARC, PO Box 258, Marlborough MA 01752.

MELVILLE LI NY
FEB 20

The Long Island Mobile Amateur Radio Club Indoor Hamfest will be held on February 20, 1983, from 9:00 am to 5:00 pm, at the Electricians Hall, 41 Pinelawn Road, Melville LI NY, located just north of Exit 49 of the Long Island Expressway (495). General admission is $3.00 and sellers' tables (4' × 6' with oval corners) are $10.00 in advance. Food and refreshments, lots of parking, and coat and equipment checking will be available. For reserved tables, contact Hank Wener WB2ALM, 53 Sherrard Street, East Hills NY 11577, or phone (516)-484-4322 between 10:00 pm and midnight. For additional information, phone Sid Wolin K2LJH in the evening at (516)-379-2861.

ELKIN NC
FEB 20

The sixth annual Elkin Winter Hamfest will be held on Sunday, February 20, 1983, at the Elkin National Guard Armory, located two miles off Interstate 77 at Exit #85 in Elkin NC. Doors will open at 0800 to the public, and breakfast and lunch will be served at the hamfest by the Foothills ARC of Wilkesboro NC and the Briarpatch ARC of Galax VA. Talk-in on 144.77/145.37, 146.22/.82, and 147.69/.09. For ticket inquiries, table reservations, or other information, contact either George Reeves WD4BMG, Route 6, Box 412, North Wilkesboro NC 28659, (919)-670-2803, or Tommy Lineberry WD4BTF, 308 Poplar Street, Galax VA 24333, (703)-236-8424.

LANCASTER PA
FEB 20

The 1983 Lancaster Hamfest will be held on Sunday, February 20, 1983, from 0800 to 1600, at the Guernsey Sales Pavilion, US Route 30 East, Lancaster PA. General admission is $3.00 for all hams and dealer personnel. Table fees are $10.00 in the main display area and $6.00 in the annex area. There will be tailgating if weather permits. Dealer setup is at 0600 by reservation. Talk-in on 146.01/.61, 147.615/.015, and 146.52. For reservations, send checks made payable to SERCOM, Inc., to Hamfest Committee, RD #1, Box 56V, Blue Ball PA 17519.

ROBBINSDALE MN
FEB 26

The Robbinsdale Amateur Radio Club (K0LTC) will hold its Midwinter Madness Amateur and Computer Fest on February 26, 1983, beginning at 8:30 am, at Sacred Heart Church School Auditorium, 4087 West Broadway, Robbinsdale MN. General admission is $2.00 in advance and $3.00 at the door. Contact Bob Reid N0BHC, 19725 Jackie Lane, Rogers MN 55374, for commercial exhibit space (tables are $15.00 each). Flea-market space is available from Barry Blazevic WB0FBN, 5437 Virginia Avenue N., New Hope MN 55428. Doors will open for setups at 7:00 am. Activities will include seminars on antennas, towers, and computer interfacing, as well as a slide presentation on the voyage of the Viking ship *Hjemkomst*. Lunch will be available in the building.

GLASGOW KY
FEB 26

The Glasgow Swapfest will be held on Saturday, February 26, 1983, beginning at 8:00 am Central time, at the Glasgow Flea Market Building, 2 miles south of Glasgow just off highway 31E, Glasgow KY. Admission is $2.00 per person. There is no additional charge for exhibitors. The first table per exhibitor will be free, and extra tables will be available for $3.00 each. There will be a large heated building, free parking, free coffee, and a large flea market. Talk-in on 146.34/.94 or 147.63/.03. For further information, write Bernie Schwitzgebel WA4JZO, 121 Adairland Court, Glasgow KY 42141.

JENSEN BEACH FL
FEB 26

The Martin County Amateur Radio Association will hold its annual free hamfest on Saturday, February 26, 1983, from 8:00 am to 4:00 pm, at Langford Park, Route 707, Jensen Beach FL. There will be free table or tailgate space and free admission. Food will be available or bring your own picnic. There is an area for cooking and playing, so bring the family. Talk-in on 146.46/147.06 (Stuart repeater). For more information, write MCARA, PO Box 1901, Stuart FL 33495.

LAPORTE IN
FEB 27

The LaPorte Amateur Radio Club Winter Hamfest will be held on Sunday, February 27, 1983, at the LaPorte Civic Auditorium, LaPorte IN. The donation is $2.50 at the door and tables are $1.00 each. Dealers will receive help unloading starting at about 6:00 am. For more information or reservations, send an SASE to PO Box 30, LaPorte IN 46350.

LIVONIA MI
FEB 27

The Livonia Amateur Radio Club will hold its 13th annual LARC Swap 'n Shop on Sunday, February 27, 1983, from 8:00 am to 4:00 pm, at Churchill High School in Livonia MI. Reserved table space (12-foot minimum) is available. Talk-in on 144.75/145.35 and .52. For further information, send an SASE (4" × 9") to Neil Coffin WA8GWL, c/o The Livonia Amateur Radio Club, PO Box 2111, Livonia MI 48151.

VIENNA VA
FEB 27

The 10th annual ARRL-approved winter season hamfest, WINTERFEST™ '83, celebrating the 20th anniversary of the Vienna Wireless Society, will be held on Sunday, February 27, 1983, beginning at 8:00 am, at the Community Center, 120 Cherry Street, Vienna VA. Tickets are $4.00 and sales tables are $5.00 and $10.00. Parking is free. Features will include a CW contest, commercial displays, an indoor flea market, and outdoor Frostbite tailgating. Excellent food service will be available. Talk-in on 146.31/.91 and 146.52. For additional information, send an SASE to WINTERFEST '83, PO Box 418, Vienna VA 22180, or call Jeff Wilkes W4NFA at (703)-281-4249 or on the Virginia Sideband Net.

MORRIS PLAINS NJ
MAR 4

The Split Rock Amateur Radio Association will hold its sixth annual electronics auction on Friday, March 4, 1983, at VFW Post #3401, State Route 53, Morris Plains NJ. The Morris Plains VFW hall is located a short distance from US 202 and NJ 10 and is easily reached via I-80, I-287, and US 46. Admission is $1.00. Doors will open at 7:00 pm for unloading and inspecting equipment and the auction will commence at 8:00 pm sharp. Items to be sold must be working equipment and loose parts must be bagged in the largest quantity possible. A commission of 10% will be taken on the first $50.00 of each sale. Commissions are payable in cash only. Refreshments will be available. Talk-in on 146.385/146.985 (WR2ADB) and 146.52. For more information, please write to SARA, PO Box 3, Whippany NJ 07981.

OLD BRIDGE NJ
MAR 6

The Old Bridge Radio Assocation will hold its third annual auction on March 6, 1983, at the K of C Hall, Pine Street (just off Route 18), Old Bridge NJ. Doors will open for registration and inspection at 9:00 am and the sale will begin at 10:00 am. Admission is $2.50. On successful sales, there will be a club commission of 10% on the first $100 and 5% on the remainder. Food and drink will be available. Talk-in on .72/.12, .34/.94, and .52. For more information, contact Fred Goldberg WA2BJZ, 29 Clearview Road, East Brunswick NJ 08816, or phone (201)-257-8753.

SOUTH ST. LOUIS MO
MAR 11

The Jefferson Barracks Amateur Radio Club will hold its annual auction and hamfest on March 11, 1983, at the Carondelet Sunday Morning Athletic Club in South St. Louis MO.

FORT WALTON BEACH FL
MAR 12-13

The Playground Amateur Radio Club will hold its 13th annual North Florida Swapfest on Saturday, March 12, 1983, from 8:00 am to 4:00 pm, and on Sunday, March 13, 1983, from 8:00 am to 3:00 pm, at the Okaloosa County Fairgrounds, Fort Walton Beach FL.

MARTINSVILLE IN
MAR 13

The Morgan County Amateur Radio Club will sponsor the Martinsville Hamfest on March 13, 1983, beginning at 8:00 am, at the Morgan County 4-H Building and Fairgrounds. Admission is $3.00 in advance and $4.00 at the door; children 11 and under will be admitted free. Flea-market space with a table is $5.00 and flea-market space without a table is $3.00. Premium tables are $20.00. Tables will be available on a first-come basis and the best spaces will be assigned first. Vendor setups will start at 5:00 am and parking will be free. Talk-in on 147.66/.06. For tickets, table reservations, and information, send an SASE to Aileen Scales KA9MBK, 3142 Market Place, Bloomington IN 47401.

ERIE PA
MAR 19

The Radio Association of Erie PA will hold The RAE Eyeball QSO Party on Saturday, March 19, 1983, at the Perry Highway Hall, 8/10 of a mile south of I-90 on the west side of Route 19. Admission is $2.00 per person. Tables (8-foot) are $3.00 each and are by reservation only. Food will be available. There will be FCC testing for applicants that mail Form 610 to the Buffalo office by February 22nd. Talk-in on .01/.61 and .22/.82.

MARSHALL MI
MAR 19

The Southern Michigan ARS and the Calhoun County Repeater Association will hold the 21st annual Michigan Crossroads Hamfest on March 19, 1983, beginning at 8:00 am, at the Marshall High School, Marshall MI. Tickets are $2.00 at the door and $1.50 in advance. Table space is $.50 a foot. Doors will be open at 7:00 am for exhibitors and there will be plenty of carry-in help and free parking. Food service will be available in the cafeteria. For tables or tickets, contact SMARS, PO Box 934, Battle Creek MI 49016, or phone Chuck Williams at (616)-964-3197.

MIDLAND TX
MAR 19-20

The Midland Amateur Radio Club will hold its annual St. Patrick's Swapfest on March 19-20, 1983, from 8:00 am to 6:00 pm on Saturday and from 8:00 am to 3:00 pm on Sunday, at the Midland County Exhibit Building, east of Midland on Highway 80 on the north side. Pre-registration is $5.00 (at the door, $6.00). Tables are $4.00 each. Refreshments will be available. Talk-in on .16/.76 and .01/.61. For further information and reservations, please contact Midland Amateur Radio Club, PO Box 4401, Midland TX 79704.

JEFFERSON WI
MAR 20

The Tri-County Amateur Radio Club will hold its annual hamfest on March 20, 1983, from 8:00 am to 3:00 pm at the Jefferson County Fairgrounds, Jefferson WI. Tickets are $2.50 in advance and $3.00 at the door. Tables are $2.50 in advance and $3.50 at the door. Parking is free and there will be plenty of food available. Talk-in on 146.52, 146.22/.82, and 144.89/145.49. For more information, advance tickets, and tables, send an SASE to Horace Hilker K9LJM, PO Box 204, 261 E. High Street, Milton WI 53563.

TRENTON NJ
MAR 20

The Delaware Valley Radio Association will hold its 11th annual flea market on Sunday, March 20, 1983, from 8:00 am to 4:00 pm, at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township. Registration is $2.50 in advance and $3.00 at the door. There will be an indoor and outdoor flea-market area and refreshments, including breakfast at 7:00 am. Sellers must bring their own tables. Talk-in on 146.52 and 146.07/.67. For further information, send an SASE to DVRA, PO Box 7024, West Trenton NJ 08628.

CIRCLEVILLE OH
MAR 20

The Teays Amateur Radio Club will hold its sixth annual King of the Pumpkin Hamfest on Sunday, March 20, 1983, from 8:00 am to 4:00 pm, at the Pickaway County Fairgrounds Coliseum. Tickets are $2.00 in advance and $3.00 at the door. Tables (8-foot) are $4.00 in advance and $5.00 at the door. Doors will be open for setups on Saturday at 4:00 pm and overnight security will be provided. A large parking area and food will be available. Talk-in on 147.78/.18 and .52/.52. For additional information, please send an SASE to Dan Grant W8UCF, 22150 Hulse Road, Circleville OH 43113, or phone (614)-474-6305.

STERLING IL
MAR 20

The Sterling/Rock Falls Amateur Radio Society will hold its 23rd annual hamfest on March 20, 1983, beginning at 7:30 am, at the Sterling High School Field House, 1608 4th Avenue, Sterling IL. Tickets are $2.00 in advance and $2.50 at the door. Commercial tables and flea-market tables requiring electricity are $5.00; all others are $3.00. A concession stand, free parking, and overnight space for self-contained campers will be available. There will be commercial distributors, dealers, and a large flea market. Talk-in on 146.25/.85 (W9MEP). For advanced tickets, tables, and information, contact Sue Peters, 511 8th Avenue, Sterling IL 61081, or call (815)-625-9262.

BLACKSBURG VA
MAR 21-24

The Virginia Polytechnic Institute and State University will hold a Personal Microcomputer Interfacing and Scientific Instrumentation Automation Workshop on March 21-24, 1983, on the Virginia Tech campus in Blacksburg VA. The workshop, directed by Drs. Paul Field, Chris Titus, Jon Titus, and Mr. David Larsen, is hands-on, with the participant designing and testing concepts with actual hardware. The charge is $595.00. For more information, write Dr. Linda Leffel, C.E.C., Virginia Tech, Blacksburg VA 24061, or call (703)-961-4848.

JOHNSTOWN PA
MAR 27

The Conemaugh Valley Amateur Radio Club will hold its sixth annual hamfest on Sunday, March 27, 1983, from 8:00 am to 4:00 pm, at the East Taylor Fire Hall, which is located on Route 271, 5 miles south of Route 22 (4 miles north of Johnstown). There will be plenty of food and refreshments available. Talk-in on 146.34/.94.

GRAYSLAKE IL
MAR 27

The Libertyville and Mundelein Amateur Radio Society will hold LAMARSFEST 1983 on Sunday, March 27, 1983, beginning at 8:00 am, at the Lake County Fairgrounds, Routes 45 and 120, Grayslake IL. Tickets are $2.00 in advance or $3.00 at the door. Tables (9-foot) are $5.00 each. Reservations are encouraged because choice locations will be assigned first. Commercial setups will begin at 6:30 am and other setups will begin at 7:00 am. There will be free parking, and breakfast and lunch will be available. Talk-in on 147.63/.03 and 146.94. For tickets, table reservations, or exhibitor information, send an SASE to LAMARS, PO Box 751, Libertyville IL 60048.

BALTIMORE MD
MAR 27

The Baltimore Amateur Radio Club, Inc. (BARC), will hold the 1983 Greater Baltimore Hamboree and Computerfest on

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EXTRAORDINARY DX PERFORMANCE IDEAL FOR 20-15 AND 10 METER BANDS. THE TOTALLY PLASTIC MATERIAL & STRUCTURE OF TRIANGULAR SHAPE THAT MATCHES PERFECTLY THE ELECTRONIC REQUIREMENTS, LENDS TO STRAIGHTFORWARD DESIGN THAT REDUCES LOSSES, SIMPLIFIES ADJUSTMENTS & STRENGTHENS CONSIDERABLY THE ANTENNA. MATERIALS REQUIRED ARE OBTAINABLE IN ALMOST ANY LOCALITY. COMPLETE DESCRIPTION, DRAWINGS AND ALL NECESSARY INFORMATION TO BUILD IT, IN ENGLISH OR SPANISH, AIR MAILED TO ANY COUNTRY $20 U.S. CHECK CASHABLE IN U.S.A. TO A. LASCURAIN PINO Nº 59 MEX. D.F. 01030 MEXICO ✓214

✓See List of Advertisers on page 114

March 27, 1983, beginning at 8:00 am, at the Maryland State Fairgrounds Exhibition Complex (located east of I-83 exit 17, three miles north of I-695, north of Baltimore), Timonium MD. Admission is $3.00; children under 12 will be admitted free. Overnight accommodations are available in the immediate area. Amateur-radio, personal-computer, and small-business-computer dealers will be present. There will be an indoor flea market, a large hard-surfaced outdoor tailgate area, food service, free parking, and guest speakers throughout the day. For additional information and table reservations, contact GBH&C, PO Box 95, Timonium MD 21093-0095, or phone (301)-561-1282. For a recorded announcement, dial (301)-HAM-TALK.

MADISON WI
APR 10

The Madison Area Repeater Association, Inc. (MARA), will hold its eleventh annual Madison Swapfest on Sunday, April 10, 1983, at the Dane County Exposition Center Forum Building, Madison WI. Doors will open at 8:00 am for commercial exhibitors and flea-market sellers, and at 9:00 am for the general public. Admission is $2.50 per person in advance and $3.00 at the door. Children twelve and under will be admitted free. Flea-market tables are $4.00 each in advance and $5.00 at the door. Features will include commercial exhibitors, a flea market, an all-you-can-eat pancake breakfast, and a barbecue lunch. Plenty of parking space and nearby hotel accommodations are available. Talk-in on 146.16/.76 (WR9ABT). For reservations (early ones are advised) or more information, write to MARA, PO Box 3403, Madison WI 53704.

SOUTH SIOUX CITY NE
APR 15-17

The 39 Hundred Club will hold the 1983 Midwest ARRL Convention on Friday, Saturday, and Sunday, April 15-17, 1983, at the Marina Inn, South Sioux City NE, directly across the river from Sioux City. On Saturday, features will include a QCWA breakfast, a 3900 Club luncheon, an all-day ladies' program, and an evening banquet with entertainment. There will be seminars, displays, commercial exhibits, and a 66-table flea market, all indoors in the same building. Tables (8 ft. × 30 in.) are $5.00 for the 3 days, $4.00 for Friday night and Saturday. For table reservations, contact Al Smith W0PEX, 3529 Douglas Street, Sioux City IA 51104. Exhibitors should contact Jim Boise KA0GZY, 22 LaSalle Street, Sioux City IA 51104. Setup time is Friday afternoon, April 15th. Convention fees are $6.00 for the 3 days; advance banquet reservations are $10.00 (at the door, $12.00). For advance banquet tickets and motel reservations, write to Jerry Smith W0DUN, Akron IA 51001. For general information, contact Dick Pitner W0FZO, General Chairman, 2931 Pierce Street, Sioux City IA 51104.

DAYTON OH
APR 23

The Washington University Amateur Radio Club will hold a reunion dinner on Saturday, April 23, 1983, at the Dayton Hamfest. All past members of the club are invited. For more information, contact Washington University ARC W0QEV, Box 1128, St. Louis MO 63130.

PARAMUS NJ
MAY 1

The Bergen ARA will hold a Ham Swap 'n' Sell on May 1, 1983, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. Admission for sellers is $3.00; buyers will be admitted free. There will be thousands of spaces but tailgating only. Sellers must bring their own tables. Talk-in on .79/.19 and .52. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared post cards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½" × 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I am looking for manuals and schematics for the Gonset G50 6-meter transceiver and the Conco 611 VHF transceiver, model 861-0611-001. I will pay a reasonable price for the original manuals or photocopies.

Gary Kohtala DA2XF
USAFS-A, Box 1415
APO NY 09458

I would like to find the schematics or technical manual for the VHF Engineering TVX-10 transmitter. I also need the address of VHF Engineering's new parent company. I will pay all copying costs and postage costs.

Lee Robinson WA3HJC
317 Peninsula Dr. #53
Erie PA 16505

I would like a copy of the schematic for the Wang 629 double cassette deck, which is part of the Wang 500/600 programmable calculator.

Dave Overton
1709 W. 30
Austin TX 78703

I need help in identifying some of the components in the Sabtronics #8610B-A 600-MHz, 9-digit counter. I would like to identify 2 chips: one is in the preamp of the prescaler, marked SAB 1009 (also marked J7940) and the other is in the frequency divider and is marked SP 8680B (also marked PS 5 A2). Any information on these ICs would be greatly appreciated.

Patrick Chivington
1476 Grace Ave.
Lakewood OH 44107

I would like to locate a copy of the instruction manuals for the Beckman models 607 and 609 heterodyne converters. These plug-ins extended the frequency range of the Beckman 6100 series counter.

Lyle Pellock W9MWP
2423 Holt St.
Vienna VA 22180

I am forming a nationwide network of motorcycling amateur radio operators. Anyone interested should please check in on 3967 kHz at 0300Z on Thursdays. Send an SASE for more details.

Gary McDuffie AG0N
Route 1 Box 90-A
Bayard NE 69334

I am having difficulties running phone patches with Radio Shack model ET-100T and ET-100 telephones. Rf is causing interference in the telephones. Can anyone give me ideas on how I can clear up the problem?

Everett C. Bollin WA3DVO
8000 Ray Leonard CL
Palmer Park MD 20785

I need a wrench that can remove the spanner nut from the microphone jack of the Kenwood TR-9000. I would also like to increase the scan delay to 10 seconds. Any help would be appreciated.

Curtis R. Olsen WA0NZQ
Box 115
Regent ND 58650

I have a synthesized 2-10-MHz AM-CW transceiver made by Delco. Their designation is Delco 1600. Does anyone know the military designation, or have a manual schematic for the unit?

Gary Cain
1428 Marigold Way
South Bend IN 46617

Wanted: two 60-kHz coil assemblies, part number M42005-1, for the Hammarlund HQ-170. They are marked as T10, T11, and T28 on the schematic.

John Seely WB3EPG
7080 Moore Avenue
Pensacola FL 32511
(904)-456-8096

Has anybody worked out a computer program for converting helical scan transmissions such as weatherfax to information that could be printed on a dot-matrix printer?

Larry J. Clark
c/o USCG Marine Safety Office
Galveston TX 77550

I need information on X- and K-band traffic-control radar units. I would like to build X- and K-band oscillators with an output of about 10 W and any schematics or other information would be greatly appreciated.

A1C Mark LaSalle
Box 2241
APO NY 09130

I am looking for the schematic and manual for the Eico model 249 VTVM. I will pay for any copying costs.

Len TenEycke VE3INK
132 Silverhill Dr.
Islington, Ontario
M9B 3W7 Canada

I am looking for proven modifications or ideas for improving the Ten-Tec Omni D- or C-series units. In exchange, I will provide modification data from my files.

Mickey McDaniel W6FGE
940 Temple St.
San Diego CA 92106

Wanted: bandswitch or individual wafers for the Hallicrafters SX-110 receiver. Suggestions welcome; whole radios considered.

Nick Adams WA4YKV
3009 NE 14th St.
Gainesville FL 32601

I need the manual and voltage specifications for the Heath HG-10 vfo for 2-80 meters, as well as the manuals for the HP500B frequency meter, the Ameco R5 receiver, the Heath FM adapter and the Heath SSB adapter. Finally, does anyone need an "as is" TEK oscilloscope?

Kevin Neal
Route A Box 221A
Flippin AR 72634

I am looking for the schematic to an RME pre-war receiver.

David R. Nadeau
S. 1200 Kelly Ave.
Coeur D'Alene ID 83814

I need assistance in locating the manuals and schematics for the SBE model 34 SSB transceiver and the EMC model 213 tube tester. I will reimburse any expenses.

Jim Seeber
708 Avenue I
Matamoras PA 18336

I am looking for information on software for using the VIC-20 on RTTY and CW. In addition, I would like to know if there is a VIC-20 net or if anyone would be interested in starting one. Just send your suggested time and frequency to me.

Dave Land KD5FX
2512 Bonnie
Ponca City OK 74601

I am interested in receiving the Space-Shuttle communications on 296.8 MHz with a JIL SX-200 AM-FM programmable scanner. Anyone knowing where I can purchase a converter system, please contact me.

Larry Powell
111 Trailview Dr.
Terrell TX 75106

I want to locate the schematic for a Western Electric #2565 HK 3-73 telephone with five incoming lines. I am reassembling the phone with a Western Electric 35AF3A 3-73 pad and a Western Electric 425 terminal block. The telephone will dial out, but it does not ring properly and the feedback monitoring system is dead.

H. Lee Hancock, Jr. W4NXC
301 Forest Hills Blvd.
Naples FL 33942

I need the manuals, either originals or copies, for the Hallicrafters model SX-146 receiver and the companion model HT-46 transmitter. I will gladly pay the costs.

James Hogarth
421 Gruber Rd.
Harleysville PA 19438

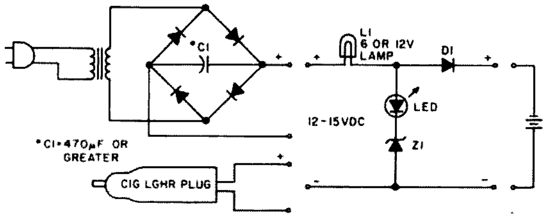
I am looking for the operation and maintenance manual for a Tektronics type L high-gain, fast-rise-time plug-in for a model 545 oscilloscope. I will copy the manual and return it.

Bruce Rahn WB9ANQ
410 Coronado Trail
Enon OH 45323

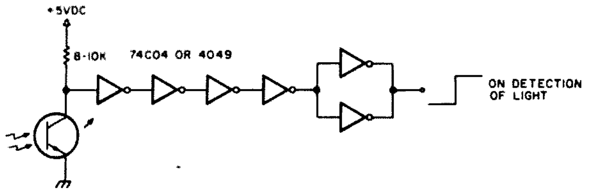
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*

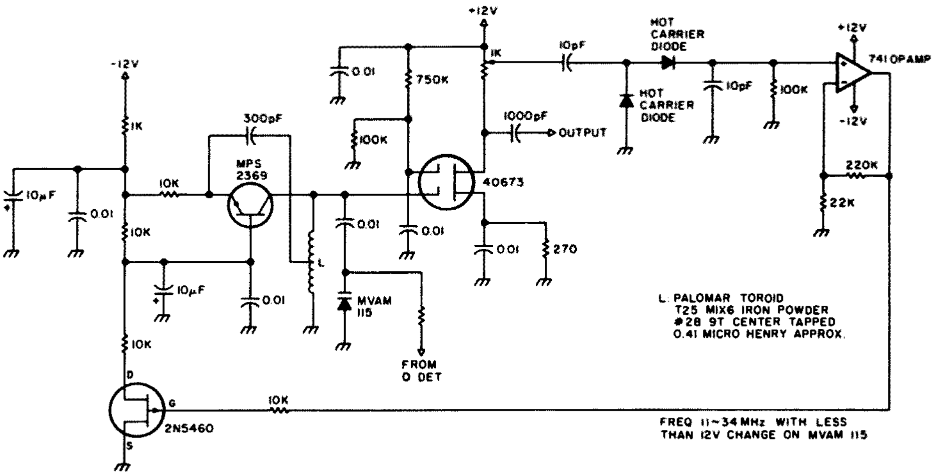


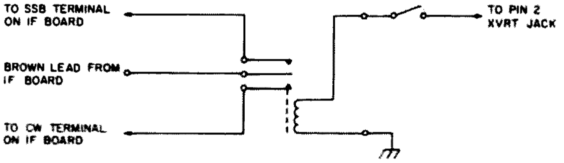
NICAD CHARGER WITH CURRENT AND VOLTAGE LIMITING: Lamp L1 will glow brightly and the LED will be out when the battery is low and being charged, but the LED will be bright and the light bulb dim when the battery is almost ready. L1 should be a light bulb rated for the current you want (usually the battery capacity divided by 10). Diode D1 should be at least 1 A, and Z1 is a 1-W zener diode with a voltage determined by the full-charge battery voltage minus 1.5 V. After the battery is fully charged, the circuit will float it at about battery capacity divided by 100 mA.—Dave Land KD5FX, Ponca City OK.



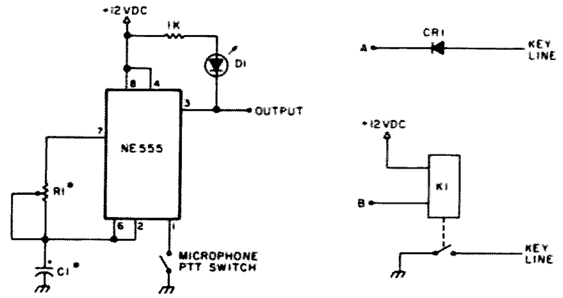
FAST AND RELIABLE PHOTODETECTOR: Using only 3 components, this circuit yields very reliable operation. Gates have been chained together for rapid action and wired in parallel for increased output current. Analog output can be obtained from either the collector of the phototransistor or the output of the first gate. A pot can be substituted for the resistor to adjust the circuit's sensitivity.—Terry Fletcher WA0ITP, Ottumwa IA.

CRYSTAL OSCILLATOR REPLACEMENT FOR THE COLLINS R390A: This circuit, when used in conjunction with a divider and phase detector which are not shown, will replace the first and second crystal oscillators in the R390A. The varicap diode is a nonlinear device, so oscillation amplitude should be kept as low as possible. The oscillator is a common-base circuit providing maximum output impedance, and the 300-pF coupling capacitor feeds a clean waveshape to the emitter. A 1k trimpot is used to set the desired amplitude.—Eiichi Takarada, Rockford IL.





SIMPLE SWITCHABLE CW SELECTIVITY FOR THE KENWOOD TS-520S: Open the case of the transciever and remove all the knobs and dial face plate. Unsolder the five wires from the RIT control. Remove the RIT control. Mount a 0-5000-Ohm potentiometer with a push-pull switch in the hole where you removed the RIT control. Solder a six-inch length of hookup wire to each of the switch terminals on the new control. Connect the five wires to the new control (these are yellow, blue, orange, orange, and orange). Ground one of the switch wires to chassis. Connect the other switch wire to the relay's coil terminal. Connect the other relay terminal to the transverter output jack to obtain the 14 V dc for the relay. Disconnect the brown SSB i-f lead and attach it to the switching contact on the relay. Connect the normally-open relay to the CW terminal on the i-f board. Connect the normally-closed relay contact to the SSB terminal on the i-f board. Reassemble the rig. Calibrate the CW selectivity to a zero-beat obtained on WWV.—Harry A. Ober WB6CGZ, Canyon Country CA.



C1 220µF 15V
CR1 IN4444 OR EQUIVALENT
D1 SUBMINIATURE LED (RADIO SHACK 276-042)
R1 1M PC POTENTIOMETER
* VARY SIZE FOR OTHER TIME RANGES

SIMPLE MICROPHONE TIMER: To avoid accidentally timing out a repeater, install this 555-based timer circuit in your microphone. R1 can be either fixed or variable. A one-megohm resistor and a 100-uF capacitor provide a one-minute, forty-second cycle. The second circuit shown will provide a higher keyline output. The subminiature LED will be visible when mounted into a hole drilled into the microphone. To save space, the circuit can be built directly on the pins of the 555. The circuit will light the LED when the transmitter is keyed, and the LED will go out and the transmitter unkey when the timing cycle is completed.—John S. Wilcox KA4DZY, Millington TN.

NEW PRODUCTS

HAND-HELD COUNTER-TIMER

Global Specialties Corporation announces the new Model 5000 Counter-Timer. It is the first portable, hand-held instrument of its kind. The 5000 combines all of the important features and performance capabilities of a bench-top unit with the convenience of a fully portable, battery-operated instrument. The 5000 measures 7.6" × 3.75" × 1.7" and weighs in at 14 oz. (without batteries).

As for performance, the 5000 is designed to measure frequency, period, and pulse width with extreme accuracy and exceptional reliability. It features full signal conditioning including: attenuator (× 1, × 10, × 100), slope selection (+ or − edge for pulse-width measurement), ac or dc coupling, and variable trigger level.

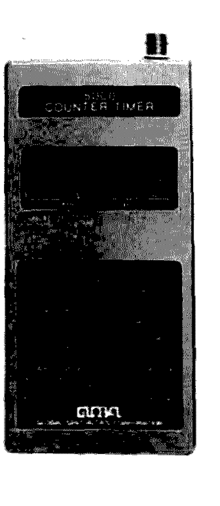
A high-contrast .43-inch LCD display offers 8-digit precision for fast and accurate readings. LCD annunciators indicate overflow, gate-open, and low-battery conditions. With a simple flick of a switch, the display-storage mode will maintain the last reading in the display indefinitely.

The 5000 features a unique automatic master reset logic. This time-saving reset function instantly clears the display and initiates a new measurement cycle eliminating erroneous partial measurement.

A self-diagnostic function performs analysis of internal logic and provides instant assurance of accurate operation.

The 5000 Counter-Timer has 3 modes of operation: frequency, period, and pulse width. Signal input is via BNC connector—input impedance is 1 megohm @ 25 pF for all modes. In the frequency mode, the 5000 can handle inputs from 0.1 Hz to 50 MHz. Gate times of .01, 0.1, 1.0, or 10 seconds can be selected. Frequency will be displayed in kilohertz on the easy-to-read LCD screen.

The 5000 will measure any periods from 25 ns to 10 seconds and deliver a single cycle measurement or an average of 10, 100, or 1000 cycles. Time will be displayed in μs. Pulse-width measurement from 25 ns to 10 seconds can be made. Either the high or low portion of the input signal can be selected.



The 5000 Counter-Timer from Global Specialties.

All of the controls on the 5000 Counter-Timer are convenient slide switches and are front panel mounted. These include: Trigger Level, Gate Time/Cycles Averaged, Mode, Power (On/Test/Off), Display (Normal/Hold), Polarity (+ to − or − to + edge selection in pulse-width mode), Coupling, and Attenuation.

The 5000 is powered by 6 AA nicad or alkaline batteries or an optional ac adapter/charger. Optional accessories for the 5000 include a 120-V-ac adapter/charger (MMAC-2), a 220-V-ac charger/adapter (MMAC-3), an automobile cigarette lighter adapter, a 24" BNC input cable terminated with color-coded quick hooks, an antenna, and a rugged carrying case.

For additional information, contact *Global Specialties Corporation, 70 Fulton Terrace, New Haven CT 06509-1942; (800)-243-6077.*

MOSCOW MUFFLER™ WOODPECKER NOISE BLANKER

AEA's Moscow Muffler™ Woodpecker noise blanker.

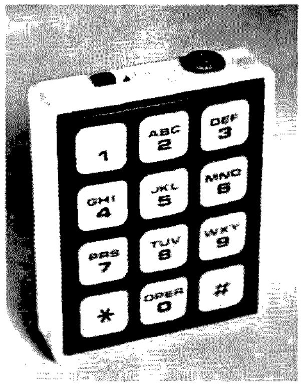
The AEA model WB-1 Moscow Muffler Woodpecker Blanker represents the latest of many AEA breakthroughs. This blanker is the first to offer effective blanking of the Russian Woodpecker signal with no modifications to the receiver required.

The WB-1 is designed to be connected in the antenna feedline between the antenna and the receiver. The WB-1 effectively blanks the interfering pulses before they have been stretched out by receiver tuned circuits, thereby causing the least amount of distortion possible.

Because the WB-1 is a synchronous blanker, it simply does not overload from strong adjacent channel signals. The overload condition is a significant problem with all i-f blankers, making the Moscow Muffler the most effective Woodpecker blanker under most band conditions.

In addition to the superior blanking features, the WB-1 offers an effective low-noise broadbanded 6-dB rf preamp with + 13-dBm intercept point. The preamplifier may be switched in or out whether or not the WB-1 is in the blanking mode.

The WB-1 Moscow Muffler Blanker is available in a transceiver version (model WB-1C) which features a carrier-operated relay (COR) for automatic transfer from receive to transmit. A COR ADJ control is provided for adjusting the relay dropout delay in switching from transmit to receive.



The Model 340 Thin-Coder™ from CES.

The WB-1 features a pulse blanking width control for reducing the blanking width to the minimum width necessary to achieve maximum blanking. The minimum blanking width will assure the minimum signal distortion that must result from placing holes in the received signal.

Blanking of both 10- and 16-Hz Woodpecker modes is achieved with the WB-1. At the time this brochure is being written, most Woodpecker transmissions are made with a 10-Hz pulse repetition rate.

The WB-1 is simple to operate and the most effective blanker of Russian Woodpecker signals that we have been able to test, including the most popular blankers built into modern transceivers. The WB-1 will typically display 45 to 50 dB of Woodpecker signal attenuation with no overload from strong adjacent channel signals.

The WB-1 comes with a 90-day limited warranty and is backed by the same AEA customer service that has earned AEA a prominent position in the amateur radio market. For more information, contact *Advanced Electronic Applications, Inc., PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.* Reader Service number 476.

THIN-CODER™

The Thin-Coder, the smallest manual tone dialer made, is now being introduced by CES.

CES president Ron Hankins states, "The Model 340 Thin-Coder is truly a pocket-sized encoder. You don't need bulky cases or pouches to carry it with you."

The Model 340 measures 2-1/2" by 3-1/8" by only 3/4" deep and effectively dials the user into private networks, computer access, or dimension systems. Its rugged white case features a brown faceplate and white digit blocks. A convenient normal/high switch allows flexible volume control. Up to 10,000 long-distance calls are possible with the Thin-Coder's long-life 9-volt battery. CES encoders utilize single-contact tactile keyboards for extra reliability.

Communications Electronics Specialties is a leader in the design and manufacture of quality encoder, microphone, interconnect, and other specialized equipment for communications markets worldwide. For complete information on the Thin-Coder Model 340 Encoder and other CES products, contact *Ron Hankins, CES Inc., PO Box 507, Winter Park FL 32790; (305)-645-0474.* Reader Service number 484.

SIMPSON 470 CALCULATOR-STYLE DMM

Simpson Electric Company has introduced a brand-new calculator-style DMM, the 470 . . . a high performance DMM with features that are usually found only on more expensive units. 25 ranges are provided, including 1000 volts dc, 750 volts ac, and 10 Amps ac/dc. All voltage and resistance ranges are protected against transients up to 6 kV at 100 microseconds.

Convenient recessed human-engineered thumbwheel knobs control ranges and functions. An audible tone on the 2000-Ohm range provides fast checks for shorts and continuity. A diode test provides quick, good-bad checks of semiconductor junctions.

The easy-to-read, high-contrast, 3½-digit, 7-segment LCD display also features a low-battery indicator—battery life is about a year's average use.

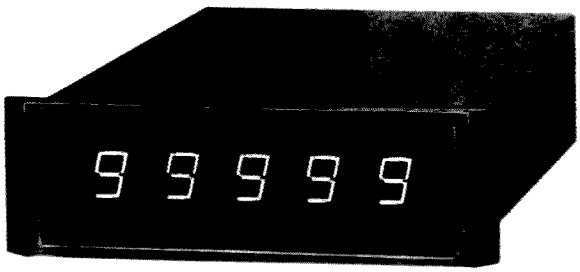
The instrument is manufactured by Simpson in the USA and carries Simpson's 1-year warranty. The high-impact, sealed case is 1.8" × 3.4" × 7.1". A two-way fold-out stand provides for convenient bench-top use or for hanging in an upright position. The 470 weighs less than 1 lb.

The 470 is supplied complete with UL-recognized, color-coded test leads with screw-on alligator clips, 9-V battery, and instruction manual. Optional accessories include Simpson's Amp-Clamp ac current adapter, as well as temperature, rf, and high-voltage probes, and the recently announced test-lead systems.

"The 470 and other calculator-style instruments will join the growing family of Simpson UL-listed DMMs," announced Simpson's sales director, Mel Buehring. "They will be available from leading electrical/electronics distributors worldwide."

For further information, contact *Simpson, Katy Industries, Inc., Electrical Equipment and Products Group, 853 Dundee Avenue, Elgin IL 60120; (312)-697-2260.* Reader Service number 483.

The Simpson 470 calculator-style DMM.



Non-Linear Systems' PF-5 frequency counter.

Microcraft's Videoscan-1000 high-resolution SSTV converter.

NEW FREQUENCY COUNTERS

Non-Linear Systems, Inc., recently announced two new digital-panel frequency counters capable of counting up to 10 MHz. Designated the PF-4 and PF-5 respectively, the new counters are packaged in miniature cases measuring only 15/16 × 2½ × 3½ inches and provide four selectable timebases: 0.01, 0.1, 1, and 10 seconds. The decimal point may be externally selected and the display may be blanked, dimmed, or tested externally.

The PF-4 is a four-digit display, while the PF-5 is a five-digit display. Internal signal-conditioning circuitry permits input signals having slow rise and fall times to be accommodated without difficulty, and both ac-coupled or dc-coupled inputs are accepted.

Input impedance is 75 kilohms and input signal amplitude may be +3 to +30 volts peak-to-peak. The instruments may be field-modified to accept up to 700 volts peak-to-peak. The units operate from an external 5-volt-dc supply.

For additional information, contact *Non-Linear Systems, Inc., PO Box N, Del Mar CA 92014.* Reader Service number 485.

SOLAR PHOTOVOLTAIC BATTERY CHARGER

The Phaeton II photovoltaic battery charger manufactured by International Solar Products Corporation of Durham, North Carolina, is being called "the most revolutionary development in rechargeable technology since the rechargeable battery." The unit produces 4.8 volts of direct-current power at 240 milliamps in peak sunlight. Four AA cells, two C cells, and two D cells can be charged with the unit. Batteries are fully recharged in 14 to 16 hours of sunshine.

Phaeton II measures 6" × 7" and weighs less than two pounds. It is constructed with spage-age materials—annodized gold or silver frame, heavy-duty aluminum battery cradles, and the same silicone covering used to protect the solar cells on orbiting communication satellites. The unit contains no plastic parts.

According to the manufacturer, the average consumer could spend as much as $100 per year on throwaway batteries to power the portable radios, tape recorders, toys, games, flashlights, cameras, and other electronic appliances found in many homes today.

For additional information, contact *International Solar Products Corporation, 1105 W. Chapel Hill St., Durham NC 27701; (919)-489-6224.* Reader Service number 478.

HIGH-RESOLUTION SSTV CONVERTER

Microcraft Corporation has announced the new Videoscan-1000, a high-resolution SSTV converter. Although the converter is compatible with amateur standard and first-generation SSTV equipment, the Videoscan-1000 also has two high-resolution modes producing 256-line pictures with 256 pixels per line.

The converter's pixels are quantized to 64 levels of gray, and it features a built-in gray-scale pattern to use in setting controls as well as three scan rates for optimum versatility.

With the Videoscan-1000's split-screen mode, four SSTV pictures may be viewed at one time, and the built-in memory can hold one frame of video from the camera or other sources. Your callsign may also be programmed into memory.

The converter takes care of all switching between the transmitter, microphone, and tape recorder. The only additional equipment necessary for operation is a camera and a monitor.

For additional information, contact *Microcraft Corporation, PO Box 513, Thiensville WI 53092; (414)-241-8144.* Reader Service number 481.

SELF-RESET POWER-LINE INTERRUPTER

Electronic Specialists expands its Ac Power-Line Interrupter series to include automatic reset models. Should ac line voltage be disrupted or exceed preset safety limits, the Power Interrupter disconnects ac power from controlled apparatus. A 4-minute time delay, followed by automatic self-reset, helps avoid wide voltage fluctuations associated with power-line malfunctions. An optional line voltage monitor is available.

Intended for installations operating unattended for long periods, the Self-reset Power Interrupter provides safety and protection for equipment and personnel.

Connecting to the ac line with a standard 3-prong plug, the Self-reset Power Interrupter can accommodate a 15-Amp resistive load or a 10-Amp inductive load.

For further information, contact *Electronic Specialists, Inc., 171 South Main Street, PO Box 389, Natick MA 01760; (617)-655-1532.* Reader Service number 477.

RTTY SOFTWARE

John Yurek K3PGP has introduced a line of TRS-80 programs for use in the ham shack.

CW runs on 4K Level I or Level II and turns the stock machine into a CW keyboard and receive terminal. The hardware interface for the program consists of a transformer and a transistor, both available from local Radio Shack stores. The program features a FIFO buffer and 8 regular buffers.

CW creates a split-screen display, allowing you to fill the buffer with a return message before you transmit. Speeds are adjustable from the keyboard, and text editing is provided for error correction.

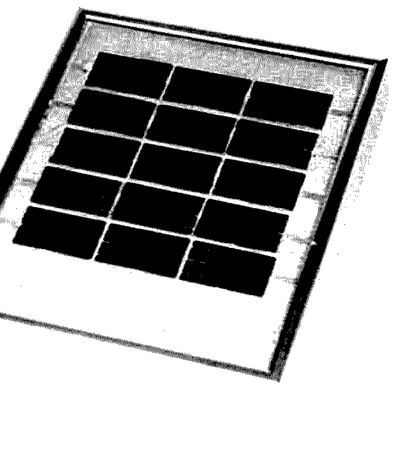
RY turns a TRS-80 stock machine into a 5-level (Baudot) teletype machine. This program also includes a FIFO buffer and a split-screen display. It will operate at all legal amateur speeds, and T/R switching is controlled automatically.

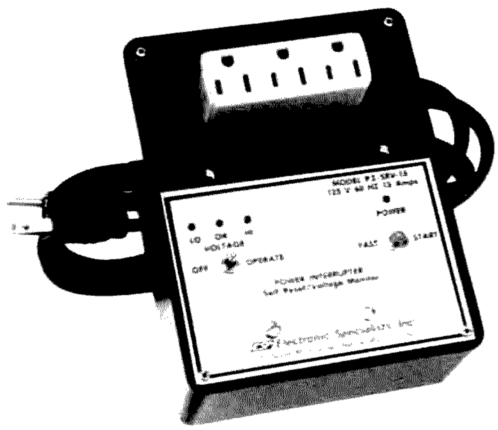
Both programs use the audio output of the cassette port to key the transmitter, without using the cassette relay.

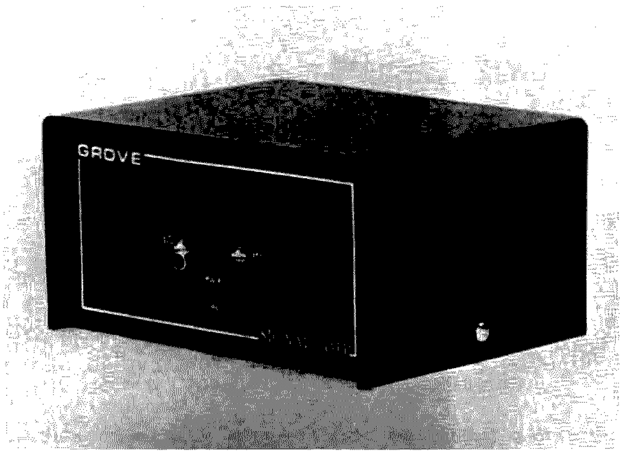
For $1, which is refundable with your first order, a catalog may be ordered from *John Yurek K3PGP, RD #6, Box 413, Irwin PA 15642.* Reader Service number 482.

WIDEBAND ANTENNA PREAMPLIFIER

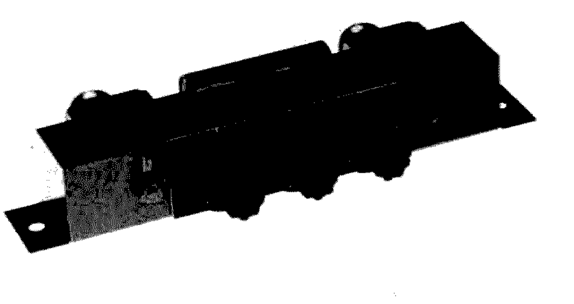
Grove Enterprises, prominent manufacturer of accessories for scanner and short-


The Phaeton II photovoltaic battery charger manufactured by International Solar Products Corporation.


Self-reset Power Line Interrupter from Electronic Specialists, Inc.



The PRE-1 Signal Amp preamplifier from Grove Enterprises.



Microwave Filter Company's 3923-T TVRO filter.

wave reception, has just announced its PRE-1 Signal Amp masthead preamplifier.

Designed to provide high-gain, low-noise amplification for received VHF and UHF signals, the PRE-1 boasts a mid-band gain of at least 15 dB with a noise figure of only 1.8 dB.

The Signal Amp consists of a lightweight antenna-mounted preamplifier module and an indoor control unit. Switch-selectable high and low gain allows the user to customize his signal-enhancing needs.

Guaranteed to outperform competitive indoor preamplifiers, the PRE-1 Signal Amp comes with all necessary hardware, connectors, and instructions. For additional information, contact *Grove Enterprises, 140 Dog Branch Road, Brasstown NC 28902; (704)-837-2216.*

TUNABLE TVRO FILTER

Microwave Filter Company's new 3923-T bandpass filter tunes to any of the 24 TVRO transponders by means of three calibrated dials.

When tuned to a particular transponder, the 3-dB bandwidth is 40 MHz with less than 1.5 dB loss. Selectivity is 30 dB at ± 76 MHz. The new filter features type-N connectors and passes dc power. Delivery can be made in ten days from date of order, and the 3923-T filter comes with specification sheet and tuning instructions.

For more information contact *Emily Bostick, Microwave Filter Company, Inc., 6743 Kinne Street, East Syracuse NY 13057.* Reader Service number 479.

REVIEW

FACSIMILE WEATHER-CHART RECORDER BY ALDEN ELECTRONICS

Remember the old adage, "Everyone talks about the weather, but nobody does anything about it"? Well, that's not quite true—if it ever was—and Alden Electronics of Westborough, Massachusetts, is surely proof that somebody really does do something about the weather. They have introduced a facsimile weather-chart-recorder kit for the home hobbyist and ham.

Specifically, Alden Electronics is one of the world's largest manufacturers of radiofacsimile receiving and recording equipment. . .equipment that prints charts of significant weather information from around the globe, gathered by weather stations and rebroadcast in coded form for use by ships, aircraft, scientific expeditions, military and oceanographic groups, and many other stations.

The world depends upon radiofacsimile weather charts and satellite photographs for up-to-date information about storms, icebergs, significant changes in weather patterns, and other vital data needed by virtually everyone who lives, works, and travels in an interdependent world. Merchant mariners, naval officers, fishermen, and small boatmen make critical decisions based on local weather and ocean conditions. Air force officers, pilots, commercial airlines, airport operators, and others make critical decisions based on weather and atmospheric conditions. Modern radiofacsimile and satellite technology is now able to bring timely and accurate weather information to these users on a worldwide basis. Correct interpretation of the information inevitably leads to increased safety, improved efficiency, and even competitive advantage.

It has been said that a picture is worth a thousand words, and so it seems to be with weather information whose presentation in chart or picture form is so much more meaningful to the end user than information represented merely by strings of coded symbols, numbers, and letters. The location of major weather systems, storm fronts, areas of violent oceanic or atmospheric activity, and similar information can be seen and understood quickly on a weather map or from a satellite photograph. Therefore, if your own personal situation or livelihood depends on or is associated in any way with weather-related phenomena, you are certainly a candidate for Alden's goods and services.

The Alden weather-chart recorder prints weather charts and satellite pictures from radiofacsimile signals transmitted by a network of government-owned and -operated stations located around the globe.

The recorder requires an external receiver. It features solid-state circuitry and a simple electromechanical design to ensure long, trouble-free operation.

The Alden weather-chart recorder uses electrically-sensitive paper packaged in handy, disposable cassettes, the 11"-wide paper requires no threading. . .and replacement involves the mere insertion of another cassette. The printing process is quiet and free from smoke, odors, and fumes. No venting is required, and the compact size and light weight permit a variety of desktop or wall-mounting arrangements.

Background and Amateur Applications

Many hams have their own home weather stations which record or display temperature, pressure, and wind velocity. . . and weather is usually a part of the conversation between two hams. It's good fun to tell the other station just how bad (or how good) your weather is, compared with that in his own area. Historically, however, facsimile has been used for the transmission of other information—maps, schematic diagrams, drawings, photographs, and other images.

Radio amateurs have often built their own fax transmitting and receiving equipment, and many have converted surplus military or commercial units to this purpose.

There are several systems of encoding and decoding fax information for its broadcast and reception, all of which work satisfactorily. None need be discussed here, because the information is available in a variety of references on the subject.

Some hams have received the radiofacsimile weather information direct from the satellites that broadcast it, while others prefer to use the information rebroadcast on the HF bands by weatherfax stations.

In one sense, fax is like RTTY, amateur television, or similar modes of communication. . .it is enjoyed by small, select groups of hams who prefer the challenge and fun of doing something slightly different. For a long period of time, hams built their own TUs for RTTY reception and converted old Model 15s or Model 19s to amateur use. Then, with the revolution in solid-state electronics and computers, home-made apparatus gave way to commercially-available units of advanced design and infinitely increased capability.

It appears that radiofacsimile is now on that threshold of development at which commercially-available units have made home-built or converted surplus units a thing of the past.

WEATHER-CHART-RECORDER KIT MODEL 9321
SPECIFICATIONS

Recording rate: 120 spm (scans per minute).
Index of cooperation: IOC 576 CCIR, 169 lines per inch.
Control signals: Automatic start, stop, frame; manual start and frame.
Start: Signal shifting between 1500 Hz and 2300 Hz at a 300-Hz rate for 5 seconds.
Frame: A 1500-Hz signal interrupted by a short burst of 2300 Hz each scan line. Duration—20 to 30 seconds immediately following start signal.
Stop: Signal shifting between 1500 Hz and 2300 Hz at a 450-Hz rate for 5 seconds.
Circuitry: Solid state.
Input impedance: 600 Ohms balanced.
Input frequencies: FSK-1500 Hz black, 2300 Hz white.
Scanning electrode: Stylus belt.
Recording paper: Alfax electrosensitive paper in throw-away cassettes with built-in printing electrode. Each cassette contains 35 feet of 11-inch-wide paper.
Input voltage: 115 V ac ± 10%, 50/60 Hz.
Maximum power: Standby mode: 10 Watts; operating mode: 30 Watts.
Net weight: 10.1 pounds.
Dimensions: 3-5/8" H, 17-1/16" W, 10-1/2" D.

Alden's Weather-Chart Recorder

Our staff received two units for test. . . one ready-to-go, and the other a kit. Each was accompanied by an amply illustrated and detailed manual which told how to connect the unit to the receiver, and how to tune and adjust it for best reception and printing. The kit unit had, in addition, a construction manual which included pictorial as well as schematic diagrams, plus detailed step-by-step instructions for the mechanical and electrical assembly.

The Kit

The kit arrived packed in a large box divided into twelve or so internal compartments, each partitioned from its neighbor by corrugated paper barriers. Each compartment was numbered and contained a correspondingly-numbered plastic envelope of parts wrapped in protective packing material. The manual calls out the contents

of each compartment and invites the kit builder to identify, check off, and repack each component ready for use.

Everything you will need, including solder, is included. Most of the more difficult assemblies have been prefabricated and subassembled so that you won't have any trouble with difficult or critical components. You assemble the mechanical parts first, according to a logical step-by-step procedure. Then, you solder the precut wires to length and solder them to the subassemblies. Finally, you interconnect the wires, harnessing them as you go.

All critical construction, board-stuffing, testing, and adjusting has been done for you, meaning that your task will be pleasant, simple, and straightforward.

Two of us started construction on Friday evening, each helping the other with the work of selecting and positioning parts, fastening them in place, connecting them, and checking them off in the manual. The work goes fast, and there is nothing to be done that could not be handled by even a beginner.

Saturday evening saw all but final assembly and checkout. . . which took place on Sunday morning. We logged 24 man-hours (12 hours total time) on assembly and test.

Preliminary checkout and test before hookup to radio receiver is done with a multimeter and consists of measuring some resistances, voltages, and continuity. Again, each step of the way is detailed in such a way that the procedure is fail-safe. There is no such thing as a smoke test.

Operation

Alden thoughtfully included a worldwide marine radiofacsimile schedule in which you will find a list of stations around the world which broadcast the radiofacsimile signals. We tuned our all-band, general-coverage Icom R70 receiver to the Halifax, Nova Scotia, and Norfolk, Virginia, stations whose signals came roaring in on their assigned frequencies.

Also included is a *Facsimile Products Guide*, which is an aid for interpreting HF radiofacsimile charts transmitted from the US Naval Eastern Oceanography Center in Norfolk VA. The guide is reproduced with permission of the US Naval Eastern Oceanography Center, whose personnel originally prepared it. You will find information covering broadcast frequencies and schedules. Each chart is illustrated and described in detail, covering atmosphere analysis, atmosphere prognoses, oceanographic analysis, and oceanographic prognoses. The charts are typical of what is transmitted worldwide. Using this information, you can tune in to the exact information you want or need, and immediately start receiving pictures and charts.

There are only two connections for you to make with the finished weather-chart recorder. One is to plug it into the house mains—115 V ac. The next is to connect the terminals on the back of the recorder to the audio output of your receiver and to ground, respectively. Although the instructions called for 600-Ohm output, we were able to receive perfectly satisfactory charts using the 3.2-Ohm receiver output. Later, we built a little impedance step-up device that transformed the R70's output to approximately 500 Ohms for a better match to the unit, although this was not considered necessary.

After connection, and before turning the unit on, you make sure that the paper cassette is properly installed and the cover of the unit (which has a safety interlock) is snapped into place over the paper cassette.

As you tune in the USB audio-frequency-shift signals on your receiver, you will notice two little LEDs on the top of the recorder blinking red and green. The green LED represents the white image, and the red LED represents the black image on the paper. We found that the receiver's RIT (incremental tuning) control helped adjust to the exact frequencies needed after the main tuning dial was locked on to the frequency. Proper adjustment is thoroughly covered in the manual.

The next step is to depress the start switch, which begins the drum rotation and the stylus scanning. If the broadcast is already in progress, you will need to press the frame button to center the map on the paper. The weather-chart recorder is set to receive broadcasts at 120 lines (scans) per minute, which is the standard for most stations you will tune.

After a few minutes, you'll see the paper coming out of the recorder with a map or picture on it. Then, it's just a matter of waiting until the map or chart is complete before you tear the paper (or cut it) to separate the completed picture.

A very nice feature of the recorder is its auto-start and auto-stop function, which allows you to leave the unit in operational condition, but silent, until a broadcast of live material begins. The broadcast itself will issue start and framing pulses which will activate your recorder and properly frame the picture.

After a transmission, a stop pulse will be transmitted, stopping the machine and placing it in the standby mode, ready for another chart.

It was fun to see the satellite picture taken over the North Atlantic just a few hours before, showing the cloud cover (what else?) over the New England area. Much of the United States is covered, as well as most of the North Atlantic ocean. You can see the Caribbean islands, some of Central America, and parts of Greenland and Iceland.

The weather charts containing pressure isobars, temperature and wind-velocity data, and much more require some study to understand. You'll be fascinated at all the things you can discover with your recorder. For example, if you have a directional antenna, you can tune in the weather facsimile broadcast stations in England, France, Russia, Germany, the Pacific, Australia, Japan, etc., etc. These will give you charts and maps, as well as possible satellite pictures from their own parts of the world. You could even tell that DX station what his own weather is like, if you wanted to!

One of the better books available from Alden is *A Mariner's Guide to Radiofacsimile Weather Charts* which, in its 127 pages of text, charts, and photographs authored by Dr. Joseph Bishop, presents the best understanding of the earth's atmospheric and oceanic processes I have ever read. It is simple, lucid, and interesting. Even for someone who has no formal education in weather interpretation or analysis, the book is easily read and understood. By all means, be sure to order this book.

I must say that Alden has opened my eyes to an unexpected and pleasant facet of radio that I had never before experienced, in spite of my 32 years of hamming. Radiofacsimile reception is fun, it's fascinating, and—believe it or not—it kept me off the ham bands for two weeks while I explored the intricacies of the world's weather. . . through the weather-chart recorder.

You should avail yourself of the small (approximately 17" × 10" × 4") and lightweight (about 10 pounds) Alden weather-chart recorder ($995) and experience a new thrill in radio. It's guaranteed to be fun and educational.

For further information, contact *Alden Electronics, Washington Street, Westborough MA 01581*. Reader Service number 488.

Alden's weather-chart recorder.

Jim Gray W1XU
73 Staff

Gene Smarte WB6TOV
Hancock NH

THE ICOM R70

The Icom R70 is a general-coverage communications receiver covering a frequency range of 100 kHz to 30 MHz. Newly introduced to the market, it made me anxious to review it and share my impressions.

As with most hams, I could not resist the urge to unpack the radio and begin using it immediately without, of course, reading the instruction manual. It is because of this ease of use that I have such good things to say about it.

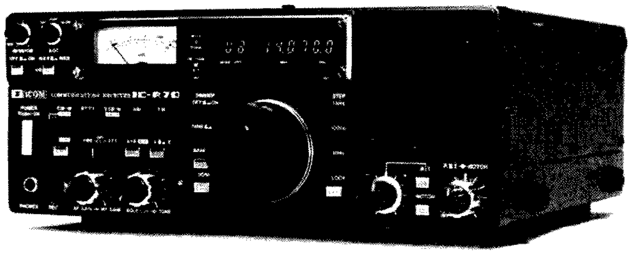
The IC-R70 has a front panel that is both uncluttered and functional. All controls are clearly marked, and after studying it for a few minutes I became aware of the radio's versatility. Bringing it to life was extremely easy, with just two connections, power cable and antenna. The 117/235-V-ac input is standard, with optional 13.8 V dc available. It is also internally modifiable to 100/200/220 V ac. The built-in speaker eliminated hunting around the shack for the phones or that bullet-riddled speaker that usually turns up.

The receiver is a quad conversion unit with its first i-f at 70.4515 MHz. The second i-f is at 9.0115 MHz. Without an antenna, I tuned across about all of its range, observing the birdies. The few I found at expected places were, however, far below the level of signals present with the antenna connected.

All of the initial testing took place on the ham bands using my triband beam. Twenty meters provided the kind of signals I was looking for, especially at the lower portion of the phone band. The R70 features a Pass-Band-Tuning (PBT) system allowing you to narrow the width of frequencies passing through the crystal filter. The passband can be moved up to 500 Hz from the upper or lower side in SSB mode (2.7 kHz in the AM mode). With the control in the OFF position, the passband is 2.3 kHz wide in SSB mode and 6 kHz in the AM mode. Using this control, I was able to hear stations that could not be received by using the notch control alone. No information was published as to the shift and depth of the notch filter, but it seems as effective as any other I've used.

While the PBT system took some getting used to, the frequency and mode selection did not. The radio has three selectable-tuning rates, 1 kHz, 100 Hz, and 10 Hz. These controls are located to the right of the tuning knob and, with a little practice, I could quickly zero in on the desired frequency. The one thing that did get a little confusing was the fact that the frequency does not roll over. Increasing from, say, 7.999.9 kHz returned you to 7.000.0 and not on to 8.000.0 kHz. This, however, turned out to be a time-saver when tuning from high to low ends of a band or vice versa. A LOCK push-button also is provided to disable the tuning knob, preventing accidental changes in frequency.

To the left of the tuning knob are three controls marked BAND UP, DOWN, and



Icom's R70 receiver.

HAM/GENERAL. These are used to increment or decrement the most significant digit of the frequency display when in the general-coverage mode. When in the ham coverage mode, these controls step you through 160m, 80m, 40m, etc., skipping all of the frequencies in between. It does stop at the new 10-, 18-, and 15-MHz bands, also.

Other front-panel controls include CW (wide and narrow—500 Hz), SSB, RTTY, AM, and FM (with the optional module). There is a separate FUNCTION push-button designed to select the sideband opposite the one you are in and select the narrow CW filter. The receiver automatically chooses upper or lower sideband depending on whether the frequency is above or below 9 MHz. A SQUELCH control also is provided, obviously getting used more for the FM mode than any other. It did work very well in SSB mode, however, but only on strong stations. Its action was dependent on the agc timing, and in the slow setting took quite a while to open (or close). I cannot see any real need for it except in the FM mode.

The frequency-display panel includes a 7-digit readout with 100-Hz resolution; it displays which mode and vfo is in use. There are two vfo's that can be loaded with the current frequency information and called independently of each other. An RIT control is provided to shift the received frequency ±800 Hz from the displayed frequency. No indication is given on the display except for a status LED showing that the control is in use. A useful feature is the fact that the RIT control is automatically disabled once the main tuning knob is moved. It can be re-enabled anytime by depressing the push-button. This assures you that you are receiving the displayed frequency.

A built-in preamplifier and attenuator is switch-selectable from the front panel. Claimed attenuation is 20 dB, with no mention of the amount of preamplification. Judging from the S-meter indication, it seems to be in the order of 6 dB. An agc selector permits a timing of fast or slow, or OFF. This I found more than adequate for all types of communications using the fixed rates. A switchable noise blanker proved very effective in both the available narrow or wide settings. It also seemed very effective with woodpecker-type noise. No decrease in signal levels was perceived with the noise blanker switched in.

The built-in speaker provided good-quality reproduction of all types of signals. In the AM mode, SW broadcast stations were very enjoyable to listen to without the high-pitched sound that one might expect from such a small speaker. In any event, an external speaker jack is provided should you wish to use it, as well as a recorder output jack. The latter outputs an audio level independent of the volume-control setting.

Although advertised as a general-coverage communications receiver, rear-panel connectors are provided to allow easy use of the unit with a transmitter or transceiver. The IC-R70 has a mute input allowing it to be quieted during transmit. Transmitted signals can be heard in the receiver, however, by using its monitor function. The volume of the monitored signal can be adjusted with the front-panel control.

The rear-panel accessory socket can also be used to control VHF and UHF converters. The switching arrangement is covered in sufficient detail in the manual. Also available on the accessory socket is an output from the receiver's detector stage. This output is at a fixed level regardless of the volume or gain settings. It is intended to be used to drive a RTTY terminal unit. Other rear-panel connectors include a scope output from the first i-f (70.4515 MHz). This would be useful for using a panoramic-type display.

Rear-panel antenna connectors are of both the PL-259 type and spring-clip type. The former is intended for approximately 180 meters and up, while the single-wire input is intended for the AM broadcast band below. The coaxial connector is designed for a 50-Ohm-impedance antenna system, and no specifications are given for the long-wire connector. No provisions are made for antenna matching, leaving it entirely up to the user to determine optimum performance.

My final comments deal with the instruction manual and schematics. As one who likes to maintain his own equipment, I found the documentation included totally lacking in content. The manual is an excellent operating instruction manual, but very little information is given on circuit description, troubleshooting, and general maintenance. The schematics are of the type showing detail of individual circuits, but interconnections are vague.

In summary, I would consider this receiver an excellent value. Its performance would make it suitable for the beginning ham, as a standby receiver for the shack, or to fill the void between hamming and casual listening. Its usefulness for Field Day or emergency communications cannot be overlooked. Also, I don't think the new or seasoned SWL could find fault with its performance—again making it a worthwhile addition to the shack. My wife, on the other hand, did not like the radio; that was after I told her that I would like to have one.

For further information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

Walt Lewandowski WA2VSN
Spofford NH

CK-2 MEMORY KEYER

Keys and keyers, like tools, are interfaces between a worker and his work. The right tools make the job easier—even pleasant. Sometimes, when the work is pleasant and the craftsman is in a proper frame of mind and the tools are of superb quality, the tools become an extension of the craftsman—seeming to have no independent existence—and the finished product becomes a work of art.

In case you wonder what all this has to do with a product review, let's go back to the beginning and talk about keys and keyers.

Each CW operator prefers a certain type of key, and within that type exists an almost infinite variety of examples. Dozens of varieties of hand keys are in daily use, and the same holds true for semiautomatic mechanical keyers, electronic keyers, iambic keyers, and memory keyers. Each has its own group of devoted adherents—operators who swear by a particular kind or make and wouldn't have any other.

Memory keyers recently have come into greater use and acceptance than ever before, particularly by contest operators, for very good reasons. Electronic memory keyers not only have the capability of forming nearly perfect Morse characters into ideally spaced and "weighted" letters, words, and sentences, but they also have the ability to store words and sentences for later transmission, merely by pushing a button or touching a keypad. In typical contest work, the same message or exchange is sent over and over again, meaning that repeated retransmission of such a message from memory is both practical and necessary if high contest scores are to be obtained. Non-contesters also have found that a CQ message is practical, and even the simplest memory keyers now in use permit limited storage of simple messages.

In the field of electronic keyers, Morse trainers, CW-generating devices, and character-encoding and -decoding devices, Advanced Electronic Applications of Lynnwood, Washington, has carved a niche for itself and has gained a reputation for quality and reliability. AEA electronic memory keyers set the pace for others to follow with their Morsematic—a do-everything memory keyer and top-of-the-line product which, in the hands of experienced operators, is equally capable of sending exquisite CW or teaching new operators to do the same. Following on the heels of the Morsematic came the CK-1, a contest keyer with all of the features of the more expensive keyer (except for the "beacon" feature and training capability) at a significantly lower price.

The Morsematic and CK-1 offered selectable characteristics of "weight" (i.e., dot-dash length ratio) and spacing, speed control, and message storage, all available by means of a keypad located on the top of the unit within easy reach and sight of the operator. Beyond that, there were pitch and volume controls which allowed the operator to adjust the keyer sidetone to exactly suit his or her preference. Finally, AEA packaged all of these features into a neat, lightweight, and versatile box that conveniently fits on the disk or table at the operating position and unobtrusively gives the operator station command from tune-up to rapid-fire exchanges.

Now, the CK-2

Mike Lamb N7ML and the folks at AEA have just released their newest electronic memory keyer, the CK-2, which incorporates the CK-1 features and adds a few more to make CW even more pleasant and simple. CK-2 stands for Contest Keyer, second model, but it also has a name: Contester.

Recently, I was fortunate to be asked to review the Contester for *73*. Fortunate, because I am a CW afficionado and because I had heard so much about the CK-1 and Morsematic but had used the Morsematic only a few times and the CK-1 not at all.

Let's take a look, together, at the CK-2, pretending that we are seeing it for the first time.

The sturdy 10" × 10" × 4" cardboard carton is your first clue to the careful and rugged packaging. Inside, you find the CK-2 neatly sealed in a plastic bag and nestled down into its shock-protective wadding. Alongside, you'll see another plastic bag containing the following items: a battery-eliminator-type power supply (optional) that plugs into the wall and furnishes 12 volts dc at .35 Amps, a three-circuit, PL-68-type plug attached to a length of two-conductor shielded wire, a separate dc power plug and cable for attaching the CK-2 to a separate dc source, and a 2-circuit PL-68 plug connected by a shielded cable to an RCA-type phono plug.

AEA has thought of nearly everything, because the 3-circuit plug connects your keyer paddle to the CK-2 and the 2-circuit PL-68/RCA phono combination connects the CK-2 to your rig. Not much else to do.

Now for the *piece de resistance*, the CK-2 itself. The housing is a matte-black-finished metal box with rounded corners, measuring approximately 2" high by 5" deep by 7" wide. A twelve-button keypad occupies the right-hand top surface of the CK-2, and two knobs—a switch and an LED—occupy the left-hand top surface.

The first knob is the on-off/sidetone-volume control, and the second is the delay max/min control. The switch activates the memory-repeat function, and the LED is a full memory indicator. The rear panel contains the power jack, the paddle jack, and the key + and key − jacks which allow your CK-2 to key a high-current tube-type rig that uses cathode keying, or a low-current, solid-state keying circuit.

My particular keyer has serial number 364, and was inspected by "Robin"—a nice touch in this day of faceless manufacturers and nameless inspectors. You have the feeling that AEA cares about you and wants you to know who they are in case you need their help. Bravo! A confidence-builder that costs very little but means a lot.

We can't forget the instruction manual that accompanies the keyer. It's there, all right, and tells you how to operate the CK-2 in each of its various modes and parameters. Now let's plug the CK-2 in and turn it on to see how it plays.

Memory Functions

The CK-2 memory storage accommodates up to 500 characters in either a single group or in up to ten different groups, selectable by the keypad.

Two basic types of memory storage are available: real time or auto memory. Real-time memory means that everything you send, including pauses between characters and words, is loaded and counted in the 500-character group. Auto memory means that whenever you pause between characters or words, the CK-2 begins counting to itself, and when you have accumulated the equivalent of a word's worth of spaces, it shuts down—thereby saving you lots of space. For the speed demons this may not be necessary, but for us slow thinkers it's a real boon. Counting begins again when you send the next character.

By switching on the "memory load" function and then keying **9, you select the auto-load function. If real-time loading is your preference, a mere *9 will get you there.

Memory location is keypad-selectable, too. By selecting any digit between 0 and 9, you can put each message into that particular storage space ready for later recall.

The # symbol terminates memory loading. Already-loaded messages can be deleted from memory when desired merely by pressing #N, where N is the number of the memory location in storage. If you forget where you put it (as I have done), that's your problem. . . you'll just have to keep trying until yc find it.

In the playba ode, your message keeps going out over the air (at the selectable delay-between-messages of your choice) until you hear an answer. Just a single tap on your paddle will halt the message and allow you to pick up the break. If, or when, you wish to resume the message, all you have to do is request it from your friendly Contester.

Oh, yes, before I forget. You can edit messages as you load them without having to start all over again—a real time-saver!

The Contester's memory includes a long-term "keep-alive" circuit, battery-powered from an alternate power source. . . a 9-volt transistor battery, for example (not supplied). This feature allows you to keep intact those previously-stored messages while you travel to the contest site or to your Field Day location.

Take some time to get acquainted with your CK-2 before you try out the message-storage functions. There's a lot to learn, and it's best to relax with the regular functions before beginning any new ones. I might add that the automatic message-repeat function will be available to you when you need it, and the delay between repeats can be adjusted from about 2 sec-

onds to 3 minutes . . . affording you almost infinite variations between casual rag chewing and high-speed contesting.

Operating Your CK-2

When you turn on the CK-2, it beeps once at about 500 Hz, the sidetone baritone note. If you prefer tenor, you can get that, too. Here—let's try it: press *1 and hold the 1. Notice the tone climbing the scale, the pitch getting higher and higher? Okay, when you reach the note you like, just lift your finger off 1 and there you are. Simple, huh? (Lower the tone with **1.)

Now, how about speed? Well, there are two speeds already preset into the CK-2. Here—try keying something—at about 20 wpm, right? That's memory A for speed. Now, touch *9 and try keying. About 30 wpm. That's memory B. Let's say you want to change both memory A and memory B for speed—no problem. **8NN lets you put the desired speed in memory A; the NN is the speed in wpm that you want. Example: **815 will give you 15 wpm. Okay, let's set that in memory A. In memory B, let's put in 25 wpm. Hit **925 and there you are! Now, by hitting *8 you get 15, and *9 gives you 25. (If you turn off the keyer, and then come back on, memories A and B will have reverted to their original 20 and 30 wpm respectively.)

Here's another neat trick. Suppose you don't know the speed you want (in terms of a particular number of words per minute) but wish to listen until it sounds about right. Okay, simple: press *6 and hold the six while keying your paddle on the dot or dash side. When the length is what you want, remove the pressure from the 6. Let's say you want to decrease speed smoothly: press *7 and hold the 7 until the speed is down where you like it. Release the 7, and presto, right on! Speeds from 1 to 99 wpm are available, in 1-wpm increments.

Here's another f'rinstance: Suppose you want to keep a serial-number record of the messages sent out by your CK-2. No problem; just press *0 and set the message number into memory. Incrementing from that number forward will then take place automatically each time the message plays back from memory. If you want to reset to 01, press **0. To set the serial number to any desired value between 0 and 9,999, you just press *0NNNN (where the Ns represent the number).

Other Features

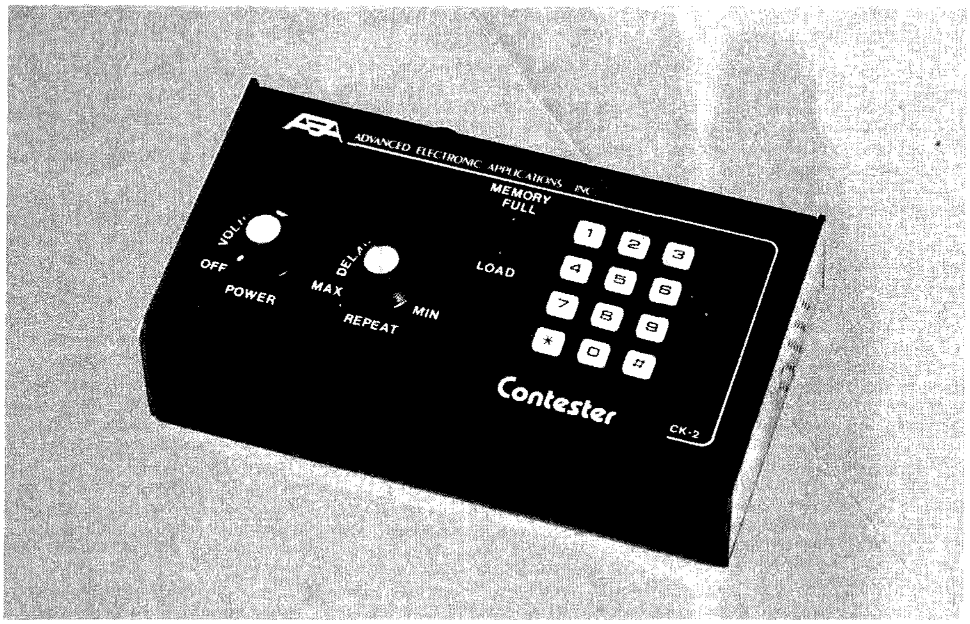
The CK-2 allows you to tailor its parameters to your own liking. For example, if you prefer fully-automatic dot-and-dash completion for iambic keying, you can have it. If you prefer a bug version, you can have just automatically-completing dots and manual-dash formation. If you don't like iambic keying but just want to have an ordinary electronic keyer, that's possible, too.

For tuning the rig, you can select a tune mode which will key the carrier until you have completed your adjustments; a tap on your paddle will instantly shut it off.

The CK-2 has rf protection against false keying, too. This might have been somewhat of a problem with solid-state devices operated in strong rf environments, but AEA has solved the problem for you.

Your friends at AEA provide full-service backup for your purchase and are always willing to help with questions or problems should they arise; since they are your friends, they want satisfied, enthusiastic customers.

You'll find the instruction manual complete, not only for using the CK-2 but also for troubleshooting and repairing it should that need ever arise. Schematic and pictorial diagrams plus a parts list are provided in the manual.



The Advanced Electronic Applications CK-2 memory keyer.

Summary

These are by no means all of the tricks that the CK-2 can teach you, but you'll learn them all if you get one for yourself. I'm still learning some of them myself!

What *didn't* I like about the CK-2? Well, very little, to be honest. It did tend to show me where my shortcomings lie, and it forced me to get out of my comfortable rut and learn something new and different. As Churchill was supposed to have said: "I love to learn, but I hate to be taught." In my case, the CK-2 was a good teacher—and I didn't hate it at all. In fact, learning was pleasant, fast, and fun.

If you need a lifetime keyer that allows you to grow in proficiency while matching your requirements exactly—the CK-2 will stick with you all the way. On the other hand, if you're just a Sunday afternoon rag chewer, the Contester can be a trusted and patient friend. The choice is yours . . . and the CK-2 can do it all.

The CK-2 is priced at $139.95 and a dc adapter is available for $14.95. For further information, contact *Advanced Electronic Applications, PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.* Reader Service number 486.

Jim Gray W1XU
***73* Staff**

THE PALOMAR ENGINEERS PT-407 ANTENNA TUNER

The true test of a race car is on the long track in Indianapolis, and the strength of a dune buggy is discovered in the heat of the Baja desert.

So, to test the Palomar Engineers PT-407 antenna tuner, I put it on the first floor of a brick apartment building, with a random-wire antenna and no earth ground.

And it performed flawlessly.

In an apartment, all of the possible problems of operating a station become a reality. Antenna space is extremely limited, TVI problems are multiplied by the closeness of neighbors, and the lack of an earth ground exacerbates the other problems. With these difficulties in mind, the PT-407 was hooked up between a Kenwood TS-520 and about 75 feet of wire.

My first surprise came during the tune-up. After having had visions of going through two sets of finals before I finally found an acceptable swr, I was pleased to settle in at 1.4 to 1 on 15 meters with two or three bursts of knob-fiddling. Tune-up on the other bands was just as easy, and I found that I could always get a match of 1.5 to 1 at the highest. However, on most of the frequencies tried, a lower swr could be found in just a few seconds.

Tune-up procedure for the T-network of the PT-407 is standard. Two controls—Antenna and Transmitter—adjust variable capacitors, and the 12-position Inductance switch selects connections on an air-wound coil. In addition, the tuner has a balun for open-wire feeds and a coaxial switch to use in conjunction with a dummy load or an antenna that needs no matching device. Its total capacity is for four antennas.

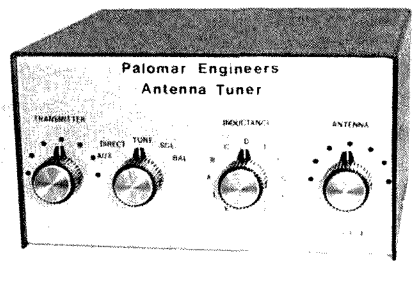
Tune-up is done at low power to avoid damaging the finals while they are loading onto a mismatch. The first control to be adjusted is the inductance; you set that at the lowest swr. The antenna and transmitter capacitances are interactive, making the second part of the tune-up the most trying.

The tuner will handle up to 300 Watts, which is enough to use with almost any rig running barefoot, and it takes up only 8″ by 8″ by 4½″. Construction inside the unit is solid; knowing from sad experience that a single poor connection is anathema to good output, I checked the unit over carefully during the first trial and could find no flaws.

With the case on, the tuner is unobtrusive yet handsome. The three-sided top is finished in a black crinkle, with a brushed aluminum front and back. The connections in back are made via three SO-239s and three porcelain insulators for a balanced feedline and the single-wire antenna.

To my surprise, the tuner proved to be quite broadbanded. Going from phone to CW on 40 meters required little peaking, and readjustment within band segments was not needed.

Assured that my finals were safe from the dangers of high swr, my attention turned next to the tuner's TVI-reduction capabilities. For this admittedly unscientific test, I used an old-model television with absolutely no shielding; my fellow apartment dwellers also (unwittingly) participated in this test. In my situation, TVI suppression is not good enough; the num-



The Palomar Engineers PT-407.

ber and density of television sets in my area necessitates a completely clean signal.

With the television on and next to the transceiver, there was minimum TVI. At voice peaks, the familiar lines we all know and fear broke the picture, but otherwise no interference was present. In the living room, a bare 15 feet away, there was no interference. And so far, I have not received any complaints from irate neighbors.

As with any component in a system, one unit's performance is limited by the other parts of the system—so other configurations could produce better or worse results. But the final question when using a matching device is if the tuner is absorbing most of the output to create an acceptable load. A few short minutes later, my question was answered in a QSO with KA7BEX in Louisiana and a second with KEØS in Colorado, both of whom gave me a good signal report.

Admittedly, most hams would not consider this great DX. But from the depths of an apartment building in Boston, Colorado is just short of a miracle.

For further information, contact *Palomar Engineers, Box 455, Escondido CA 92025; (714)-747-3343.*

Avery L. Jenkins WB8JLG
73 Staff

AMATEUR RADIO CALL DIRECTORY

Since 1920, there has been only one directory of amateur radio operators. The *Radio Amateur Callbook* has been the sole source of names and addresses of hams worldwide—until recently.

Now, in addition to the *Callbook*, there is the *Amateur Radio Call Directory*, published by Buckmaster Publishing in Ridgefield, Connecticut. Though similar to the *Callbook*, the *ARCD* has a slightly different format and comes in three books, each indexed differently—by call, by name, and by area.

Like the *Callbook*, the *ARCD*'s callsign index ($12.95) is divided into three columns per page. However, where the *Callbook* has separate sub-columns for the state and the zip code, the *ARCD* only separates the state and zip by commas. This makes the *ARCD* more difficult to read or copy from.

In addition, the *ARCD* does not have some of the operating aids which are included with the *Callbook*, such as a prefix list, QSL bureaus, Q signals, and time charts. And although the *ARCD* is the same width and height as the *Callbook*, it is somewhat thicker. When using the *ARCD*, I found that I missed having that additional information at my fingertips.

The *ARCD*'s geographical and name indexes are about half the length of the callsign index, but they are priced substantially higher than the callsign index. However, both of these indexes are good ideas, and I am surprised that nobody published these books earlier.

The geographical index ($25) is divided first by state, and then by city in alphabetical order. The city is followed by the street address and the callsign, enabling the reader to cross-reference to the call directory and get the full name and address. Although this process is rather cumbersome, it does save space and reduce the amount of redundant information.

Each page is topped by the state abbreviation and the listing is divided into six columns per page. Fortunately, divisions between columns have been clearly marked.

This index will not find much daily use in the average shack, but it would be quite useful if a club were putting together a prospective member mailing list or estimating the density of hams in a given area.

The *ARCD* name index ($25) is an alphabetical listing, by last name, of all hams in the US. The index includes the full name, middle initial, callsign, and state, again enabling the user to cross-reference to the callsign directory for more information.

Nor will this index quickly become dog-eared, although I am sure enterprising hams will find uses for it. My first response was that hams more frequently know each other by first name than they do by last. However, this is a useful source of information for clubs or nets.

Together, these three volumes comprise an extensive source of information, and although their comparison with the *Callbook* is necessary and inevitable, the *Callbook* and the *ARCD* are useful for different purposes.

Because of the operating aids in the *Callbook*, as well as its format, I find it handier in the shack than the *ARCD*. However, when you need an index for uses other than filling out a QSL card, the various indexes of the *ARCD* prove to be a valuable adjunct to the *Callbook*. Together, the *Callbook* and the *ARCD* would provide a highly versatile source of information.

For further information, contact *Buckmaster Publishing, 70 Florida Hill Rd., Ridgefield CT 06877.* Reader Service number 487.

Avery L. Jenkins WB8JLG
73 Staff

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

HOW HAMS VIEW THEMSELVES

Well, it's that time of year again. What time of year? Why it's time for the annual FUN! Poll, amateur radio's only free-form opinion survey where every ham gets his or her chance to speak out on the issues of the day. A ham tradition for three years.

If the past is any indication, this year's poll should manage to stir up a substantial amount of heat. And considering February's reputation for bitter cold breezes, a little heat just may be what we could all use right now. I can hardly wait until I see my mailman struggle up the icy walk to my house with a bag loaded with reader response forms. As you may have already guessed, there's a definite sadistic streak in KI2U.

This year, as in previous FUN! Polls, we're keeping some old questions in order to keep track on developing trends in our hobby, and adding some new ones to keep up with the times. Sharpen those pencils.

ELEMENT 1—BACKGROUND

1) Sex:
- A) Male
- B) Female

2) Age:
- A) 15 or below
- B) 16-21
- C) 22-39
- D) 40-59
- E) 60 or above

3) License class:
- A) Novice
- B) Technician
- C) General
- D) Advanced
- E) Extra

4) Number of years licensed:
- A) 1 year or less
- B) 1-5 years
- C) 6-10 years
- D) 11-20 years
- E) 21 years and up

5) Do you have a new (post-March '78) call?
- A) Yes
- B) No

6) How many hours a week do you devote to amateur radio?
- A) 0-1 hour
- B) 2-5 hours
- C) 6-10 hours
- D) 11-20 hours
- E) 21 hours or more

7) Which HF band do you use most?
- A) 80-75 meters
- B) 40 meters
- C) 20 meters
- D) 15 and/or 10 meters
- E) Don't operate HF

8) Which VHF-UHF band do you use most?
- A) 6 meters
- B) 2 meters
- C) 220 MHz
- D) 420 MHz and/or up
- E) Don't operate VHF-UHF

9) Which mode do you use most?
- A) SSB
- B) CW
- C) FM
- D) RTTY
- E) Other

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues, and other incidental expenses.)
- A) 0-$250
- B) $251-$500
- C) $501-$1,000
- D) $1,001-$2,500
- E) $2,501 and up

ELEMENT 2—SOCIAL CHARACTERISTICS

11) Has amateur radio influenced your career choice?
- A) Greatly
- B) Somewhat
- C) Not at all

12) Do you answer QSLs that include a self-addressed, stamped envelope?
- A) Yes
- B) No

13) Politically, how would you define yourself?
- A) Conservative
- B) Middle-of-the-road
- C) Liberal

14) Do you think amateur radio will exist 20 years from now?
- A) Yes
- B) No

15) How old were you when you first became a ham?
- A) 15 or below
- B) 16-21
- C) 22-39
- D) 40-59
- E) 60 or above

16) Were you a CBer before you became a ham?
- A) Yes
- B) No

17) Do you own a home computer?
- A) Yes
- B) No

18) Do you think hams, compared with computer hobbyists, are:
- A) More technically inclined in their hobby
- B) Less technically inclined in their hobby
- C) Both are about equally skilled in their hobby

19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
- A) Yes
- B) No

20) Did you ever use a "cheat book" (not counting the *ARRL License Manual*) to upgrade your license?
- A) Yes
- B) No

21) If someone offered you ten million dollars, tax free, on the condition you give up amateur radio forever, would you?
- A) Yes
- B) No

22) Do you belong to a local ham radio club?
- A) Yes
- B) No

23) Have you ever attended a ham flea market?
- A) Yes
- B) No

24) Do you think the new ARRL leadership is better than the previous administration?
- A) Yes
- B) No

ELEMENT 3—OPERATING HABITS

25) Should Novices have phone privileges?
- A) Yes
- B) No

26) Do you think US phone bands should be expanded at the expense of foreign-station-only bands?
- A) Yes
- B) No

27) Have you ever used a personal computer in connection with your amateur radio activities?
- A) Yes
- B) No

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
- A) Yes
- B) No

29) Where do you think the future of ham radio lies?
- A) On the HF bands
- B) On the VHF-UHF bands

30) Should we get rid of, or reduce in size, the CW subbands?
- A) Yes
- B) No

31) Do you think religiously-oriented nets have a place in ham radio?
- A) Yes
- B) No

32) Do you think politically-oriented nets have a place in ham radio?

RESPONSE FORM

Instructions: Read each question and mark your response by circling the appropriate letter next to the number of the question.

Element 1:	7) A B C D E	12) A B	19) A B	*Element 3:*	31) A B	38) A B	45) A B C D E
1) A B	8) A B C D E	13) A B C	20) A B	25) A B	32) A B	39) A B C D E	46) A B C D E
2) A B C D E	9) A B C D E	14) A B	21) A B	26) A B	33) A B C D E	40) A B	47) A B C D E
3) A B C D E	10) A B C D E	15) A B C D E	22) A B	27) A B	34) A B C D E	41) A B	48) A B C D E
4) A B C D E		16) A B	23) A B	28) A B	35) A B	42) A B	49) A B
5) A B	*Element 2:*	17) A B	24) A B	29) A B	36) A B	43) A B	50) A B
6) A B C D E	11) A B C	18) A B C		30) A B	37) A B	44) A B	

Comments: ____

Please mail Response Form to: John Edwards KI2U, 78-56 86th Street, Glendale NY 11385.

A) Yes
B) No

33) If, while tuning across a band, you heard a net of gay hams in progress, would you:
A) Jam it
B) Ignore it
C) Complain to the FCC or some other organization
D) Listen
E) Join it

34) If, while tuning across a band, you heard a net called "The American Communist Radio Society" in progress, would you:
A) Jam it
B) Ignore it
C) Complain to the FCC or some other organization
D) Listen
E) Join it

35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes
B) No

36) If required, could you pass the FCC theory test for your license class without consulting a "cheat book"?
A) Yes
B) No

37) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes
B) No

38) Do you think the FCC affects amateur radio in a positive manner?
A) Yes
B) No

39) Do you ever speak to foreign, non-English-speaking hams in their own language?
A) Always
B) Sometimes
C) I attempt it
D) Rarely
E) Never

40) Do you feel yourself competent to replace the finals in a tube-type rig?
A) Yes
B) No

41) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes
B) No

42) Have you ever built an electronic project from a kit?
A) Yes
B) No

43) Have you ever home-brewed an electronic project from a book or magazine?
A) Yes
B) No

44) Have you ever designed your own electronic project?
A) Yes
B) No

45) What do you think of contesting?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

46) What do you think of DXing?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

47) What do you think of repeaters?
A) Great
B) Good
C) Okay
D) Don't like them
E) Despise them

48) What do you think of traffic handling?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

49) Do you plan to use Phase III OSCAR within a year of its launch?
A) Yes
B) No

50) Do you plan to use the new 10.1-MHz band within one year of its opening?
A) Yes
B) No

HAM HELP

I have a Swan 350 and would like to know if anyone has added an RIT to this transceiver. I'll be happy to pay for any copying or postage fees.

James Harriges WB9RSK
542 E. Van Beck Ave.
Milwaukee WI 53207

I would like to find the manual (or copy) for the Alda 105. I am willing to pay a reasonable price.

Larry K. Pittman WD9EME
18919 E Rd., 410N
Hops IN 47246

I need the manual, schematic, or any information on a rack-mounted modem marked as both Periphonics DSU-400 and as I/Onex Type Autotone model 302. I am also looking for work in electronics in upstate New York. I have a BSEE, FCC General-class license, and I am very good with computers, especially assembly language.

Michael Moroney WA2VXY
18 Seville Drive
Clifton Park NY 12065

Wanted: AA, AB, AC, and AD coils for a National HRO-60 receiver.

Fred P. Robbins Jr. W5LNE
Star Route Box 166
Bay City TX 77414

I am looking for the Hallicrafters Super Skyrider model SX-28A, the UHF model S-37, and the Panoramic Receiver, model S-35. I will pay all costs.

Peter Dal Corobbo
18650 S. Marshfield
Homewood IL 60430

I need the manuals (or copies of them) for the Yaesu FT-7B and the Azden PCS 2000.

Larry Fields, Engine Dept.
USNS Silas Bent T-AGS26
FPO San Francisco CA 96661

I need a manual for a Model 75 Aerovox resistance-capacitance bridge. Can you help?

A. D. Buckley WB1AQV
14 Knapp Drive
Prospect CT 06712

Wanted: manual for the Tektronix 564 mainframe. I would prefer to buy it, but I am willing to copy a manual and return it.

Hugh Watson
59 Orchard St.
Elmwood Park NJ 07407

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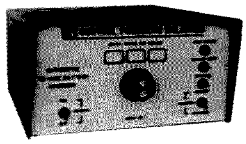

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W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

at that time, so this might be a good opportunity to mount a major DXpedition. The hams in Brunei are enthusiastic about this—anything to get DXers off their backs. I've talked with hams in Sabah about this, too, and perhaps the independence of Brunei might be a good excuse to mount an all-Borneo DXpedition. I'll bet we could get coverage on television for something like that. We might send a team to 9M8, 9M6, and YB7 as well as Brunei and put these countries on the air for a week solid. Anyone game for this? I think we could arrange for a very reasonable charter air flight, group accommodations at a reduced rate, and so on. I have been assured that licenses can be arranged if we start far enough ahead. I'd suggest this as a project for DX clubs, with each choosing one country for their group to activate. Then we could all get together in Singapore at the end for one hell of an Asian hamfest.

By the way, I've found that there is considerable enthusiasm from all of the DX amateurs in our starting a foreign operating news section for *73*. All of them are interested in keeping up with rule changes in other countries, reciprocal licensing news, DXpeditions, and anything else unusual happening around the world. This is a world hobby today, but none of the ham magazines has really treated it as such. We are all interested in knowing about countries which will be becoming independent, in the formation of new countries such as Qua Qua, in new certificates and contests, and so on. We want to know about major hamfests and conventions around the world. We'd like to know about any outstanding cases where amateur radio provided emergency communications.

With a couple new magazines in the works for 1983, I may have to skip the next Asian tour myself, but this is no reason for you to pass up this fantastic trip. Hit the major cities and their electronics shows, then ad lib some unusual spots on your way back home. You'll find the local hams outstanding in their hospitality. And, if you start well ahead of time, you may be able to get your own license and do some DXing from the rare end. By 1984, I think we'll be putting together the Borneo Super DXpedition if enough of you like the idea. As I told the chaps when we were going to Navassa, no matter what else you ever do in life, this is one experience you will never, never forget. The experience is priceless.

One little hint for those with the guts to make the decision to come to Sabah: You will enjoy it. I guarantee you will enjoy It. But be sure, if you stop at the Hyatt, not to take an inside room. The entertainment in the central atrium is loud and continues until midnight, filling the room with 90-dB sound. Take an outside room.

HAM HELP

I need schematics or service manuals for the Heath DX-150 transmitter and the Heath IO-10 oscilloscope. I will copy and return them.

William Bohnenberger
18 E. 199 St.
Bronx NY 10468

Wanted: a lower sideband crystal, 251.650 kHz, for the Collins KWS-1 transmitter. Please advise me of the condition and the delivered price.

Edward Dobbielaere
4184 Long Lake Road SE
Port Orchard WA 98366

Can anyone send me a copy of the schematics and manual for the Realistic DX-120 communications receiver? I will pay for copying.

John P. Centers
514 Pine St.
Wapakoneta OH 45895

Anyone who can provide historical information on the defunct American Legion net, which operated in California from 1924 to 1952, please contact me.

J. Phil Scherck WA7AGY
8987 Curbaril Ave.
Atascadero CA 93422

I am looking for the manual, schematic, or parts list for the Measurements Corporation model 62 VTVM. I will gladly pay copying and mailing costs.

Vernon Jones WB1BVH
32 Cat Mousam Rd.
Kennebunk ME 04043

I would like to get in touch with other users of the R390A/URR. I need a source for manuals, schematics, and modifications.

Bob Lombardi WB4EHS
2046B Renee Place
Melbourne FL 32935

I am looking for a manual for a Knight KG-685 color pattern generator and a tube chart for a B & K model 650 tube tester. I will pay for shipping both ways so I can photocopy.

Larry Schuldt
545 Willow Rd.
Marengo IL 60152

I am trying to find schematics for the Heath HO-10 monitor scope and the Ameco model CN 6-meter nuvistor converter. I will reimburse all expenses.

Howard Robb
340 S. 5th St.
Bird Island MN 55310

I would like to add 10-meter capability to my DenTron GLA-1000B linear amplifier. Please write me; I will defray costs.

George Gauggel
3660 Puuku Mauka Dr.
Honolulu HI 96818

I need a schematic and a manual for the Eico model 320 signal generator. I am willing to buy it or pay copying costs.

Edwin Adams KB3DH
RD4 Box 241A
Bloomsburg PA 17815

We need the manuals or schematics for a Fermont Engine Generator Plant 10-kW diesel generator, model J-141-1, bearing serial number J-141-0018. The generator is marked as a General Electric #LC7470B16 type 6J, model number 5SJ4254P22Y12. The battery recharging circuitry, marked Fermont #6064-0001, has been damaged. We will gladly make arrangements to obtain information on this generator.

Wayne Richardson
Lebanon Junction Area Coordinator
Bullitt County Division of Disaster and Emergency Services
Main St.
Lebanon Junction KY 40150

I am looking for information on the Western Electric Indicator BC 1152-A, particularly the schematic and data on the 3HP7 CRT. I will pay costs for copying and postage.

Torgny Karlsson SM7CFQ
Sandormsvagen 7
S-260 41 Nyhamnslage
Sweden

I am looking for pen pals in the US. I am 18 years old and an engineering student.

Isaac Maxwell Kyereboah
PO Box 078
Takoradi, Ghana
West Africa

I am looking for modifications for the Heath SB-101 transceiver. I am particularly interested in improving 10-meter reception, adding an RIT and improving the selectivity. I will answer all replies and refund expenses.

Paul Newman G4INP
3 Red House Lane
Leiston, Suffolk IP16 4JZ
United Kingdom

I need 3 tubes, type 12JB6, for my Drake TR-3. I cannot find these tubes in Brazil.

Walter Pereira Da Costa PY4ZO
PO Box 207
Araguari, Minas Geraid
38440 Brazil

I desperately need parts to repair my Hallicrafters FPM-300 transceiver. I will pay for a complete non-working unit or the audio amplifier module, a U401 balanced mixer assembly MX-1, part number 150-018555-001.

Robert Sondack VE2ASL
260 Rue Bellerive
St-Luc, Quebec
Canada J0J 2A0

I need the manual for the Hammarlund HQ-180A receiver. I will pay for copying costs and send a note of thanks.

Bob Napoli K2LGO
Box 158
Riverhead NY 11901

CORRECTIONS

In Fig. 1 of "The Automatic Beam Aimer," on page 23 of November's issue, the power-supply diode was drawn backwards. The cathode should be connected to the transformer secondary.

Avery Jenkins WB8JLG
***73* Staff**

The parts values were omitted from the "Headlight Reminder" which appeared in the November "Circuits" feature on page 109. Q can be any common PNP transistor, but a 2N3638 or a 2N2907 works well; D1 and D2 are 1N4002 diodes; R1 is a 5.6k, ¼- or ½-W resistor; R2 is a 4.7k, ¼- or ½-W resistor.

Avery L. Jenkins WB8JLG
***73* Staff**

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

There's a great old song written by James V. Monaco and Joe McCarthy called "You Made Me Love You." It's that kind of feeling that I get in February, what with Valentine's Day and all, along with the letters from you, the readers, whom I truly adore. Let's see what you all have to relate this month.

Starting with the "foreign desk" (sounds like "World News Tonight"), I have a note here from a colleague in Central America. David Reuben Harris, M.D., a physician in Costa Rica, is a TRS-80 user who is trying to obtain software for his Model I that will enable him to both copy RTTY and fully interface his computer on the air. Now, I have always been a fan of software solutions to "hard" problems, but not this time. A perusal through the published literature really fails to demonstrate much in the "strictly software" vein.

On the other hand, I have received a packet of material that just might answer some of Dr. Harris's needs. Kantronics, located in Lawrence, Kansas, produces a versatile RTTY interface, which we touched upon in December. With some more information in hand, let's see what they say it can do.

Their box, called "The Interface," is the hardware link that turns a computer and amateur transceiver into a highly sophisticated RTTY system. It allows transmission on Murray, ACSII, or Morse with essentially the same operating convenience.

The unit itself is contained in a small box that attaches to external devices through a series of jacks on the back panel. Inputs and outputs are provided which accept audio and digital inputs between speaker audio, computer, and accessory keyboard or key. Front-panel indicators include a tuning LED and bar-graph LED, used to center incoming signals within the demodulator's passband. There is even a loop driver available to switch an external 60-mA loop so that an antique Model 15 can be used as a printer for such a modern system.

No hardware of this complexity is any good without equally able software and, recognizing this, Kantronics has made available a group of programs known generically as "Hamsoft" that interface The Interface to the Apple II, Vic-20, TRS-80C, and Atari 400/800 computers. Additionally, it is entirely possible to write custom software to use The Interface with other computers.

An interesting possibility is raised by the note that the Hamsoft programs, which allow for Morse code in the 5-99-wpm range, 60-, 67-, 75-, and 100-wpm Murray, 110- and 300-baud ASCII, split-screen display, transmit buffer, Morse ID during RTTY, printer output, and more, will operate with other terminal units. That means that you might, and I emphasize *might*, be able to use the Hamsoft program between your computer and terminal unit if all else is compatible. Kantronics makes no promises that you can, but it might be interesting to try.

A further indication of the care that went into this product is a full section in the manual of The Interface which details modifications needed to operate with certain transceivers which present problems. Whether the modifications need be made to The Interface or the transceiver, it is spelled out in enough detail that accomplishing the change should be no real problem.

Kantronics has put together a nice package here, and I will be interested to hear from those of you who have used The Interface and Hamsoft in its various configurations. I am sure that Phil Anderson W0XI, president of Kantronics, and the other folks out there will be happy to answer your questions. Write them at 1202 E 23rd Street, Lawrence KS 66044, and be sure to mention 73's RTTY Loop.

Speaking of Phil Anderson, he passes along a question which several others have also posed. Kirk Baxter WB0AXX, in Mission, Kansas, and John Ryan, in Alcove, Quebec, both also are interested in several of the encoded RTTY signals heard on commercial frequencies. Kirk relates a series of such codes, including bit inversion, bit transposition, TOR codes, SITOR codes, ARQ, FEC, and SEL-FEC codes. These signals are uncopyable on a standard system and can represent a real challenge to the hard-core RTTYer.

The first few codes asked about are simple techniques, designed merely to ensure some degree of privacy. It is fairly easy to envision manipulating a standard Murray character to, say, invert one or more bits from mark to space, or vice versa. Thus, the letter "R" would change from 01010 to 00110, if bits two and three were inverted, and would print as an "I" on an unmodified machine. Similarly, one can consistently transpose two or more bits in each character, again rendering it unprintable without the key for deciphering.

These codes are not difficult to decode with a computer program which recognizes the cipher and undoes what the sender did. Of course, if the encoding station is really nasty, the characters can have bits both inverted and transposed, but that is another convolution.

The Murray code, as we all know, is a five-level code. While ASCII is the most common code using more than five bits, it is apparently quite rare on radio circuits. A complex series of codes is used on many commercial circuits which has error-detection abilities. Known as the Moore code, or CCITT No. 3, it is a seven-bit code sent synchronously, as opposed to the asynchronous Murray code.

Thirty-five characters are each composed of three marks and four spaces, in various combinations. If a character is received which does not have the correct number of marks and spaces, the receiving station can send a code to repeat the last transmission. This is called the "Automatic Repetition on Request" and yields the mnemonic "ARQ" when referring to this code.

Another code system which allows for error correction is the "Telex Over Radio," or TOR system. Some trademarks for systems using TOR include SITOR and SPECTOR. The TOR codes resemble the Moore system in their formulation, but are each four marks and three spaces; thus, the characters themselves are completely different. The FEC noted above is a Forward Error Correction in which each character is sent multiple times to receivers unable to request a correction. The receiver is set up to select any of the repetitions which meet the correct mark/space ratio and discard the rest.

Although this is an overview, I hope this explains the more unusual codes heard on the air. If there is sufficient interest, we may be able to devote more time in the future to schemes to decode some of these code types. Let me know with your cards and letters; I look forward to them.

I will close this month with a request from another reader out west. Bob Sanett W6TWR, in Van Nuys, California, is trying to hook up a Siemens T-1000 RTTY unit. He describes this as a daisy-wheel printer for TTY! Sounds interesting, but he needs any information he can get. Anyone with anything of note should drop me a line and send Bob a copy at PO Box 7323, Van Nuys CA 91409. I'm sure he will appreciate it.

Will try to outline some more on the terminal next month, and of course something from you, the readers. This is our column, yours and mine, and between old Model 15s and new computers, that's quite a range, here, in RTTY Loop.

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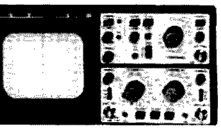

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CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

ARIZONA QSO PARTY

Starts: 1800 GMT February 5
Ends: 0600 GMT February 6

Sponsored by the Southern Arizona DX Association. Single-operator and club entries, all bands and modes but no repeater contacts allowed. Each station may be worked only once per band.

EXCHANGE:

RS(T) and state, province, DXCC country, or Arizona county. Novices and Technicians also sign /N or /T, respectively.

FREQUENCIES:

Phone—3895, 7230, 14280, 21365, and 28560.
CW—60 kHz up from lower band edge.
Novice—25 kHz up from lower band edge.

SCORING:

Count 1 point per phone QSO, 2 points for each CW or other mode QSO, and 4 points per QSO with Novice or Technician in the Novice bands. Arizona stations multiply QSO points by number of states, provinces, and DXCC countries. Others multiply QSO points by number of Arizona counties (13 maximum). The club station, W7NQ, also counts as 1 multiplier for non-Arizona stations. Anyone working all Arizona counties and W7NQ may double the multiplier.

AWARDS:

Certificates for the highest-scoring station in Arizona, non-Arizona, and Novice/Technician. In addition, certificates for highest score in any Arizona county, state, province, or DXCC country in which there are at least five entries.

Other certificates for Arizona and non-Arizona clubs whose members' scores combine for the highest score. Club entry must consist of at least five individual entries to be eligible. Club residency determined by mailing address.

ENTRIES:

Individual entries should show each station worked, exchange, and time and frequency of each QSO. Include a summary sheet of your scoring and dupe sheets for bands with more than 50 QSOs. Entry may designate one club with which you are participating. Deadline for individual entries is March 5th.

Club entries should be submitted by a club officer with a summary of callsigns and claimed scores. To be counted toward the club total, the individual entries must also designate the club. Deadline for club summaries is April 5th.

Include a large SASE for results. Entries should be addressed to: Southern Arizona DX Association, c/o Philip M. Stickney N7BUP, 1890 West Paseo Cuenca, Tucson AZ 85704.

SOUTH CAROLINA QSO PARTY

Starts: 1800 GMT February 5
Ends: 2359 GMT February 6

The QSO party is again sponsored by the Colleton County Contestors. The same station may be worked on each band and mode, simplex only. South Carolina mobile stations that change counties are considered new stations. Novice and Technician stations please sign /N or /T.

EXCHANGE:

RS(T) and state, province, country, or South Carolina county.

SCORING:

Phone contacts are worth 2 QSO points, CW contacts are worth 3 points. The multiplier for South Carolina stations is the number of states, provinces, and DX countries worked. Others multiply QSO points by the number of South Carolina counties worked (46 maximum).

FREQUENCIES:

Phone—3895, 7230, 14280, 21365, and 28560.
CW—3560, 7060, 14060, 21060, and 28060.
Novice—3725, 7125, 21125, and 28125.

AWARDS:

Certificate to top-scoring station in each South Carolina county, state, province, and DX country. Novices and Technicians compete only with other Novices and Technicians.

ENTRIES:

Include a summary sheet with your entry showing scoring and other information. Indicate each new multiplier in your log as it is worked. Novices and Technicians indicate class on your entry. Include a large SASE for results. Mailing deadline is March 5th. Send to: Colleton County Contestors, c/o Elliott Farrell, Jr. KE4VP, Rt. 3 Box 658, Walterboro SC 29488.

NEW HAMPSHIRE QSO PARTY

1900 GMT February 5 to
0700 GMT February 6
1400 GMT February 6 to
0200 GMT February 7

Sponsored by the Concord Brasspounders, Inc. (W1OC), to promote the Worked New Hampshire Award. Stations may be worked once per band, per mode. New Hampshire stations may work each other.

EXCHANGE:

Send RS(T) and country, ARRL section, or New Hampshire county as appropriate.

FREQUENCIES:

Phone—1820, 3935, 3975, 7235, 14280, 21380, and 38575.
CW—1810, 3555, 7055, 14055, 21055, and 28130.
Novice—3730, 7130, 21130, and 28130.
VHF—50.155 and 145.015 FM simplex, no repeaters.

SCORING:

New Hampshire stations score 1 point per QSO multiplied by the number of ARRL sections plus countries plus New Hampshire counties. Others score 5 points per New Hampshire QSO times the number of New Hampshire counties worked.

ENTRIES:

Send your entry no later than March 12th to the Concord Brasspounders, Inc., c/o Norman W. Littlefield, RFD 1 Buck St., Box 323, Suncook NH 03275. Include a large SASE for results and/or award.

VERMONT QSO PARTY

2100 GMT February 5 to
0700 GMT February 6
1100 GMT to 2400 GMT
February 6

Sponsored by the Vermont Amateur Radio Club (W1BD). Each station may be contacted once on each band and mode. Repeater contacts and multiple contacts with the same station on the same band and mode are invalid.

EXCHANGE:

QSO number and state, province, country, or Vermont county.

FREQUENCIES:

Phone—3930, 3960, 7230, 7260, 14280, 14320, 21360, 28570, 50.110, and 144.2.
CW—3530, 3730, 7030, 7130, 14080, 21060, 21160, 28070, and 144.1.

SCORING:

Vermont stations score one point per contact with any station. Multiply QSO points by number of states plus Canadian provinces plus countries (exclude US/Canada). Others score one point per Vermont contact and multiply by the number of Vermont counties (14 maximum).

AWARDS:

For non-Vermont stations, certificate to highest-scoring station in each state, province, and country and to highest-scoring Novice/Technician. Certificates will be given each Vermont station submitting a log. W/VT Award given to stations working 13 of Vermont's 14 counties.

ENTRIES:

Send SASE for official log and score sheets. Send logs/facsimiles, name, class of license, and address not later than March 1st to: D. Nevin KK1U, W. Hill, Northfield VT 05663. Include an SASE for a copy of the results.

QCWA QSO PARTY—CW

Starts: 0001 GMT February 12
Ends: 2000 GMT February 13

This is the 26th annual QCWA QSO Party, with separate weekends for CW and phone. You can work the same station more than once providing it is on another band. Only the bands listed under frequencies will count in this QSO party.

EXCHANGE:

QSO number, operator's first name, QCWA chapter identification (official number or name), and state or country. Members not affiliated with a chapter should use "AL."

FREQUENCIES:

Any authorized amateur frequency in the bands that are listed below is permissable. The following suggested frequencies have been selected to minimize interference to others, but please feel free to wander up or down from these if you so desire. Bands: 3530-3560, 7030-7060, 14030-14060, 21040-21070, and 28040-29070. The above are selected as a starting place. When pileups occur, don't be afraid to go to either side of these frequencies.

SCORING:

Each contact made with another QCWA

CALENDAR

Feb 5-6	South Carolina QSO Party
Feb 5-6	Arizona QSO Party
Feb 5-6	Vermont QSO Party
Feb 5-7	New Hampshire QSO Party
Feb 12-13	QCWA QSO Party—CW
Feb 15-16	America Radio Club International DX Contest
Feb 16-20	*A5 Magazine* UHF-ATV (FSTV) QSO Party
Feb 19-20	YL ISSB QSO Party—Phone
Feb 19-20	ARRL International DX Contest—CW
Feb 26	RTTY World Championship Contest
Mar 5-6	ARRL International DX Contest—Phone
Mar 12-13	YL ISSB QSO Party—CW
Mar 12-13	QCWA QSO Party—SSB
Mar 12-14	Idaho QSO Party
Mar 12-14	Virginia QSO Party
Apr 9-10	CARF Commonwealth Phone Contest
Apr 9-10	ARRL QSO Party—CW
Apr 16-17	ARRL QSO Party—Phone
Jun 11-12	ARRL VHF QSO Party
Jun 25-26	ARRL Field Day
Jul 9-10	IARU Radiosport Championship
Jul 15-17	*A5 Magazine* SSTV DX Contest
Aug 6-7	ARRL UHF Contest
Aug 19-21	*A5 Magazine* UHF FSTV DX Contest
Sep 10-11	ARRL VHF QSO Party

RESULTS

1982 A5 *MAGAZINE* NORTH AMERICAN FSTV-UHF CONTEST

1	W6VCF	9989
2	WA8RUT	5685
3	WD8MRV	3560
4	WB6ROP	3403
5	KB0XL	3015
6	WB9MCF	1955
7	W2RPO	1907
8	WB0ZJP	1905
9	WA9NJR	1895
10	VE3FYY	1621
11	W6RVP	1620
12	W2WHK	1496
13	WA8SAR	1494
14	K8HVA	1445
15	KA0BVT	1225

PARKING TICKET

AE5C/R 147.78/.18

PLANO AMATEUR RADIO KLUB

NEWSLETTER OF THE MONTH

Although most people do not like to get parking tickets, the hams in Plano, Texas, get one every month—and they enjoy it.

The Parking Ticket is the newsletter of the Plano Amateur Radio Klub, and it encompasses a rare combination of humor, information, and good looks.

The good looks came from recent experimentation with the newsletter, varying the type and layout in response to reader feedback. The result is a very clean newsletter; the columns are well laid out and rarely can a typographical error be found.

Inside features include a two-month calendar of events—not just a list, but a full-fledged calendar with enough room to write notes. Regular features include "Traffic Talk," an educational column on traffic handling, and "The Novice Corner," a tongue-in-cheek tribute to beginning hams. December's issue featured a review of some books titled *The EMP That Ate Worldwide Communications*, and *Practical Tree Pruning With Mobile Antennae.*

However, editor Rick Goodin N5CBI admits that he does have his limitations. "I had grand delusions," he said in a recent editorial, "of writing a coherent, cogent, and otherwise brilliant column, but that was quite a few hours ago when my body still felt awake and my cerebrum had not yet lapsed into autopilot."

Take a nap, Rick; you deserve it for a job well done.

73 encourages clubs to send in their club newsletters. Just address them to *73*, Pine Street, Peterborough NH 03458. Let us know what is going on in your area.

member will count as a single point. This year's contest has three multipliers: chapters, states, and countries. For each band, every new chapter is a multiplier of one, every new state (USA) is a multiplier of one, and every new country (ARRL DXCC list) is a multiplier of two. At the end of the party add up your total contacts for all bands and multiply it by the sum of all your multipliers for all bands. This will give you your total and final score.

ENTRIES:

Please keep separate logs for each band. Logs should include the following information: time (GMT), call, QSO numbers, name, chapter number or name, state or country. It is the responsibility of each contestant to provide a legible log (no carbon copies) and to list all claimed contacts. The total contacts and multipliers for each page should be recorded at the bottom of each page. The total contacts for the party should be recorded on the first page of the log. Log sheets will not be returned. Make sure you have correct postage when you mail your logs. Send logs no later than March 31st to: Spaceport Center #66, Donald McClenon N4IN, 3075 Florida Avenue, Melbourne FL 32901. Separate logs and scores must be submitted for the CW and phone parties.

AMERICA RADIO CLUB INTERNATIONAL DX CONTEST

Starts: 0400 GMT February 15
Ends: 2400 GMT February 16

Any amateur station making two contacts with America Radio Club DX member operators during the two-day contest will be eligible to apply for the Special Silver QSL Award. Stations making three contacts will be eligible for the Special Gold Silver QSL Award. Contacts must be during the two-day period listed above. Suggested frequencies include all authorized frequencies in the 10-, 15-, 20-, and 40-meter phone and CW bands. Exchange RS(T) and QTH. SWL stations also may apply for this award on a heard basis. For special award, send QSL and $2.00 in US funds or 3 IRCs to: America Radio Club QSO Contest, PO Box 3576, Hialeah FL 33013.

YL ISSB QSO PARTY—PHONE

Starts: 0001 GMT February 19
Ends: 2359 GMT February 20

Two six-hour rest periods are required. Operating categories include: single operator, DX/WK partners, and YL/OM teams. All bands will be used and the same station may be contacted on different bands for contact points but not as country multipliers. VHF and UHF may be used but all contacts must be direct and not through repeaters. Nets are not allowed!

EXCHANGE:

Name, RS, SSBer number, country, W/K state or VE province, and DX/WK partner's call. If no partner, leave blank. If nonmember, send "NO NUMBER."

FREQUENCIES:

On HF, use the USA General-class band portions. On 20 meters, be aware of the nets on 14313 and 14336. Stay away from 14332; leave it open for DX members trying to make contacts. Check 80 and 40 meters on the hour.

SCORING:

Score 3 points for each member contacted on your own continent, 6 points if different continent. Nonmembers' contacts count one point. Only member station contacts count for multipliers. Multipliers are each state, country, and VE province. Also, each team contacted but only once for each team. When DX/WK partners contact each other it counts as a double multiplier. If your total dc input power is 250 Watts or less during the entire QSO party, then count an additional power multiplier of two. Final score is the sum of QSO points times the total multiplier.

AWARDS:

Special certificates will be awarded to the winners of each category. Regular certificates for country, US state, and Canadian province winners.

ENTRIES:

Logs must show date/time (GMT), station QSOed, RS, mode, band, SSBer number, US state, VE province, or country, and period of rest time. Summary sheets show states, Canadian provinces, countries, YL/OM teams, DX/WK teams, and partner contacts. Send logs and summary sheets to Rick and Minnie Connolly (K0RDJ and KA0ALX), Star Rt. 1, Crocker MO 65452 prior to June 1st. Be sure to indicate who your DX/WK partner is!

RESULTS

1982 NEW JERSEY QSO PARTY

New Jersey Stations

Station	QSO Points	Sections	Score
WA2QNW	1018	72	73,296
W2ZO*	534	62	33,108
N2AEW	260	48	12,482

Out-of-State Stations

Station	Contacts	Counties	Score
N3RJ	77	21	1,617
W5WG	47	19	893
KC4HN	47	18	846

New Jersey Counties

Station	Score	Station	Score
Atlantic		*Monmouth*	
WD4SIG/M	234	W2GSA*	11,562
Bergen		(Operators:	
WB3HUP/M	8	KN2B, KA2F,	
Burlington		WA2SSH)	
W2XQ	3,475	KF2T	2,508
WD4SIG/M	209	WD4SIG/M	132
WB3HUP/M	10	*Morris*	
Camden		WD4SIG/M	324
WD4SIG/M	88	WB3HUP/M	54
WB3HUP/M	8	*Ocean*	
Cape May		N2AEW	12,480
W2YC/2	4,060	WD4SIG/M	192
WD4SIG/M	143	*Passaic*	
Cumberland		KC2PL	3,000
W2ZY	3,536	WA2ASO	561
WD4SIG/M	192	WB3HUP/M	30
Essex		*Salem*	
WD4SIG/M	54	WB2KMR	918
WB3HUP/M	30	WD4SIG/M	56
Gloucester		*Somerset*	
WD4SIG/M	72	WD4SIG/M	70
WB3HUP/M	25	WB3HUP/M	9
Hudson		*Sussex*	
WB3HUP/M	72	W2RO	112
Hunterdon		WD4SIG/M	112
WA2HCC	3,000	WB3HUP/M	9
WD4SIG/M	70	*Union*	
WB3HUP/M	4	WB2DND	1,045
Mercer		WD4SIG/M	72
W2ZQ*	33,108	WB3HUP/M	2
WB2PKG	4,350	*Warren*	
WB3HUP/M	4	WD4SIG/M	72
Middlesex		WB3HUP/M	16
WA2QNW	73,296		
WD4SIG/M	49		
WB3HUP/M	2		

Out of State

Location	Station	Score	Location	Station	Score
CT	KF1B	143	KY	WA4EBN	231
	W2CC/1	1	VA	KC4HN	846
ME	N1PL/1	364		K0RI/4	782
	WB1GLH	25		WA4PGM	247
E. MASS	KA1CLV	228	LA	W5WG	893
E. NY	K2POF	592	N. TX	KX5U	9
	W2WSS	187	S. TX	W5PWG	646
W. NY	WB2IPX	442	AZ	AK7J	30
DEL	N3ARV	180	OH	W0BOYF	264
E. PA	N3RJ	1617	WI	K9GDF	30
(Worked 21 Counties)			CO	N0CKC	225
	KB3ZF	688	ONT.	VE3KK	595
	W3SK	420		VE3DIF	120
(Operators: AA3B)			DX	JA2YKA	1
	WA3JXW	216	(Operators: JR2GMC, JJ1BTC, JH2QXG)		
W. PA	N3COR	216			
N. FLA	WD4ITK	144			

* = Multi-operator

2ND ANNUAL RTTY WORLD CHAMPIONSHIP CONTEST

Starts: 0000Z February 26
Ends: 2400Z February 26

SPONSORS:

73 and *The RTTY Journal.*

MISCELLANEOUS RULES:

The same station may be worked once on each band. Crossmode contacts do not count. Single-operator stations may work 18 hours maximum, while the multi-operator stations may operate the entire 24-hour period. Off periods are no less than 30 minutes each and must be noted in your log(s).

OPERATOR CLASSES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

ENTRY CATEGORIES:

(A) Single band. (B) Allband, 10-80 meters.

EXCHANGE:

Stations within the continental 48 US states and Canada must transmit an RST report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RST report and consecutive contact number.

QSO POINTS:

1 QSO point is earned for each valid contact.

MULTIPLIER POINTS:

1 multiplier point is awarded for each of the 48 continental US states, Canadian provinces or territories, and DX countries worked on each band.

FINAL SCORE:

Total QSO points times total multiplier points equals claimed score.

CONTEST ENTRIES:

Entries must include a separate log for each band, a dupesheet, a summary sheet, a multiplier checklist, and a list of equipment used. Contestants are asked to send an SASE to the contest address for official forms.

ENTRY DEADLINE:

All entries must be postmarked no later than March 26, 1983.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification.

AWARDS:

Contest awards will be issued in each entry category and operator class in each of the US call districts and Canadian provinces and territories, as well as in each DX country represented. Other awards may be issued at the discretion of the awards committee. A minimum of 5 hours and 25 QSOs must be worked to be eligible for awards.

CONTEST ADDRESS:

Send an SASE to RTTY World Championship Contest, c/o *The RTTY Journal*, PO Box RY, Cardiff CA 92007.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

FROM EASTER ISLAND TO CHRISTMAS ISLAND

The Pacific adventures of DXpeditioner Eric Sjolund SM0AGD were mentioned in the August, 1982, edition of this column. The saga of how a copy of that column caught up with Eric reflects the hectic nature of his recent six-month journey.

Fellow Swede (SM5HIH—and how's *that* for a CW callsign!) picked up a copy of the August *73* while his ship was in Houston. SM5HIH sent the article to Eric Edberg W6DU, who maintained daily schedules with SM0AGD as the latter prowled the Pacific. W6DU fired the column off to Eric on Tarawa, in the Kiribati Islands. One month later, the letter arrived in Tarawa postmarked Taiwan and marked, "Not in Taiwan" Well, *some* of the letters are the same...

Meanwhile, Eric had completed his two-week operation from T30CB and was in Pago Pago in American Samoa. The letter containing the copy of the column was forwarded to Pago Pago, but once again Eric was on the high seas before the letter caught up with him, this time heading for Christmas Island. The letter missed Eric again at Christmas, but the next forwarding to Hawaii did the trick and Eric finally got to see the column mentioning his "forthcoming DXpedition" at the very end of that trip.

Your DX reporter caught up with world-traveler Eric on his way home to provide this update on one of the most successful amateur radio journeys in many years. Eric reviewed his odyssey for the benefit of *73* readers.

"After the International DX Convention in Visalia, California, I headed for Rarotango in New Zealand's Cook Islands to meet my yacht. We sent the generators and beam antennas ahead by air freight to make sure they would arrive on time, but they didn't show up. The skipper was anxious to leave, so we sailed to deserted Suwarrow Atoll, where I operated as ZK1AF.

"Before he died, a hermit had been the sole occupant of the atoll for years. I used the desk from his hut as my operating table, but I had to move it to the shore of the lagoon to get away from the trees around the hut. It was the most beautiful operating position on the trip: looking out over the long wire and Windom antennas stretched across the blue water. We made two more stops in the North Cook Islands, at the inhabited atolls of Manihiki and Pukapuka.

"I left my transportation in Fiji since the skipper was heading for New Zealand and would miss the other Pacific islands. I spent a month in Fiji looking for a yacht going in the right direction, while operating as 3D2DX. And although the island has no television, I received TVI complaints. It seems the neighbor's video players were sensitive to my low-band operations in the evening. Fortunately, the telecommunications official handling the problem was the person who issued my amateur license, and he took my side.

"It was just as well that I spent the time in Fiji. The poor propagation and solar flares would have made for frustrating DXing. I finally found a yacht heading north. I put T30CB on the air from Tarawa, where I stayed with a local ham, T30BY. I didn't feel guilty about spending a lot of time fishing and seeing the island, as T30 is not too rare.

"In Tuvalu I received my T2AGD callsign in a couple of hours and spent about a week operating. I was the only passenger on a seaplane to Wallis Island, but I had no trouble getting on the air as FW0AG.

"I finally caught up with my generators, TH2 beam, and transportation, and we sailed for Atafu Atol in the Tokelau Islands. This was my favorite stop on the entire trip; I only wish I had been there without radios. The island is unspoiled due to its lack of a good anchorage. The natives were extremely friendly, throwing feasts and dances in my honor. I had to explain that the pileups were waiting and I had to return to the radio. They all thought I was a bit crazy to sit and operate the radio all day and night. I never got to see much of the islands, and I think I would like to go back to really explore them, without a radio—or at least with only a very small one.

"After four wonderful days we sailed on to Kanton Island, the rarest spot on the trip. Kanton was once a military base, so old buildings and antennas abound. Unfortunately, I could not use the huge log-periodic antennas because we had no power to turn them.

"Kanton's two-dozen residents enjoy joint administration by the United States and Kiribati. Thus, I could use two callsigns: T31AD and SM0AGD/KH1. To reduce the confusion and to give out as many contacts as possible, I alternated callsigns, changing them daily at 2400 UTC. It was very confusing for me, so I hung up a sign with my call. At 2400Z, I would turn over the sign and change the call."

Eric Sjolund SM0AGD (right) recently completed a six-month DXpedition in the Pacific, making 47,600 contacts. Friend Eric Edberg W6DU (left) helped Eric stay in touch with Europe during the poor propagation last summer.

Eric's dedication to his DXing is evident in the impressive statistics he rolled up on Kanton: 19,000 contacts in six days of operation under each callsign. He worked 80 meters between 1100 and 1300 UTC, sunrise across the US, to give all operators their best chance to work him, even though this was the middle of the night in Kanton. In fact, Eric got by on only a couple of hours of sleep each night during his two-week stay. "There were no social distractions on Kanton," Eric relates, "but I did get a little tired the second week." Eric operated the radio nearly all the time he was on Kanton, except for a single afternoon that he spent bird watching.

Eric's last DXpedition stop was Christmas Island where he operated for six days as T32AJ. When he finally flew into Honolulu at the end of the voyage, he deposited his rig in a locker at the airport so that he wouldn't be tempted to turn it on.

After a week on the beach at Waikiki, Eric headed home for Sweden. Behind him he left thousands of pleased DXers. Among the 47,600 contacts were thousands of new ones and many more thousands from new-band countries. DXers from the 300-country level to the newcomer worked Eric, many at every stop. Even long-time DXers commented on the excellent handling of the pileups, saying that it was always a pleasure to work Eric.

"He gives everyone a fair shake; you know you will get through eventually, and he almost never misses a callsign, no matter how bad the pileup."

QSL CARDS

Those who made one of the 47,600 contacts with Eric will undoubtedly be looking for their QSL cards. So far, in my series on QSLs and QSLing, I have covered the design of the card, filling out the card, and mailing it to the proper person. Now let's look at the most fun part of QSLing: How do we get the card *back*?

If you are in a hurry (and who isn't?), the fastest way to get your return QSL is by sending a self-addressed, stamped envelope (SASE) with your card. Let's look at the finer points of using SASEs.

Your first step in preparing an SASE is to choose an appropriate envelope. The envelope should be large enough to accept standard-sized cards without folding; try a few of your larger cards first. If you are expecting a return card from outside the US, use an airmail envelope with the little colored slashes around the edges. In the place for the return address, put the call of the DX station.

Neatly address the envelope to yourself, including your callsign, and be careful to include "USA" at the end of your address. Use a separate envelope for each contact —or at least for each different callsign.

Hot Tip: Write the QSO information from your QSL card on the inside of the return envelope flap. For example: T30CB 13X82 0435Z 14003 kHz 2xCW 599. Then if the envelope gets separated from your card, the DX station or QSL manager can fill out and mail you a card based solely on the envelope.

If you are mailing your card and SASE to a stateside station or QSL manager, you can include a US stamp for return postage. (Watch out for postage-rate increases, and include enough postage to pay for the return.) But what if you're mailing your card to Eric's QSL manager, SM3CXS, in Sweden? You can't get Swedish airmail stamps at your local US post office, so how do you supply sufficient return postage? Most amateurs turn to the International Reply Coupon (IRC).

The tiny IRC has many mysteries of its own which we'll explore in a future column, but we'll keep it simple for now. In theory,

you can buy International Reply Coupons at any US post office. However, I have gotten a blank stare at some of the smaller branches when I asked for some IRCs. The cost of the IRC goes up frequently, but they were selling for $0.65 each at last count.

You might be able to purchase IRCs for less through your local radio club or from QSL managers and DX stations which receive a lot of IRCs. Ask around. A typical asking price might be $0.40 each, in lots of 100.

The International Reply Coupon forms a sort of internationally-recognized currency for hams. IRCs are seldom cashed in at a post office. Since each is worth one unit of international *surface* postage in exchange, you would get one $0.30 stamp for each IRC turned in. At $.65 each, this is quite a loss.

The IRC has several advantages in DX QSLing. It is universally recognized, even in countries where they are not directly useful, such as communist countries. Eastern Europeans, for example, cannot buy or exchange IRCs within their countries, but they can send out any they receive.

The chief drawback to the use of IRCs is their expense. Many operating aids for the DXer specify the number of IRCs necessary to return your envelope and QSL via airmail. This number ranges from 2 to 5, so it might cost as much as $3.25 in IRCs to get your card back from Sri Lanka, not counting the cost to get your card and return envelope *to* Sri Lanka.

Because of the high cost of IRCs and the poor exchange rate at the local post office, some DX stations suggest a "Green Stamp" instead of IRCs. No, not a real Green Stamp, but a US $1.00 bill. It costs less than 2 IRCs, is almost as universally recognized as the IRC, and usually is worth more in exchange. The money is certainly useful to the DX station and often is used to finance future DXpeditions.

However, "Green Stamps" have their own problems. First, they are easily lost or stolen before the money ever gets to the DX station. Also, some DXers question the ethics of asking for money, especially over the air. The ARRL will not accept QSLs from stations which *insist* on a cash "donation" for a QSL. But many stations "suggest" rather than insist on cash. Finally, a hoard of US dollars could get hams in some countries in trouble with the local authorities. If you are in doubt, stick with IRCs.

There is a third method of arranging for return postage for your QSL: Supply stamps which the DX station can use directly to return your card. In other words, if you send your card to SM3CXS, you put Swedish airmail postage on your envelope. All you need is a source of small quantities of mint airmail stamps from countries all over the world. You might try the local stamp and coin dealer, but he is unlikely to have much of a selection, and he'll want a stiff premium on what he does have. Wouldn't it be nice if some ham bought such stamps in quantity and packaged them for individual DXers?

Fortunately, someone has! Send an SASE (you know how to do it right, now) to DX Stamp Service, 7661 Roder Parkway, Ontario NY 14519, for their current price list.

The use of these stamps has several advantages. The cost is comparable to IRCs (and can be cheaper when 4 or 5 IRCs are required). The DX station returning your card does not have to dispose of the IRCs at a loss nor arrange to sell them. He doesn't even have to go to his local post office to buy stamps to return your card. He merely fills out your card, sticks it in the envelope, and throws it into the mailbox.

By making the QSL return so easy for the DX station, the QSL-return rate increases. And isn't that the point of this whole operation, to get your card back as quickly as possible? So try using the DX Stamp Service and see what it does for your QSL returns.

Next month we'll talk about QSL bureaus. Until then, good DX!

LETTERS

THANKS TO ALL

In response to the notice you put in the *73 Magazine* "Ham Help" column for me, requesting a schematic for a Philco 89 radio, I have so far had no fewer than 16 offers of help. I've written to each one thanking them and would like to say thank you to you, too. Hams are certainly helpful people!

Charles Owens
Durham NH

BOOTLEG COMMENTS

When the early morning hours of Monday, September 6th, produced some of the finest auroral curtain reflections I've ever heard on VHF (and a dazzling visual light show as well—one of the hottest ever seen in New England), I began to wonder how inexperienced or uninformed operators would react to this bizarre propagation phenomenon and its ghostly northern echos. Naturally, I tuned my receiver down to the illegal "bootleg band" (27.6-28.0 MHz) that lies between CB and ten meters for a first-hand look.

The band was hot with auroral reflection and my hunch was confirmed in spades! A hop across the band produced these howlers, which deserve to be logged for posterity:

From an unidentified source: "How come everybody in skipland sounds like they're gargling with Listerine? This has got to be the worst outbreak of bad breath I ever heard, 10-4?"

From a station in New Jersey: "O.K., Massachusetts, but there's 'lots of QRM from a station in North Carolina—he really be booming in *OFF THE BACK SIDE* (sic) of this here beam!!!"

From two stations in Maine: "10-4 on Old Orchard Beach...we're about 50 miles apart but you're peakin' off the ***BACK*** of the beam...I had to turn north to pull you in, and you're right dead off the back of the antenna. I don't know what to make of it."

The next time someone talks to you about the advantages of lowering or eliminating licensing standards for the amateur service, just reflect for a moment about the consequences of turning emergency communications services over to a gang of operators who don't even know which way to turn an antenna to work an auroral curtain—let alone (God help us!) the reasons why.

I've never had a heartier laugh, nor met a better argument for keeping licensing standards exactly as they are.

Dave Beauvais KB1F
Amherst MA

THANK BASH, WAYNE

I have subscribed to your magazine since 1977. In that time you have consistently vilified incentive licensing (something we WDs and KAs would not have thought to question). For the last year or two, you have been attacking the Morse code requirement. In your October, 1982, editorial, you demean Bash.

With at least the passive connivance of the non-hams running the FCC, Bash has given you exactly what you asked for. Incentive licensing is now a joke. (Wanna upgrade? Send a check.) I received a catalog in the mail last week which offered Bash tapes of the code tests. Now knowledge of Morse is irrelevant.

Wayne, where is your gratitude? Your sermonizing and lobbying just filled editorial space. Bash has accomplished your stated purposes. How can you attack him for that?

I don't believe incentive licensing has ever bothered newcomers to amateur radio. Incentive licensing irritated a bunch of geriatric AM operators by crowding them up the band among the sidebanders.

If the Feds ever caused a slump in new hams, it was probably by terminating Conditional licenses. The Bash hams of today are the sons of the Ws, Ks, and WAs who got their licenses by buying a new rig from the right guy.

I don't see how turning licensing over to radio clubs can be much of an improvement over the old Conditional system. I saw the Bash booth at the Cedar Rapids convention; there were enough people standing around, presumably licensed amateurs, to form a club.

Possibly hams could learn from the relationship the National Rifle Association enjoys with the Army. The military should be well funded for at least the duration of the Reagan administration, and it has a vested interest in rule 97.1(d). Today's armed forces, particularly the Navy and Air Force, have a far greater need for electronics and communications experts than for skilled riflemen. Reserve, National Guard, and ROTC units are conveniently located close to population centers and should be eager for a chance to show their best side to young electronics enthusiasts.

The FCC should be glad to give up the expense of the testing program, and the military should want a program that actually determines proficiency in electronics and communications skills.

Robert A. Wiley WD9FQD
Solon IA

INCENSED AND LICENSED

As a new amateur, I enjoy *73*—even bought a subscription. But after 2 issues I became incensed after reading comments from your other readers. Hams apparently are a big bunch of hypocrites when it comes to code and licensing.

The consensus—at least judging from your magazine—is that CW is:

1. A sacred cow: "I got mine, so everyone else must also suffer."
2. CW keeps yo-yos off the ham bands.
3. Every ham constantly uses CW.
4. Bash is destroying the tradition of hams for understanding radio.

Well, I say bull! First, if code is so sacred, then current hams would not mind taking a retest at renewal time to prove proficiency. Betcha a lot of Extra class would become Novice, maybe! At a recent ARS auction, the auctioneer, in selling a bug without success, asked if *anyone* uses CW. The laughter spoke for itself.

Second, it appears to me that the only ham bands that are crowded are the phone bands. The CW portion of all but the Novice bands are unused by comparison. And please tell me what General, Advanced, and Extra are doing on the Novice bands sending at 18-20 wpm with umpteen Watts?

Now to the test. The written FCC test is a joke. I studied a complete Heath course and the ARRL manuals, memorized all sorts of formulas, and flunked the test. The questions are ridiculous. My advice is to forget Bash, or whatever, peruse a manual or two, take and flunk the test, then study. The questions don't change.

Now that everybody is mad at me, I will make my recommendations for improving amateur radio.

1. Keep the code as a license requirement but set the General speed at 10 wpm. Nothing sacred about 13 that I know about. The single item keeping more people from becoming hams is $$$ for equipment. And require a code retest with every renewal. If that's too hard to swallow, set 10 wpm for Technician and grant phone on 40 and 80.
2. Expand the phone bands. An awful lot of our frequencies are wasted.
3. Restructure the written test to be a true evaluation of knowledge of radio telecommunications.

Pete Thacher N4HQZ
Raleigh NC

HABLA MORSE?

You're right on the mark regarding elimination of Morse code as a part of the amateur licensing process. What the FCC really ought to require is that all hams learn Spanish. You never know when someone knowing only Spanish could get into an emergency situation with only a phone-capable rig and couldn't remember any code (only time he used it was for the test).

Just the other evening I listened to two locals talking on two meters saying that we have to keep the screen tight and keep the code. Then they went on to talk about how they were working to upgrade and how nice the Bash books were. Who is kidding whom?

Drop the code and keep the written, but maybe print up 10 or 20 different versions to make it memory-proof. Contrary to the November editorial in *QST*, the time IS now.

Charles L. Kelsey WB2EDV
Mayville NY

LEARN TO EARN

Without going totally into the debate pro or con on the code requirement and justification for each question on the written exam, it appears to me that both have strong and weak points. I submit that anyone who has reasonable intelligence and desire can learn the code at 5 wpm. Whether 13 or 20 wpm should be required for phone privileges, I question. Also, the theory exam certainly has a problem. I think Bash is wrong to provide direct answers to the FCC questions! However, I think he is right in that some questions are ridiculous. The wording and content of some questions are outdated and would not lend themselves to the scrutiny of a first-year education major. Maybe H.R. 3239 will provide some change

for the better in these problem areas. Nevertheless, my main purpose in writing is to discuss learning the code.

I would like to share my experience at learning the code. This technique was used for both the 13-wpm General exam and the 20-wpm Extra exam. Now, I do not consider that I have much time available as I am a full-time employee (Texas Instruments), full-time father, full-time husband, and part-time student. Oh, yes, I do have a little time left over for a hobby. Also, I do not consider myself exceptionally bright (not a member of Mensa).

I purchased a battery-operated cassette tape recorder/player with earphone and a copy of the *73* 13+ wpm tape. Then I placed the tape player with pad and pencil on a table near my favorite chair. Each evening as I sat down to read or rest I would copy code for 10-15 minutes (at most). Very few evenings would I miss an opportunity to copy, however.

Using this technique, I passed the 13-wpm test on the first try after one month. On the 20-wpm test, I studied for six weeks and passed on the first try. I used only the *73* random character tapes and trained myself to copy only one letter at a time, responding to the composite sound. Also, I concentrated only on the code and did not prepare for the written (theory) exam. I prepared for that at a separate time after passing the code.

The very first hurdle is to decide that *you* are going to learn the code at the wpm required and dedicate some time to the project. Thus, the first problem is a psychological one. Also, you understand, no one is going to "give" you a passing grade—you earn it.

I consider the code as part of earning a privilege and it makes my license worth even more to me. Maybe code is outmoded and not modern, but like some of the theory, it gives me a taste for what is involved and the ability to use it when and if needed. Whether one needs to learn code at 20 wpm to get full privileges is questionable, but a good stiff theory exam seems appropriate. Let's keep the code, make it appropriate, and improve the theory exam.

Mike Grimes K5MLQ
Sherman TX

INSULTING

Reference my letter to you, published in the September, 1982, *73* ("Emergency Systems"). Your reply is, to say the least, oversimplified and insulting to my intelligence. I wonder how many IC boards you worked on and whose kids work on your equipment. If you can't give an intelligent answer to the problem, why waste space and time?

From all the comments on the CW issue versus comments on "Emergency Systems," it appears that there is no interest in the latter issue, and with your funny/useless/stupid comment, the problem will never be considered seriously. Of course, Wayne, there won't be any problems because the enemy will give us plenty of advance warning so we all can disconnect our antennas, and when your equipment gets blown away, you can find the kids to repair it.

I know you won't print this rebuttal to your stupid answer, but at least I got it off my chest. I most probably did a hell of a lot more equipment repair than you ever did. I can't find kids to do my repair work.

Good luck, Wayne. In your old age you are getting very sarcastic.

Arnold D. Samuels KH6COY
Ocean Shores WA

Old age may have made me sarcastic (no, I've always been sarcastic—it's just that you are getting old enough to recognize it at last), Arnold, and I don't doubt for a moment that I have insulted your intelligence. I also don't doubt that you've done a lot more repair work than I. I did train in the Navy and did the electronic repair on the USS Drum *during the war, keeping the radar, radio, and sonar running despite every effort of the submarine tenders to screw it up. And I spent ten years or so building ham gear for RTTY, sideband, and so on... managing to twist my hip permanently from standing on one leg at the workbench. But you're right—I've gotten away from servicing and even building, much is the pity, doing it only when there is no alternative. However, before I wrote my "funny/useless/stupid" response to the letter, I did my homework. If you do yours, in return, you will find out what I know... and that is that it is the youngsters who are the real hot shots at repairing today's circuits. The best service person we've ever had here was a teenager... and the worst were some older hams. The Drum is still around, so I did okay.—Wayne.*

SOFTWARE NEEDED

I don't have to tell you about the growing invasion of microcomputers into the ham shack. Many of your editorials show your awareness of this. I would, however, like to bring your attention to the expanding popularity of one computer in particular: the Commodore VIC 20. Many people don't realize how fast this machine's popularity is growing. For example, I know about nineteen hams who own computers. Out of these nineteen, two own the Heathkit H-89. One owns an Apple, two own a Radio Shack Color, five own Model 1s (Radio Shack), and nine own the Commodore VIC 20. And why not? The VIC 20 is an easily expandable computer with a fairly powerful Basic (CBM V2.0). Also, it is rf-tight. It's perfect for beginners in computing who are trying to learn and, right now, that is a lot of hams.

Unfortunately, there is one problem which, if let go too long, may cause the computer to be self-defeating. Because so many beginners are buying the machine, there is a shortage of good software. In fact, that is the one big reason many hobbyists may have for not buying the VIC.

Naturally, I don't want to see the death of such a fine computer. The solution to this problem, as I see it, is not so much to make available packaged software as it is for magazines, such as *73*, to publish software along with articles which explain how and why this software works. This would not only make software available but also would supply other VIC 20 owners with a better understanding of their computer so that they, in turn, could write programs to be published.

I have written a number of programs which would be of interest to hams, such as RTTY and Morse programs, programs which track OSCAR, etc. Also, many VIC owners don't realize how simple it is to interface a Model 33 ASCII teleprinter to their computer to serve as a line printer.

I'm sure that if you investigate this a bit further, you will find that printing this information could be profitable not only to amateur radio, but to *73* as well.

Jim Archer KF1T
Warwick RI

ANTI-SEMITIC?

In your November, 1982, editorial regarding how hard work pays off, you wrote, "given equal opportunity, the US would be as proportionately populated with wealthy Chinese as it is wealthy Jews."

I was shocked and surprised to read such an obvious anti-Semitic statement. Did you take a survey asking bank balances and religious persuasion? How about wealthy Catholics? Or wealthy Protestants? Why did you single out Jews? How in good conscience can you perpetrate this ugly myth and stereotype and in doing so inflame the fires of anti-Semitism?

As a former New Yorker, you must be aware of the many needy unfortunate Jewish families in the lower East Side of Manhattan. Did you take them into account in your survey?

Your point would have had the same effect if you had deleted "Jews" and substituted the word "people." By noting your comparison to "wealthy Jews," it showed you as a narrow, unthinking person who may profess to be free of bias but in reality is not.

Mike Herbstman KM2F
New York NY

While I've never been anti-Semitic before, I think in your case I might be able to make an exception. You, sir, appear to have a very serious inferiority problem. At any rate, I gather that you are trying to make a case that there is something wrong with being successful. Well, that's a good rationalization for your personal failure to be as successful as you feel you should. No, I'm not anti-Jew, anti-Chinese, anti-Catholic, anti-WASP, and so on, and I have thirty years of editorials to back me up... plus a wide range of personal friends of every known persuasion and color. I'm known, I think, not to be anti-Arab—which may taint me in your estimation. Now, I must admit that I do have my prejudices, being anti-drugs (which includes tobacco), anti-establishment (and most of you know what government agencies I am referring to), anti-laziness, anti-illiteracy... and so on. I have a strong record as being pro-success and I think I can point with pride to the intelligence and success of Jews, the Chinese (where they have not been screwed by the communist political system), and the Japanese.—Goy Green.

KEEP THE GOOD STUFF

QST and *Ham Radio* were my steady diet of amateur radio magazines for as many years as I care to admit—at least since the inception of *Ham Radio*. But in one way or another, these magazines changed (as magazines tend to do) and I became disenchanted. Being the inquisitive experimenter type, new excitement was needed. What seemed to have been lost, I found in *73*!

I like your editorial philosophy of including the type of articles in 73 which, according to some publishers, do not belong in amateur radio magazines. Hogwash! For example, one of these days (and sooner than most of us believe), the ham fraternity will have access to its own geosynchronous satellite, complete with microwave-band transponder! (See *Westlink Report*, September 10, 1982.)

Over the years, I have authored about 22 ham magazine articles, not the least of which was the popular coffee-can feedhorn (*Ham Radio*, May, 1976). In fact, in *73* for October, 1982, John Franke WA4WDL, says, "The first antenna I tried was the popular coffee-can horn. Since then it has become my standard to which all other antennas are compared."

Seeing testimonials like this from fellow amateurs gets my adrenalin pumping! Makes life seem worthwhile! But, alas, one can't have everything. I fear few persons know about the 1976 article or who authored it.

TVRO will never be the same since that article was published. You probably know that rectangular horns were the "in" thing originally, but not anymore. I like to think I should take a teeny bit of credit for that, too. It seems to me both the amateur and non-amateur stand to gain from articles of this kind; it works both ways.

Keep the good stuff coming. Maybe I'll even renew my *73* subscription! And I might even find time to write an article or two for *73*.

Norman J. Foot WA9HUV
Elmhurst IL

P.S. My consulting business is to a large degree an outcome of my amateur radio activities over the years. Your editorial covered such a possibility very well.

BEST ISSUE EVER

The November issue of *73* is the best amateur magazine I have ever seen—simply outstanding in its variety of construction projects. The power-supply project by WA6TTY is so good I can't believe it—even to an offer of help for an SASE! The step-by-step instructions are what are so sorely needed. I have, 2 years ago, written to *QST* and said that this is what we need, but I'm afraid the letter was given a stock reply and there it ended. But there are many of us who are not technical wizards who want to learn and construct. Well, Ken Wyatt has done a great service for us, and I do hope that you can encourage him to contribute again. How about a 66-foot 4- or 5-band cheap dipole—simple, yes, but isn't that what will get the new ham into making rather than buying? A cursory glance through the ham ads will show you how many hams buy their dipoles.

Well, anyway, if you never produce another issue for a year, the November issue is worth the annual price. Keep that up and let *QST* keep on with the dreary contest rules/winners/DX clubs, etc.

I could write pages of congratulations, I'm so pleased with that issue.

Eric Stabler VE3ISO
Ontario, Canada

HAM HELP

I need an original or photocopy of *TVI*, written by Dick Wildman W6MOG and published by *73*. I also need a DO-T35 or DO-T6 audio transformer, and I would like to buy MBD 201 or MBD 301 hot-carrier diodes in lots of 10. Please write and state your price before sending material.

Gordon La Grange W5AKQ
318 East Circle Dr.
Baytown TX 77521

I am a GI stationed in Europe and a soon-to-be Novice. I need a schematic for a Yaesu FT-401D (same as the FT-DX401). Also, can anyone tell me how to hook up my frequency counter to the FT-401 to measure the receive frequency? I will, of course, pay postage and copying costs for this information.

David Granholm
HHD, 69th Sig. Bn.
APO New York 09178

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

40-METER HOOT OWLS

There is another Hoot Owl network, which has been in existence since 1967. This net was started by W3CDH and others, meeting on 40 meters at 0600Z on Saturday mornings. Various frequencies have been used over the years but now they meet on 7.274 MHz, plus or minus QRM, and have check-ins from all across the country. To call in, merely say "hoot hoot," and after five regular check-ins, an award will be mailed to show participation.

The type of rig, power output, antenna system, or genus of operator has no bearing on the degree of Hoot Owl classification. Hoot Owl capability is based solely on the licensed operator's ability to stick with it on the 40-meter band at least two hours beyond his sensible bedtime.

An associate membership may be issued to operators who qualify in some respects but operate in the wrong frequency band or, for some other reason, fold up and are unable to hack it.

There's even an women's auxiliary! Any female stayer-upper attempting to qualify who is thereby hollered at by her father or husband shall be designated a "Mini-Hoot"!

Dues for the organization are $10.00, which keeps a Hoot Owl in good standing for a period of ten years. If not paid within the ten-year period, the former Hoot Owl becomes a "Chirp," which means he no longer gives a hoot.

Oh yes, the password, we must not forget that! Any Hoot Owl can easily be identified by another member when the password "hoot hoot" is injected at the point of contact. Do you give a hoot, or not?

CANADAWARD

The Canadian Amateur Radio Federation is pleased to announce the following awards available to all radio amateurs worldwide.

A colorful certificate will be issued to any amateur who confirms two-way contact with all Canadian provinces and territories. All QSOs must be on one band only. Separate awards are issued for each band on which the applicant qualifies.

Canadian provinces and territories include: VO1/VO2 Newfoundland/Labrador; VE1 Prince Edward Island; VE1 Nova Scotia; VE1 New Brunswick; VE2 Quebec; VE3 Ontario; VE4 Manitoba; VE5 Saskatchewan; VE6 Alberta; VE7 British Columbia; VE8 Northwest Territories; VY1 Yukon Territories. Note: VO2, Labrador, is part of the province of Newfoundland and therefore counts for a Newfoundland contact.

A mode endorsement is available if all QSOs are made on the same mode (CW, SSB, RTTY, SSTV). Contacts made after July 1, 1977, only will count for this award. All amateur bands may be used. Each distinct satellite mode (432/144, 144/29, or 144/432 MHz respectively) will count as a separate band.

To apply, submit the twelve QSL cards with $2.00 (Canadian or US funds) or ten IRCs plus sufficient funds ($.60) for return postage for your cards. CARF members need only send funds for return postage as the award is free to all CARF members.

A special plaque is available to any amateur who confirms two-way contact with all Canadian provinces and territories on each of five separate bands. Submit your 60 confirming QSL cards with $25.00 (Canadian or US funds) plus sufficient funds for return postage to: Canadawards, PO Box 2172, Station D, Ottawa, Ontario, Canada K1P 5W4.

WBCC AWARD

The Worked Broward County Cities award is sponsored by the Broward Amateur Radio Club. All amateurs are invited to apply for this very attractive and desirable certificate, printed in three colors on heavy parchment stock.

Applicants must obtain two-way contact with five of the Broward County cities. A gold seal will be awarded for fifteen cities worked.

All contacts must be made from the home QTH of the applicant; QSOs with mobile or portable stations in Broward are valid. All legal bands and modes may be used, but contacts via repeater will not be accepted.

Applicants should list the date, time, band, mode, and call and QTH of the Broward stations worked. Have this list verified by two fellow amateurs. Send your list, together with a fee of $1.00 and two first-class mail stamps (DX applicants send US $1.00 plus 3 IRCs), to: WD4RAF Awards Manager, 1921 NW 41st Street, Oakland Park FL 33309. Gold seals will be issued for a self-addressed envelope or one IRC.

The following Broward County cities apply: Coconut Creek, Cooper City, Coral Springs, Dania, Davie, Deerfield Beach, Fort Lauderdale, Hacienda Village, Hallandale, Hillsboro Beach, Hollywood, Lauderdale-by-the-Sea, Lauderdale Lakes, Lauderhill, Lazy Lake, Lighthouse Point, Margate, Miramar, North Lauderdale, Oakland Park, Parkland, Pembroke Park, Pembroke Pines, Plantation, Pompano Beach, Sea Ranch Lakes, Sunrise, Tamarac, and Wilton Manors.

THE VK5 WHISKEY CHARLIE AWARD

This award was originally created to commemorate 25 years of the club's existence and is still an award hunter's challenge.

For the first 23½ years of VK5WC's existence, it was the only callsign authorized from Woomera, a now small Australian community and former home to the European Launch Development Organization (ELDO). The club presently has four active HF members with several other members awaiting their reciprocal calls. VK5OL, VK5MQ, VK5AH, and VK5LA can be heard operating from the village as well as the club's station itself.

The award is available to all licensed amateurs throughout the world who can show proof of two-way contacts with club station VK5WC and two club members, or four different Woomera stations who are club members.

Any authorized frequency or band, including crossband and VHF, UHF, or satellite repeater, and any mode or combination of modes for which the stations concerned are licensed are permissible. Contacts may be claimed retroactive to May 3, 1978, which is the date the use of individual callsigns was authorized within the Woomera village community.

To apply for the award, submit a copy of all eligible log entries signed by the claimant and certified by either the cosigning of two other licensed amateur radio operators or, in the case of an isolated claimant, certified by a justice of the peace or a notary public. In case of dispute, local log entries at Woomera shall be accepted as proof conclusive of whether or not a contact took place.

Claims for the award are to be submitted in writing to the Award Manager, Woomera Amateur Radio Club, PO Box 538, Woomera, South Australia 5720, Australia, accompanied by $2.50 in Australian currency (or equivalent), preferably by bank check payable to Woomera Amateur Radio Club, Award Account.

The award is an enlarged version of the club's QSL, with black, red, and blue printing.

WORKED VK8 AWARD

Work or hear eight stations in the VK8 area, irrespective of applicant's QTH. Any band, any mode, GCR applies. Award fee is $3.00 Australian or ten IRCs. Send log data with fee to: Awards Manager, PO Box 40318, Casuarina 5793, Northern Territory, Australia.

TASMANIAN DEVIL AWARD

Applicants must establish contact with a number of VK7 stations depending on their QTH: Australia, 50 contacts; Oceania and Antarctica, 30 contacts; Asia and North America, 20 contacts; Europe and South America, 10 contacts; Africa, 7 contacts. Band and mode endorsements are available as well as special endorsements for making all contacts with Novice stations.

Claim logs with applicant's call and full name are to show station contacted, date, time, band, and mode. The claim is to be signed by the applicant and countersigned by two other amateurs. Spot checks will be made with contact stations in VK7 for confirmation. QSLs are not required. Contacts made on or after January 1, 1978, are valid. The award fee is five IRCs or equivalent for Australian applicants, ten IRCs for overseas applicants. Apply to: Tasmanian Devil Award, VK7 QSL Bureau, PO Box 3710, Hobart 7001, Tasmania, Australia.

ZONE 29 AWARD

To qualify for this award, it is necessary to contact 25 amateur stations located in zone 29. Zone 29 includes the VK6 and VK8 call areas. Only contacts after 0800 GMT on January 1, 1952, are valid. No crossband contacts are permitted. Minimum acceptable exchange of reports is RS33 or RST338.

QSL cards are not required as proof of valid contacts but the applicant must show that the log extracts have been examined and verified by two other amateurs. A simple declaration that the applicant's station has conformed to all licensing regulations related to his operation is mandatory.

The fee for the award is $1.00 Australian or five IRCs. Apply to: Awards Manager, Zone 29, WIA (VK6 Division), PO Box N1002, Perth 6001, Western Australia, Australia.

THE VK1 AWARD

This award is available to any amateur or SWL who submits details of valid contacts with the required number of VK1 stations. On HF, VK stations require 20 VK1 contacts, others require 10 VK1 contacts. On VHF, 10 VK1 contacts are required.

A log extract is required, showing for each contact claimed the GMT date and time, band, mode, callsign of the station worked, and reports or cyphers exchanged. SWLs must show callsigns of both stations in the QSO and the reports or cyphers given by each station. The award cost is $2.00 Australian or five IRCs. Applications should be forwarded to: Awards Manager, WIA (VK1 Division), PO Box 46, Canberra 2600, Australian Capital Territory, Australia.

THE SOUTHERN CROSS AWARD

This award is granted to amateurs and SWLs who obtain the required number of points from working or hearing members of the Eastern and Mountain Districts Radio Club of Melbourne, Victoria. To qualify, Australian amateurs and SWLs require fifteen points, New Zealand amateurs and SWLs require ten points, and all other amateurs and SWLs require five points.

A point is awarded for each club member worked or heard. The club callsigns VK3ER and VK3BNW each count two points, but only three points can be claimed if both callsigns are included in any one application for the award.

The award will be issued for multiband and multimode or specific band or mode as requested at the time of application.

To obtain the award, a General Certificate Log and the award fee of $.50 Australian or three IRCs should be sent to: Awards Manager EMDRC, PO Box 87, Mitcham 3132, Victoria, Australia.

The General Certificate Log Rule means that any officer of a recognized amateur radio club or society, any two licensed amateurs, or any CHCer may certify a copy of the applicant's log. In this way, you do not have to submit your original log.

THE NAVAL POSTGRADUATE SCHOOL AMATEUR RADIO CLUB

The Naval Postgraduate School Amateur Radio Club in Monterey, California, will operate a special-event station K6LY during the 42nd Bing Crosby National Pro-Am Golf Championship. The station will be located near the eighteenth green at Pebble Beach. Operating hours will be 1800Z-2400Z daily, February 3-6, 1983. K6LY will operate on the lower part of the General class phone band on 15 & 40 meters. Stations contacting K6LY and wishing to receive a commemorative Crosby Pro-Am QSL card should send their QSL card to WB6ZSB, 831 Avalon Place, Monterey CA 93940. An SASE is not required.

NORTH OKANAGAN RADIO AMATEUR CLUB

We of the North Okanagan Radio Amateur Club are going to be having a special station set up during our winter carnival again this year. Our station will be operating during the week of February 4-13, 1983, from 2100Z to 2400Z, daily. The frequencies that we will be on are 28.575, 21.375, and 14.295, plus or minus QRM. The cost of our award is either $1.00 or an SASE sent to North Okanagan Radio Amateur Club, Box 1706, Vernon, British Columbia V1T 7T9, Canada. This award, called the Vernon Winter Carnival Award, is available year round by working our club station (VE7NOR) or 3 Vernon area stations. The Vernon area is defined as Vernon, Armstrong, Winfield, Oyama, Lumby, and Enderby.

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Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	7A	7	7	3A	3A	3A	7B	14	14	21A	21A
ARGENTINA	21	14	7B	7B	7B	7	14A	21A	21A	21A	21A	21A
AUSTRALIA	21A	14	7B	7B	7B	7B	7B	14B	14	14	21	21A
CANAL ZONE	14A	7A	7	7	7	7	14	21A	21A	21A	21A	21A
ENGLAND	7	7	7	3A	7	7	14A	21A	21A	21	14	7
HAWAII	21A	14	7B	7	7	7	7	14B	14	21A	21A	21A
INDIA	7B	7B	7B	7B	7B	7B	14	21	14	7B	7B	7B
JAPAN	21A	14	7B	7B	7B	7	7	7B	7B	7B	14	14A
MEXICO	21	7A	7	7	7	7	7	14A	21A	21A	21A	21A
PHILIPPINES	14A	14B	7B	7B	7B	7B	7B	7B	7B	7B	7B	14
PUERTO RICO	14A	7	7	7	7	7	14	21	21A	21A	21A	21
SOUTH AFRICA	14	7	7	7	7B	14	21	21A	21A	21A	21	21
U. S. S. R.	7	7	3A	3A	7	7B	14	21A	21	14B	7B	7
WEST COAST	21A	14	7	7	7	7	3A	14	21A	21A	21A	21A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7	7	3A	3A	3A	7	7	14	21A	21A
ARGENTINA	21A	14	7B	7B	7B	7	14	21A	21A	21A	21A	21A
AUSTRALIA	21A	21	14B	7B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7A	21	21A	21A	21A	21A
ENGLAND	7	7	7	3A	7	7	7	14A	21A	21	14	7
HAWAII	21A	21	14B	7	7	7	7	7	14	21A	21A	21A
INDIA	7B	14	7B	7B	7B	7B	7B	14B	14	7B	7B	7B
JAPAN	21A	14	7B	7B	7B	7	7	7	7B	7B	14	21
MEXICO	21	14	7	7	7	7	7	14	21	21A	21A	21A
PHILIPPINES	21A	14	7B	7B	7B	7B	7B	7B	7B	7B	7B	14
PUERTO RICO	14A	7A	7	7	7	7	14	21	21A	21A	21A	21
SOUTH AFRICA	14	7	7	7	7B	7B	14	21A	21A	21A	21	21
U. S. S. R.	7B	7	3A	3A	7	7B	7B	14A	21	14B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14A	7A	7	3A	3A	3A	7	7	14	21A	21A
ARGENTINA	21A	14A	7B	7B	7B	7	7B	14A	21A	21A	21A	21A
AUSTRALIA	21A	21A	14	14B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7	14A	21A	21A	21A	21A
ENGLAND	7B	7B	7	3A	7	7B	7B	14B	21A	21	14	7B
HAWAII	21A	21A	14	7A	7	7	7	7	14	21A	21A	21A
INDIA	7B	14A	14	7B	7B	7B	7B	7B	14B	7B	7B	7B
JAPAN	21A	21	14	7B	7B	7	7	7	7	7B	14	21A
MEXICO	21	14A	7	7	7	7	7	7	14A	21A	21A	21A
PHILIPPINES	21A	21A	14	7B	7B	7B	7B	7	7	7B	7B	14A
PUERTO RICO	14A	14	7	7	7	7	7	14	21A	21A	21A	21A
SOUTH AFRICA	14	7B	7	7B	7B	7B	7B	14	21A	21A	21	21
U. S. S. R.	7B	7B	3A	3A	3A	7B	7B	14B	14	14B	7B	7B
EAST COAST	21A	14	7	7	7	7	3A	14	21A	21A	21A	21A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

FEBRUARY

SUN	MON	TUE	WED	THU	FRI	SAT
		1 F/F	2 F/G	3 F/G	4 G/G	5 G/G
6 F/G	7 F/F	8 G/G	9 G/G	10 G/G	11 G/G	12 G/G
13 G/G	14 G/G	15 F/F*	16 P/F*	17 P/F	18 F/F	19 F/G
20 F/G	21 F/G	22 G/G	23 G/G	24 G/G	25 F/G	26 F/G
27 F/F	28 G/G					

March 1983 $2.49½
Issue #270

73®

Amateur Radio's Technical Journal

A Wayne Green Publication

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OSCAR Gear From Junk
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More Simple Circuits
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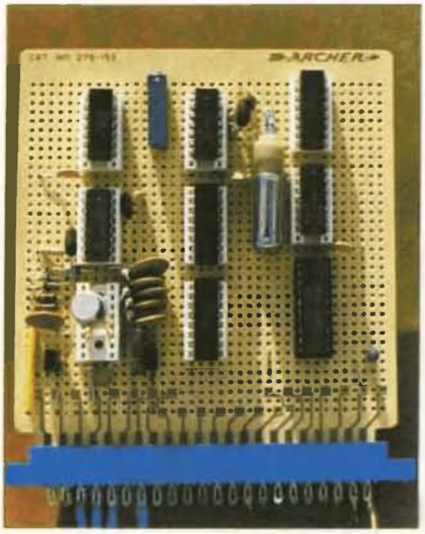

RTTY Tuning—10

Sarawak 9M8—42

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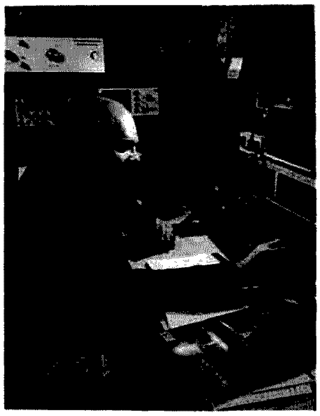
W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



THE CONNECTICUT CONTEST, CERTIFICATE, AND CHOWDERHEAD CLUB

There are three items on my agenda which may be of less than great importance to you. One has to do with some wondrous changes wrought by the International Amateur Radio Union, wherein, I was told by several of the assembled at the recent Bangkok hamfest, the ARRL was finally dumped out of the driver's seat. There was an unseemly amount of rejoicing among our supposed friends overseas.

While the League has graciously permitted foreign amateur radio societies to belong to this illustrious organization, HQ always insisted that they have complete control of it. Unrest has been brewing for quite a few years over this, with a growing number of malcontents fomenting revolution over the high-handed, low-action management by the League.

Oh, there goes that miserably crotchety old Wayne Green, griping about the League again... right? Well, you probably believe in the Tooth Fairy, too, so who am I to suggest you take off your smoked glasses and see what your bumbling voting record at ARRL elections has cost you. But, if you even have a shred of question about how our beloved League is perceived overseas, then for heaven's sake try to find your old rig up there in the attic and get on the air for a day or two...make some DX contacts ...and, after you've gone through all the usual drivel ...probably mercifully covered up by QRM...ask 'em what they think. You'll get an earful from a bunch of 'em.

At any rate, there was general rejoicing at Bangkok over the freeing of the slaves as news of the vote to move IARU headquarters from some almost totally unknown town in Connecticut to Geneva was spread. Who knows, perhaps the IARU will now be able to develop some clout!

Item two has to do with the recent director election wherein Mary Lewis eked out a win by less than ten votes...raising hell with the morale of the entrenched chauvinists at HQ. They'd said for years that, dammit, this was a man's hobby and they didn't need any women on the board of directors. One ex-president of the outfit said that hell would freeze over before they'd let a woman get on the board. I wondered about that, so while in Bangkok I made a visit to Hell (a well-known Bangkok restaurant) and found that it had not, in fact, frozen over. Well, so much for ex-presidential predictions. No wonder they dumped him.

Then there was the defeat of poor Don Miller out in Indiana. Don has had a rough time of it. First the HQ gang did all they could to keep him from being elected the first time. Then they trumped up a bunch of baloney and scared him into resigning, threatening to put on the pressure to get him fired from his job. Knowing that HQ had been able to get Mary's job, he panicked. With Dannals and Baldwin out of the driver's seat at HQ, Don apparently thought he might be able to make it back into the director's chair again. Well, one thing no one at HQ wants to have to live with is a director who starts asking questions and shows any initiative at really directing. They have their short yearly meeting, vote on everything unanimously, and go home. Do not rock the boat, please. Remember that we here at ARRL are all one happy family and that Wayne Green is a kook. Close, but no cigar...actually I'm a cook...love to cook.

So Metzger is your Midwest Director and those who voted for this chap are welcome to him. Some of the other directors like him, others sneer and call him a toadying turkey. That sort of talk is ill-becoming of directors, even if it might be true. I try to look at the bright side...the more all this politics screws up the League, the more interesting things I can write about.

Since most of the older timers at the League have bailed out, the attitude has improved a bit. The old-timers' perception of the membership was as a bunch of nitwits who could easily be led into anything they wanted. Unfortunately, there was more truth in this perception at times than was comfortable. For every thinking ARRL member, there was a counterbalancing group of blind followers, eager to buy whatever the latest party line demanded.

The laughter was uncontrolled at HQ when they came out with incentive licensing. This was their plan to disenfranchise 85% of the hams from the phone bands, returning us to the pre-WWII licensing system of two classes, one with phone bands and the other without. Would you believe that almost 50% of the ARRL members bought the idea ...mostly on the basis of the nice name they'd given it. Who could be against *incentive* licensing? Only those who bothered to read the fine print, which turned out to be a minority. And a lot of those opposing it were fighting it because they didn't want to have to go down and retake the test all over again rather than because the whole idea was ridiculous.

The few firms still left in the amateur radio industry are waiting to see some positive moves by the new management of the League. There's not much left of the industry any more. 95% of the manufacturers are long gone...and 95% of the dealers are gone. We used to

QSL OF THE MONTH

This month's winning QSL is from Lutz Hannig DL9GI of Berlin, West Germany. Lutz's unique design depicts a confused-looking Red Baron flying into the center of a multi-colored radio wave. The card cleverly focuses your attention to the center by moving from the black background to the bright yellow and red of the middle. The rapid shift in hue lends depth to the scene, making it appear as if the aviator were flying into the maw of some great creature. Lutz's callsign, emblazoned in white at the bottom, ensures that the viewer knows where this card is from.

If you would like to enter our QSL card contest, put your QSL in an envelope with your choice of a book from *73*'s Radio Bookshop and send it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries which do not use an envelope or do not specify a book will not be considered.

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have nearly a thousand ham dealers around the country selling *73* over their counters! Now there's a few score. You know this when you look around for some place to go to see a new rig. A few years ago, ham stores were almost everywhere... today they aren't. There's just one or two left in all of New England, for example.

THE CODE

Which really brings us to a discussion of the Morse code. Just what you really wanted, eh? Yes, I know the League is dedicated to preserving the code. And, believe me, I have heard all the old saws about the code being the only thing protecting us from the hordes of CBers and keeping the ham bands from being like the CB bands. What a crock of...er...stuff. Frankly, I'm not at all convinced that if we set up booths on the street and gave away ham tickets to any passerby, we could attract anyone to our hobby.

There is now a rising call for getting older people into amateur radio, our having failed to interest kids any longer. Just what we need. Sure, the hobby is great for oldsters. It would keep them from getting lonely. It would give them something to do in their twilight years...kerchunking repeaters and jamming nets. Why save all that fun for just the Extra-class hams, eh? Of course, we aren't going to provide our country with much in the way of technicians, engineers, and scientists this way...or electronic fodder for our war machine, should we decide to save the world for capitalism again. But we would be able to sell some rigs, thereby enriching the lives of the Japanese manufacturers. I say let's get at it. Let's get into the old folks homes and set up club stations...give licensing classes ...and call in Bash so faltering memories won't even have to learn any theory.

Word from the underground has reached me that the outfit selling the FCC Morse-code exams at Dayton was run by none other than a very well-known California ham. We really have to see that those tapes get better distribution so that old people, who have more trouble than kids with the code, are not discriminated against. Why should we penalize old people just because they can't learn the code?

As a matter of fact, if we are going to go along with the modern morality, we should set up a system whereby anyone who has shown proof that he has seriously tried to learn the code, yet failed, would get a license. In today's world, it is not the answer to the question

Continued on page 101

Well...I Can Dream, Can't I? by Bandel Linn K4PP

"It's the FCC! They're not just renewing your license—they're also giving you a Caribbean cruise!"

John Langner WB2OSZ
115 Stedman Street
Chelmsford MA 01824

RTTY Tuning: The New Solution

This simple tuning indicator whipped the competition and took first place in 73's Home-Brew II Contest.

What is your favorite method to tune in a radioteletype (RTTY) signal quickly and accurately on an SSB receiver? A dual ellipse on an oscilloscope? Light-emitting diodes (LEDs) activated by mark and space filters? A signal-strength meter? By ear? Here is a new one that might make you change your mind.

Background/The Problem

When Teletype® signals are sent through audio channels, they are usually conveyed by switching between two tones with a different timing pattern for each of the characters. During periods when no characters are being sent, a steady tone, called the "mark" tone, is present. The other tone is called the "space" tone. A device called a "terminal unit" (TU) extracts these two particular tones from any background noise and produces a digital signal suitable for a printer or computer.

If this audio signal is coming across a telephone line or an FM radio link, the frequencies of the tones at the receiving end will be the same as at the origin. However, there can be a problem when using an SSB receiver, because a slight mistuning will change the frequencies of the tones heard and the terminal unit will not work. Over the years, various methods have been devised to indicate when the proper tones are detected. Here is a new one.

A New Solution

As shown in Photo A, the circuit displays its output with a row of 20 LEDs. Each one will light up when the strongest audio frequency present is within its particular range. The two with the pointers over them correspond to the mark and space tones. A constant mark signal is tuned properly when the LED under the left marker is lit. When characters are being received, the LEDs under both markers will be lit. If the tones are low in frequency, LEDs to the left of these positions will be lit. Higher frequencies activate LEDs farther to the right. It's as easy as tuning an FM broadcast receiver with a tuning meter!

Theory of Operation

The simplified block diagram in Fig. 1 illustrates the basic principle involved. Each time the input signal completes a cycle, the current content of the counter is captured in the latch. After a brief delay, the counter is reset and resumes counting for another cycle of the input signal. Meanwhile, a decoder is looking at the output of the latch and selects one of the LEDs based upon it.

For example, let's suppose we had a clock of 200 kHz and an input signal of 2 kHz. During each cycle of the input signal there would be 100 clock pulses, so the counter would contain 100 when the latch grabs the counter's output. If there was an LED corresponding to a count of 100, the decoder would cause it to light up until a different count was obtained from the counter. A higher frequency input would result in a shorter period, a smaller count, and a different LED.

Keeping this simplified model in mind, let's look at the actual circuit (Figs. 2 and

Photo by Mark Hood

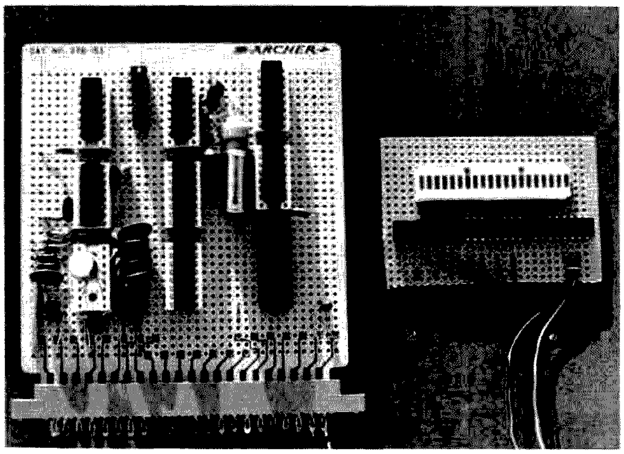


Photo A. Appearance of the display for a correctly tuned signal.

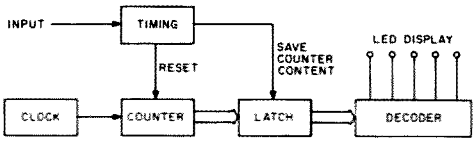


Fig. 1. Simplified block diagram.

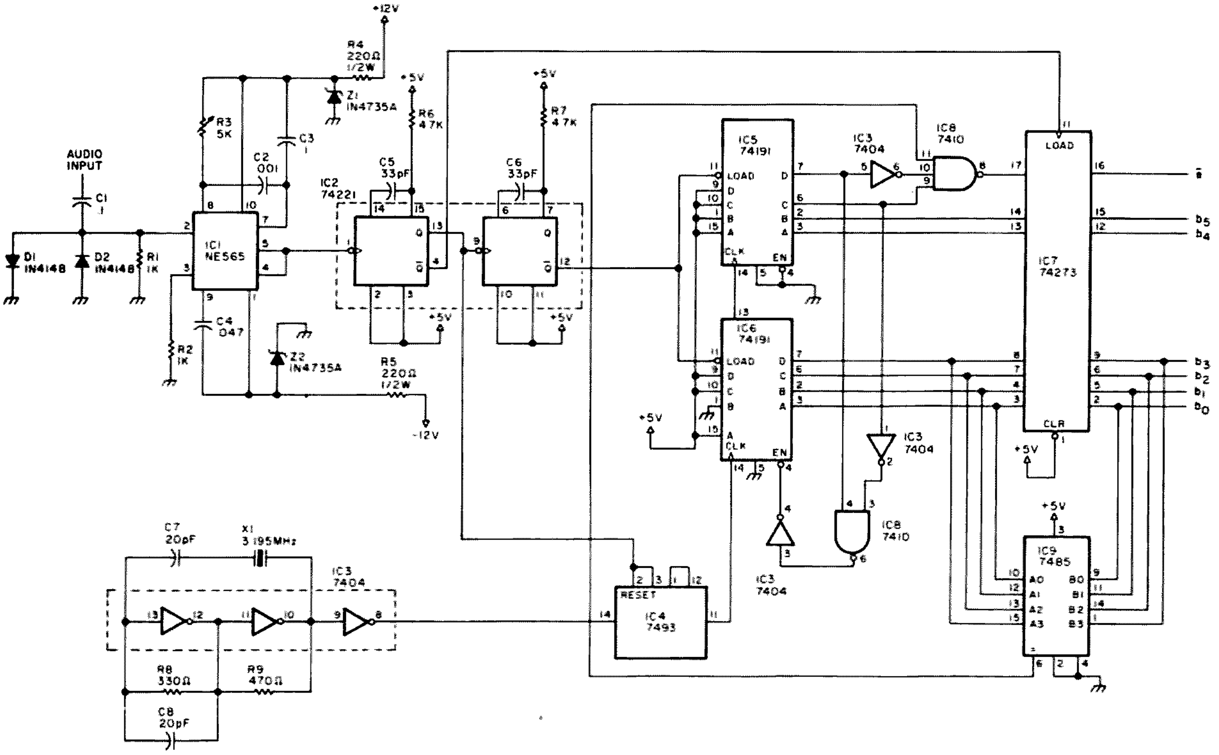


Fig. 2. Main circuit for tuning indicator.

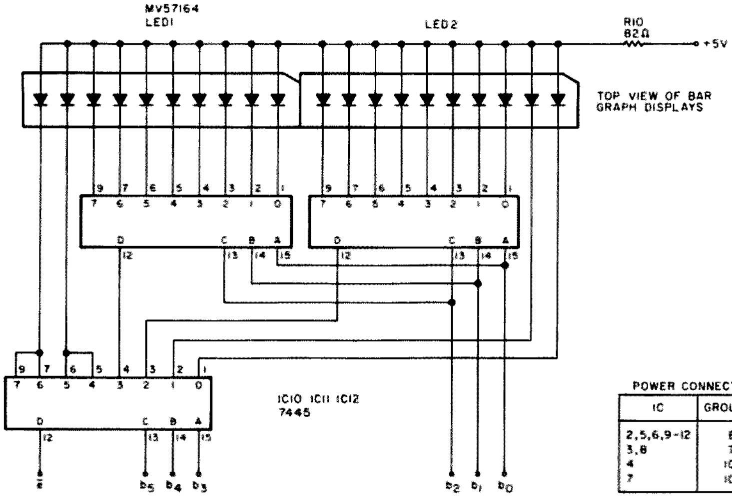
3) and see how it differs. Starting from the audio input on the left, the first thing you will notice is the 565 phase-locked loop. I initially tried some experiments with bandpass filters and a Schmidt trigger. This worked great with a nice clean waveform from a signal generator, but was pretty useless with a noisy signal from a sideband receiver. The phase-locked loop does a good job of following a signal through the noise and providing a nice clean square wave of the same frequency for later logic circuits. The two diodes before it provide protection against large signals that could damage the IC.

Next we have a couple of one-shots (IC2) to generate timing pulses at the end of each cycle. Four separate steps are involved: (1) Stop the clock so the count isn't changing during latching. (2) Capture the contents of the counter in the latch. (3) Reset the counter. (4) Restart the clock.

When the counter is reset, it is set to −3 rather than zero as you would probably expect. (See pins 9, 10, 1, and 15 of the counters.) This is to make the mark and space tones fall in the middle of the frequency ranges for the corresponding LEDs.

When the most significant bit of the count (IC5, pin 7) is 0 and the next bit (pin 6) is 1, the count is in the range of 64–127. This is the region where the display is enabled. If the counter content reaches 128, IC6 is disabled through pin 4 and counting stops. This prevents overflowing and a false display for a very low frequency input.

Under the latch (IC7), you will notice a 7485 magnitude comparator. Each time the latch is clocked, it compares the counts for the current and preceding cycles. When the low-order four bits are the same, the display is enabled for the next cycle. This blanks the display during changes, resulting in a much cleaner appearance and dimming with only noise present. High-order bits could also be compared with another chip but I doubt it would have much effect because counts for consecutive cycles differing by a multiple of 16 are probably quite rare.



POWER CONNECTIONS

IC	GROUND	+5V
2,5,6,9-12	8	16
3,8	7	14
4	10	5
7	10	20

Fig. 3. Display portion of tuning indicator.

```
10 REM-- RTTY TUNING INDICATOR DESIGN PROGRAM.
20 REM--
30 REM-- WB2OSZ, APRIL 1982
40 REM--
50 REM-- M9 AND S9 ARE DESIRED COUNTS FOR MARK & SPACE LEDS.
60 REM--
70 M9=91
80 S9=84
90 REM--
100 PRINT "WHAT IS MARK (LOWER) FREQUENCY";
110 INPUT M
120 PRINT "WHAT IS SPACE (HIGHER) FREQUENCY";
130 INPUT S
140 IF M>=S THEN PRINT "MARK MUST BE LOWER FREQUENCY." \ STOP
150 REM--
160 REM-- CALCULATE COUNTER PRESET VALUE.
170 REM--
180 P=INT((M9*M-S9*S)/(M-S)+.5)
190 IF ABS(P)>63 THEN PRINT "INVALID PRESET COUNT." \ STOP
200 REM--
210 REM-- CALCULATE THE CRYSTAL FREQUENCY.
220 REM--
230 X=((M9-P)*M+(S9-P)*S)*8
240 REM--
250 REM-- PRINT CALCULATED VALUES FOR CIRCUIT AND
260 REM-- PRODUCE CHART OF FREQUENCY RANGES FOR EACH LED.
270 REM--
280 PRINT "WHERE WOULD YOU LIKE THE OUTPUT (TERMINAL IS
 DEFAULT)";
290 INPUT O$
300 IF O$="" THEN O$="TT:"
310 OPEN O$ FOR OUTPUT AS FILE #1
320 PRINT #1,"MARK FREQUENCY =";N;"HZ, SPACE FREQUENCY =";S;"HZ"
330 PRINT #1
340 REM--
350 PRINT #1
360 PRINT #1,"COUNTER PRESET = ";P;" (BINARY ";
370 N=128
380 P2=P
390 IF P2<0 THEN P2=P2+256
400 IF P2<N THEN 440
410 PRINT #1,"1";
420 P2=P2-N
430 GO TO 450
440 PRINT #1,"0";
450 N=N/2
460 IF N>=1 THEN 400
470 PRINT #1,")"
480 PRINT #1,"CRYSTAL FREQUENCY =";X/1.00000E+06;"MHZ"
490 PRINT #1
500 PRINT #1
510 PRINT #1
530 B=127.5 \ GOSUB 620 \ GOSUB 680
540 B=111.5 \ GOSUB 620 \ GOSUB 680
550 FOR B=95.5 TO 79.5 STEP -1
560 GOSUB 620 \ GOSUB 680
570 NEXT B
580 B=71.5 \ GOSUB 620 \ GOSUB 680
590 B=63.5 \ GOSUB 620
600 CLOSE #1
610 STOP
620 REM--
630 REM-- PRINT AUDIO FREQUENCY BOUNDARY.
640 REM--
650 F=INT(X/16/(B-P)+.5)
660 PRINT #1,,,"---";F
670 RETURN
680 REM--
690 REM-- PRINT '##' REPESENTING A LED.
700 REM-- APPEND 'M' OR 'S' FOR MARK AND SPACE TONES.
710 REM--
720 C$="##"
730 IF B-.5=M9 THEN C$=C$+" M"
740 IF B-.5=S9 THEN C$=C$+" S"
750 PRINT #1,,C$
760 RETURN
```

Fig. 4. Basic program to compute crystal frequency and counter preset for given mark and space tones.

Construction and Adjustment

As shown in Photo A, the LED displays and three decoder chips are mounted on a small piece of perfboard which can be installed on the front panel of a terminal unit. The rest of the prototype was constructed with wire wrapping for ease of modification during development. You can reduce the cost by using solder-tail sockets with point-to-point wiring or making a PC board.

With no input applied to the circuit, adjust R3 so that the LED just to the left of the center line is lit.

Power requirements are + and −12 volts at about 25 milliamps and 5 volts at about 350 milliamps.

Modifications

The crystal frequency and counter preset value shown in the schematic are for the standard RTTY tones of 2125 and 2295 but can easily be changed for a different pair of tones in the same neighborhood. The Basic program in Fig. 4 computes these values from

Parts List

Semiconductors

IC1	NE565		$ 1.00
IC2	74221		1.25
IC3	7404		.22
IC4	7493		.52
IC5, 6	74191	2×	.85
IC7	74273		1.25
IC8	7410		.19
IC9	7485		.65
IC10-12	7445	3×	.69
D1, 2	1N4148 or 1N914 diode	2×	.20
Z1, 2	1N4735A 6.2-V, 1-Watt zener	2×	.30
LED1, 2	MV57164 10-segment bar-graph display (Radio Shack part number 276-081)	2×	3.79

Resistors (¼-Watt unless noted)

R1, 2	1k	2×	.07
R3	5k 15-turn trimmer		1.25
R4, 5	220-Ohm, ½-Watt	2×	.07
R6, 7	4.7k	2×	.07
R8	330-Ohm		.07
R9	470-Ohm		.07
R10	82-Ohm		.07

Capacitors

C1, 3	.1-uF, disc ceramic	2×	.15
C2	.001-uF, disc ceramic		.10
C4	.047-uF, mylar™		.15
C5, 6	33-pF, mica	2×	.26
C7, 8	20-pF, mica	2×	.26
—	.01-uF, disc ceramic (to bypass +5 volts to ground)	5×	.10

Other

X1	3.195-MHz crystal, FT-243 holder, .01% tolerance, 32-pF load capacity (available from Jan Crystals)		3.00
	solder-tail IC sockets, 14-pin	7×	.14
	16-pin	4×	.16
	20-pin		.29
	perfboard		1.59
	total about		$28.00

Obtaining Parts

The only unusual components in this device are the 10-segment LED bar-graph displays. As indicated in the parts list, these are available at your local Radio Shack store. If there is not a Radio Shack in your part of the world, use 20 separate LEDs instead.

I happened to use a crystal in an HC6/U holder. If you don't mind the size and appearance of an FT-243 holder (like Novices used in the old days) you can save a couple of bucks by getting a crystal with only .01% tolerance which is still more than adequate.

Everything else is quite ordinary and available from various dealers who advertise in the back of *73*. The circuit is not at all critical and minor substitutions should not affect performance.

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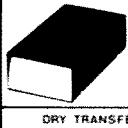
CABINETS



STOCK #	W	D	H	PRICE
01-5004	4.0	2.5	2.0	5.55
01-5008	4.0	5.0	2.0	6.25
01-5012	4.0	6.0	3.0	7.99
01-5016	6.0	2.5	2.0	5.95
01-5020	5.0	7.5	2.5	8.79
01-5024	4.0	3.5	4.0	6.75
01-5028	8.0	3.5	2.5	7.65
01-5032	5.0	6.0	4.0	8.99
01-5036	4.0	3.0	6.0	7.47
01-5040	10.0	5.0	3.5	10.45
01-5044	5.0	5.0	3.5	11.45

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the tone frequencies and prints a chart (Fig. 5) indicating the frequency range for each LED.

```
Mark frequency = 2125 Hz,
Space frequency = 2295 Hz,
Counter preset = -3 (binary
11111101), Crystal frequency =
3.19532 MHz

            -1530
##          -1744
##          -2027
##          -2048
##          -2070
##          -2091
##          -2113
## M        -2136
##          -2159
##          -2183
##          -2207
##          -2231
##          -2257
##          -2282
## S        -2309
##          -2336
##          -2363
##          -2392
##          -2421
##          -2681
##          -3003
```

Fig. 5. Output of program in Fig. 4 for standard tones of 2125 and 2295.

Use and Conclusion

The circuit requires a minimum of 10 millivolts peak-to-peak for good tracking of the input signal. Acceptable results can be obtained by connecting the tuning indicator directly to the receiver's speaker, but a cleaner signal will produce a more pleasant display. If your terminal unit has a bandpass filter, connect this circuit after the filter, but before the limiter. If you don't have a bandpass filter, I suggest that you build one (see *73*, September, 1977, page 38) or buy one such as the Flesher PS-170. It's simple, inexpensive, and makes a big difference when trying to copy RTTY under noisy conditions.

For a couple decades, most people agreed that a dual ellipse pattern on a CRT was the best way to see when a RTTY signal was tuned in properly. Try this circuit and you might not be one of them anymore. ■

Uncover Equipment for OSCAR Phase III

Lurking in flea markets and junk boxes is everything you need to work OSCAR. K6KLY tells you what to look for and how to make it work.

R. Bentson K6KLY
3432 Lodge Drive
Belmont CA 94002

This article is for the amateur who wants to get on OSCAR Phase III inexpensively. This can be done by converting a surplus GE UHF transmitter strip to a 435-MHz SSB mixer.

With the upcoming launch of OSCAR Phase III, I was looking for a way to get on the 435-MHz input inexpensively when I found some old GE Progress-line UHF transmitter strips at a ham flea market. I asked a friend who had a GE data file to send me a copy of the schematic, which he did.

After reviewing all the material he sent me, I found that I had a 450-to-470-MHz transmitter, model 4ET24A2. It could be modified to be a mixer for 435 MHz, but it would be upconverting in frequency with the local oscillator frequency on the high side of the wanted output-signal frequency. Thus, the sideband signal would be inverted and when I wanted to change frequency in an upward direction on 435 MHz, I would have to go down in frequency with the 28-MHz exciter.

This was too confusing to try to handle while tracking a satellite, so I looked further and found in the data my friend sent me a schematic on a unit, model 4ET24A1 or A11, which covered 406 to 420 MHz. This was perfect. When you want 435 out and you are putting 28 MHz into a mixer, you need a 407-MHz local oscillator to make the mixer work correctly. This 4ET24A1 was in the right frequency range. I started looking around at the swap meets and asking my friends who were into old FM equipment to keep an eye out for this model for me. I found out later that GE did not make too many of these A1-type strips as compared with the A2-type strips. I finally found a 4ET24A1 strip at an FM-equipment auction and paid $20 for it, complete with all the tubes.

After cleaning the dirt off the unit and making sure it had not been modified or robbed for parts, I started the conversion. My first task was to order a crystal from the ICM crystal company in

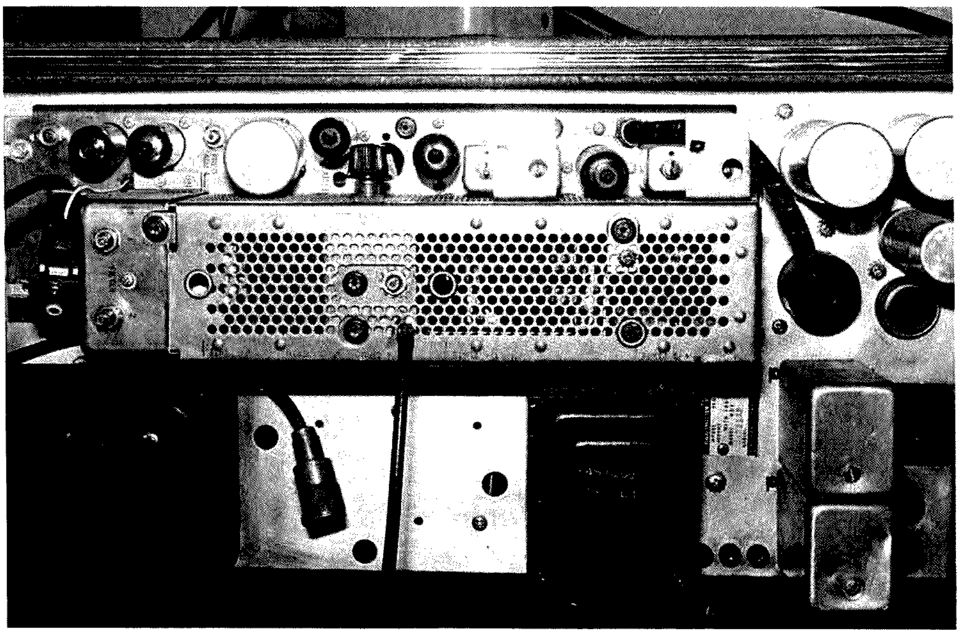

Photo A. Overall view. Notice orientation of the crystal oven.

Oklahoma City. Since we need a 407-MHz local oscillator and the transmitter strip has a multiplier of 36, the crystal frequency needed is 11.3055 MHz. When ordering the crystal, tell ICM that the crystal is for a GE model 4ET24A1. If your strip has a crystal oven or if you can get a GE crystal oven, tell ICM that the crystal will be used in a GE oven.

Modification

The modification of the transmitter strip is very easy. First, remove the cover over the three large tubes in the caged-in area. This is done by removing one screw next to the MULT-4 test point (see Photo A). Next, pull off the cover, starting with the end over the 2E26. The far end of the cover fits under a notch in the output filter. Then, find C171, the PA grid-tuning capacitor of the last tube, a 6907. Drill a 3/16" hole in the plate that C171 is mounted on, halfway between C171 and the edge of the plate closest to the red test point, PA CATH (see Photo A). Next, using a small pair of wire cutters, cut off the capacitor and wire going to pin 4 of the 6907 tube. Pin 4 is right under C171.

Prepare a three-foot length of RG-58-type coax by stripping off 2 inches of the outside rubber jacket, followed by one and one half inches of the coax braid. Next, remove ¼ inch of the inner insulation from one end of the coax. Prepare the other end of the coax to accept a PL-259 coax fitting with the adapter ring for the RG-58 coax. Push the center conductor of the coax through the 3/16" hole in the plate and then wrap and solder the center conductor to pin 4 of the 6907 tube under C171. Push the coax braid down around the 3/16" hole and solder the braid to the plate.

Find the cover and, using a reamer or a set of drill bits, enlarge the vent hole in the cover that is closest to being right over where the 3/16-inch hole is in the plate when the cover is replaced. Enlarge this hole to about ¼ inch, which is big enough to allow the coax to pass through it. Feed the coax through the hole and replace the cover on the cage.

Solder a PL-259 with the adapter to the end of the coax cable you prepared earlier. Find a 28-MHz rf choke coil such as a Miller RFC28 or Ohmite Z28. Solder this rf choke inside another PL-259 coax fitting. One end of the rf choke goes to the center pin of the PL-259 and the other end goes to the outside rear edge of the PL-259. Using a UHF coax T-fitting, connect the new cable from the mixer unit and the coax fitting with the rf choke inside it to the T-fitting. Later, the coax from the 28-MHz exciter will connect here also.

Caution: The rf choke must be connected or damage could result to your exciter. Check the rf choke with a VOM to be sure it is good, after soldering to the PL-259.

Locate the socket the crystal oven plugs into and cut off the ground wires going to pin 5. If there are any other wires going to pin 5, cut them off pin 5 also and solder them to ground points. Next, remove V108, a 12AU7/6680 tube. It will not be used. If any other tubes are missing, replace them per the following list:

V101	6BH6/6661
V102	6U8
V103	6CL6
V104	2E26
V105, 106	6907/6252
V107	12AU7/6680

Install the crystal in the GE oven between pins 4 and 8; then plug the GE oven into the 8-pin socket on the mixer. If an oven is not used, plug the crystal into pins 4 and 6 on the 8-pin socket.

Power Supply

Power supply connections are as follows:

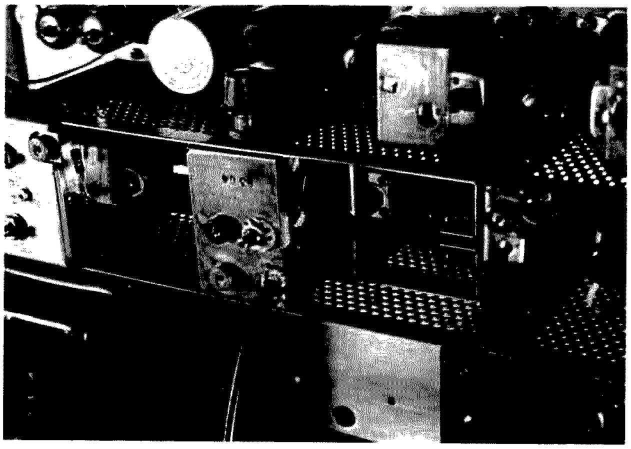

Photo B. The coax from the 28-MHz exciter is soldered to pin 4 of the last 6907 tube right under the variable capacitor, C171.

- Pins 1 and 2 are not used. Audio input for FM.
- Pin 3 to ground. Oscillator-select channel 1 on A11 model.
- Pin 4 is not used. Oscillator-select channel 2 on A11 model.
- Pin 5 to +6 volts dc keyed on transmit, if antenna relay is used.
- Pin 6 to 6 volts ac or dc filament supply (not used if 12-volt filament supply is used).
- Pin 7 to ground (filament-return lead for 6-volt filament). (To 12 volts ac or dc if 12-volt filament supply is used.)
- Pin 8 bias supply, −22 volts dc, adjustable.
- Pin 9 B+ final, 450 volts dc, keyed on transmit.
- Pin 10 B+ multiplier, 300 volts dc, keyed on transmit.
- Pin 11 B+ oscillator, 200 volts dc.

This transmitter strip is normally used with a GE model 4EP4A power supply. This is the same supply that is used on GE Progress-line repeater stations. Since many older 2-meter and 440-MHz repeaters are going to solid-state equipment, some of these power supplies are showing up at auctions and flea markets now. The 4EP4A power supply is selling for about $30 to $40 in working condition. See the photos of the completed mixer mounted on the power supply to help you recognize the power supply at the flea markets.

When using the 4EP4A power supply, the bias-supply section will need to be modified to a voltage-multiplier-type power supply in order to get the required −22-volts-dc bias. See the *ARRL Handbook* under power supplies for circuits. This requires only the addition of two capacitors and two diodes.

Here are the terminal-strip connections on the 4EP4A power supply:

- Terminals 1, 2, and 4: not used. Audio lines.
- Terminal 3: key to ground on transmit PTT line.
- Terminal 5: 250 volts dc "caution."
- Terminal 6: to ground channel A select on model A11.
- Terminal 7: ground.
- Terminal 8: 6.3 ac filament line.
- Terminal 9: one side of 110-V-ac input.
- Terminals 10 and 11: other side of 110-V-ac input.
- Terminal 12: not used. Channel B select on model A11.
- Terminal 13: not used. Transmit light line.
- Terminal 14: not used. Rec mute line.
- Terminals 15 and 16: not used. Spares.

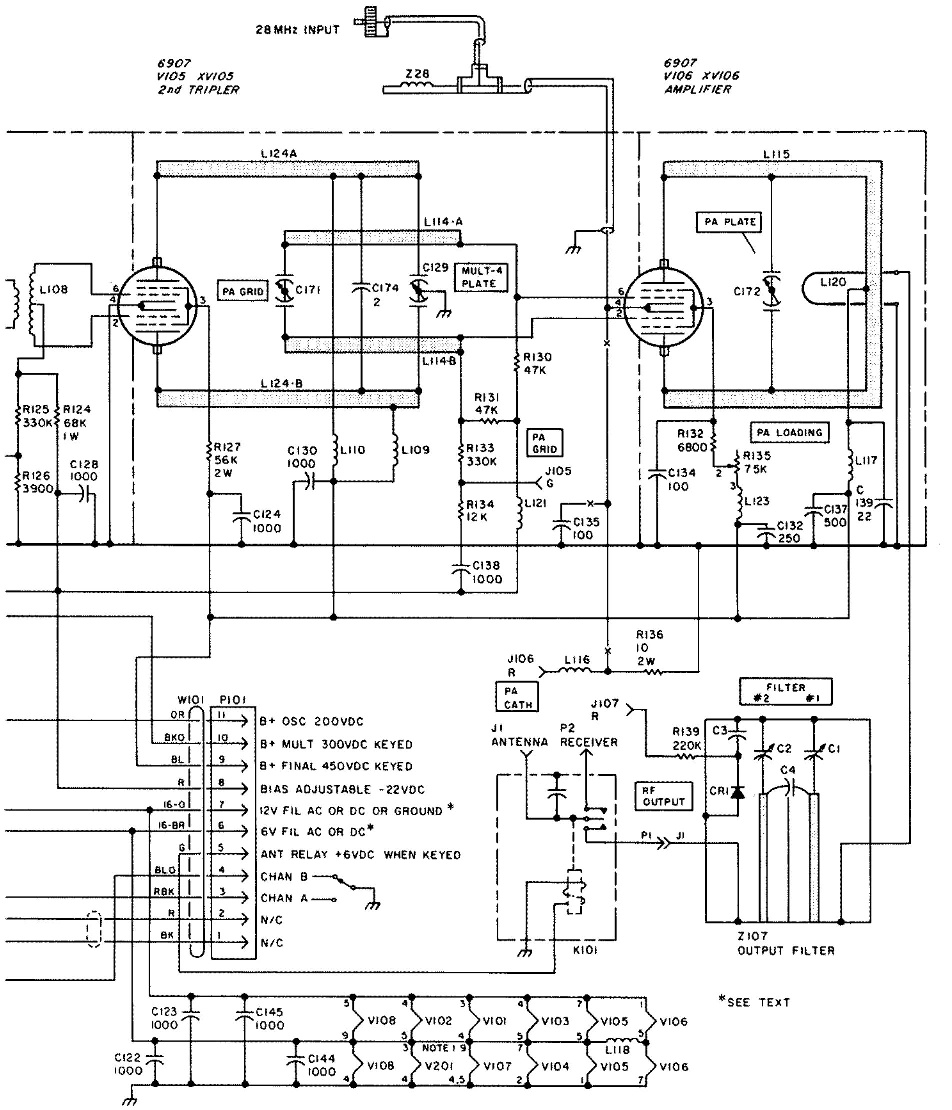

Fig. 1. Schematic.

If you have a model A1 unit and want to modify it to be an A11-type unit so you can switch between 432 and 435 MHz at the flip of a switch, send me an SASE for a schematic.

Install a 10-Ohm, 2-Watt resistor in another PL-259. This will replace the PL-259 with the rf choke for the bias setting in the alignment procedure only.

Alignment

Replace the PL-259 with the rf choke in it with the PL-259 with the 10-Ohm resistor in it on the T-fitting. Connect a voltmeter (2.5-volt scale) to where the exciter should connect on the T-fitting. Turn on the power supply and, after a few minutes warm-up, turn on the B+ voltages. Adjust the bias supply until you just start to get a reading on the voltmeter. This indicates that the mixer tube is just starting to draw cathode current. Remove the B+ voltages and replace the PL-259 with the rf choke in it. Do not connect the exciter yet. Turn the variable resistor on the side of the cage to fully counterclockwise.

Caution: Do not key the transmitter for more than 30 seconds at a time during the entire alignment procedure.

Connect the negative lead of the voltmeter to the MULT-1 test point and the positive lead to ground. Key the B+ voltage and you should see a reading of about 1 volt. This shows the oscillator is working. Move the negative lead to the MULT-2 test point and adjust the two transformers between the 6U8 and 6CL6 tubes for maximum voltage on the voltmeter (approximately .75 volts).

Move the negative lead to the MULT-3 test point and adjust the two transformers between the 6CL6 tube and the end of the transmitter strip for the maximum voltage (approximately 1.5 volts). Move the negative lead to the MULT-4 test point on the top of the cage next to the 2E26 tube. Using a nonconductive screwdriver, adjust C126, the 2E26 plate-tuning capacitor, for maximum voltage on the meter (approximately 2 volts).

Move the negative lead to the test point marked PA GRID. This is near where the new coax cable is coming out of the cage and the test point is green in color. Using a nonconductive screwdriver, adjust C129, the plate-tuning capacitor of the first 6907 tube, for maximum voltage by putting the screwdriver through the hole in the cage cover and down about an inch to engage the plate-tuning capacitor. This is a very sensitive adjustment. With the negative lead in the same place, adjust C171, the grid-tuning capacitor of the mixer tube, for maximum voltage on the meter. C171 is the capacitor right next to where the new coax cable comes out of the cage cover. You should repeak C129 again.

Connect a load to the output of the transmitter and connect the exciter to the coax T-fitting. You may want to connect a good UHF wattmeter between the transmitter and the load. I suggest a Bird wattmeter with a 25-Watt 200-500-MHz element. Connect the voltmeter with the negative lead going to ground and the positive lead going to the test point marked RF at the end of the cage area. Remember, do not key the transmitter for more than 30 seconds at a time in CW mode or you could burn out R132, a 6.8k ½-W resistor connected to the screen pin of the mixer tube.

Apply about 10 Watts of 28-MHz energy from your exciter and turn the B+ voltages on. Tune C172, the mixer-tube plate-tuning capacitor, for maximum voltage on the meter. Be sure you use a nonconductive screwdriver and place it down through

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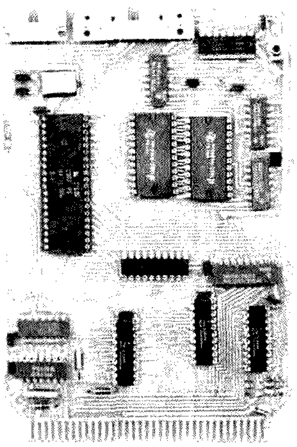

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the hole in the cover of the cage to engage with C172. This is a very sensitive adjustment. Adjust the two controls on the output filter at the end of the cage area, by the antenna relay, for maximum voltage on the voltmeter or maximum output on the wattmeter. Go back and readjust C172 again for maximum output. I suggest that you take the output power right from the filter output connector without going through the antenna relay. You should go back and adjust C171 (PA GRID) again for maximum output.

Turn R135, the variable resistor on the side of the cage, fully clockwise again. Increase the 28-MHz input power up to 20 to 25 Watts and you should get between 8 and 12 Watts out of the mixer at 435 MHz. This completes the alignment procedure.

Operation

You may connect the mixer directly to the antenna or run the output of the mixer into an amplifier. I have used this mixer on 432 MHz with a 4CX250B amplifier to win many ARRL VHF contests in the Pacific Division. I have also used its predecessor, the A2 version of the transmitter strip, to make over 500 contacts on OSCAR 7, mode B.

As you can see, this is an inexpensive way to get a 435-MHz SSB signal on the air to input OSCAR Phase III. If you would like to use this same unit on 432 SSB, substitute a crystal with a frequency of 11.2222 MHz and follow the same alignment procedure as before. I hope this article will help many more stations get on OSCAR that would not have because of the high cost of new equipment. ■

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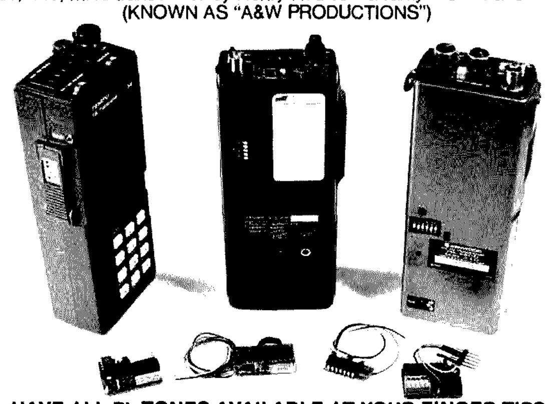

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Up and Coming: Direct-Broadcast Satellites

Part II looks at the technical problems with communications at 12 GHz, which may be offset by the advantages.

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Oxford OH 45056

Hams love a challenge. Why else would they erect 200-foot towers, endure cold mountaintops, or spend hours designing and building the ultimate receiver? The current generation of satellite television was a natural attraction for hams. Dedicated to doing more with less, electronics hobbyists took on the TVRO challenge and ended up creating a new home-entertainment industry.

Will the 1980s version of spacecasting, Direct-Broadcast Satellites (DBS), offer the same kind of opportunity that beckoned TVRO pioneers like W5KHT, W6HD, K4AWB, and N6TX? The first part of this article, in last month's *73*, concluded that DBS holds a different kind of promise. The presence of large, technically-advanced companies is likely to discourage garage-style entrepreneurs. But what about the basement tinkerer? For him, DBS could be a challenge par excellence.

This is not a "how to" article. With DBS service planned to begin in the mid to late 1980s, it would be premature to start manufacturing circuit boards. But if you have already mastered the reception of present-day 4-GHz satellite signals, then consider taking on the challenge of receiving 12-GHz signals from one of the "communications" satellites already in orbit or soon to be launched. Though no hobbyist has publicly announced such an accomplishment, an examination of the technical parameters will show that it is doable.

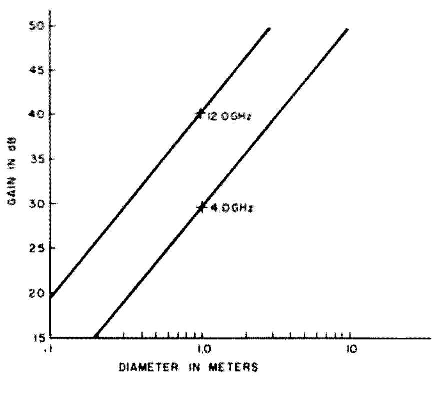

Fig. 1. The gain of a dish antenna depends on the frequency of operation and its efficiency. A one-meter dish has 10 dB more gain at 12 GHz than it has at 4 GHz, provided efficiency remains the same.

Why 12 GHz?

The choice of 12 GHz for DBS is not as baffling as it may first appear. Perhaps the most important reason behind 12 GHz is the need for small, inexpensive receive antennas. Fig. 1 shows that a dish, one meter in diameter, has roughly 30 dB of gain at 4 GHz, making it far too small for catching satellite TV signals on that band. The same dish has about 40 dB of gain at 12 GHz. A dish antenna's gain at a particular frequency is proportional to the reciprocal of the wavelength squared, hence the increase of 10 dB.

A second argument for 12 GHz centers on the ability to use larger bandwidths. DBS proponents have suggested using signals with bandwidths as wide as 400 MHz. The tenfold increase over 4-GHz signal bandwidths holds some exciting possibilities. We might be treated to high resolution video and have our choice of several different audio channels!

The technical attractions of the 12-GHz Ku-band are accompanied by some substantial drawbacks. While much of the theory that works at 4 GHz holds true at 12 GHz, actual Ku-band components require another magnitude of precision. Consider that a Ku-band signal has a freespace wavelength that is less than one inch long. At these frequencies, hardline gives way to waveguide and suitable microwave transistors, when available, cost in the hundreds rather than the tens of dollars.

The Satellites

DBS planners have laid the groundwork for a multi-satellite network. Depending on the proposal, there will be either three or four geosynchronous spacecraft, each one beaming to a separate region of the US. The multi-satellite approach offers two advantages over

the current system of using a single satellite to blanket the country.

First, by concentrating the satellite's signal on a smaller area, the cost and complexity of receivers can be lessened. When the antenna-size limitation, receiver-noise performance, and the substantial path loss (approximately 205 dB) are weighed against the need for snow-free pictures, it becomes clear that the new satellites must have an effective radiated power far greater than the 30- to 35-dBW signals emanating from the 4-GHz satellite-TV birds. Ku-band DBS signals will probably exceed 50 dBW and may even approach 65 dBW. A satellite capable of covering the continental US with that kind of signal would need close to 1000 Watts of output power, severely taxing the weight and power-supply limitations for spacecraft.

How do spacecasting transmitters generate high-powered microwave signals? The answer is, very carefully. Traveling-wave tube amplifiers (TWTAs) are used, often in groups of two or more since the largest single unit can generate no more than a couple of hundred Watts. TWTAs, like amplifiers for ham radio, can fail at the worst time. The world's first direct-broadcast satellite, a Japanese experimental spacecraft, had a shortened life due to TWTA problems. The push is now on to build higher power TWTAs and improve satellite power generation and cooling systems.

A second drawback to the single-satellite approach stems from biannual eclipses where the Earth prevents the sun's rays from reaching a satellite's solar cells. The satellite must cease transmitting or rely on heavy and expensive storage batteries. Rejecting the second alternative, it may be possible to place the satellite in an orbital location that causes the blackout to occur at an hour when few people expect television service. But, as Harley Radin pointed out in the August, 1982, issue of *Satellite Communications*, such a location would be over the Pacific Ocean and impractical for east coast reception.

With the single-satellite approach presenting problems at every turn, planners have suggested a multi-satellite system where each craft would serve either one-fourth or one-third of the continental US. In arguing for the three-satellite approach, Radin questions the need to match program times with the national time zones, a feature of the four-bird proposal. Instead, he suggests that using only three satellites will reduce the overall cost (satellites are expected to cost in the $100-million range) and make better use of the frequency spectrum and orbital space.

Should DBS become a money-maker, two additional problems may develop. First, there is a limited number of ways to launch a satellite. Companies that counted on the European Space Agency's Ariane launcher are beginning to have second thoughts, and the best alternative, the US Space Shuttle, is almost completely booked through the mid-1980s.

If a large number of satellites do end up in orbit, it could present problems on the receiving end. Dish antennas are limited to a very narrow beamwidth—about 3 degrees—and may need to be rotated to receive signals from different satellites. If motorized antennas prove too costly, an electronically-steered "flat" array could be introduced.

Receiver Performance

The plight of satellite-receiver designers is best expressed by the old saying, "He robs Peter to pay Paul."

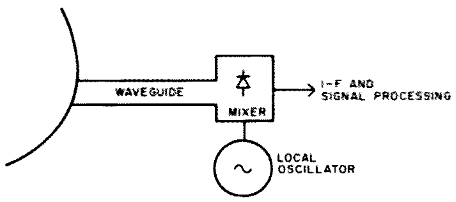

Fig. 2. The NHK Corporation of Japan receiver, described in the January/February, 1982, issue of High Technology, *uses direct conversion for low cost and a reasonably good noise figure.*

The tradeoff is between receiver-noise performance and antenna size. It boils down to getting acceptable performance at a reasonable cost. Acceptable performance is usually equated with a carrier-to-noise ratio (C/N) of at least 10 dB. While 10-dB C/N may not be studio quality, it does ensure reasonably snow- or sparklie-free pictures. DBS backers realize that their signals must compete favorably with conventional broadcasting and cable TV if they are to stand a ghost of a chance.

For an in-depth look at the "rob Peter, pay Paul" dilemma, read Stephen Gibson's "How Big a Dish?" in the November, 1981, *73*. The culprit, as Gibson points out, is noise.

In his article, "Direct Satellite TV: The 12-GHz Challenge" (*High Technology, January/February, 1982*), James Fawcette outlined three approaches to building receivers. The first and perhaps most startling method (shown in Fig. 2) is direct conversion, developed by the Japanese broadcasting giant, NHK. Akin to the simplest of ham receivers, the NHK design features a very low manufacturing cost. The signal goes from the antenna to a diode mixer via waveguide. There is no low-noise preamplifier stage. Fawcette cites an NHK claim of a 3.4-dB noise figure and 300-MHz bandwidth!

A more traditional approach to receiver design centers on a low-noise preamplifier circuit operating at 12 GHz. Like the current 4-GHz gear, several gallium arsenide (GaAs) field-effect transistors (FETs) are chosen because of their minimal noise contribution to form a preamplifier before the mixer stage. GaAsFETs are, however, expensive and difficult to use. Designers must pay close attention to the transition from waveguide to printed circuitry and use isolators to insulate the FETs from high swr. These additions can add to the receiver noise level and require a lot of individualized alignment. The result, while expensive, should be better than that which is achieved with the direct-conversion approach.

Hobbyists who want to roll their own 12-GHz low-noise amplifier might want to consider the Mitsubishi MGF-1403. This GaAsFET, offered by at least one *73* advertiser, has a Ku-band noise figure of less than 2 dB. If your pocketbook permits, you might want to try for an even better noise figure.

Manufacturers hope to avoid the cost of discrete GaAsFET front ends by fabricating GaAs integrated circuits. It is conceivable that the entire receiver could be on one chip. But until GaAs technology is refined and yield levels are boosted, receivers probably will employ hybrid circuitry using discrete front ends and integrated circuits for intermediate frequencies and signal processing. Siemans A.G., a European

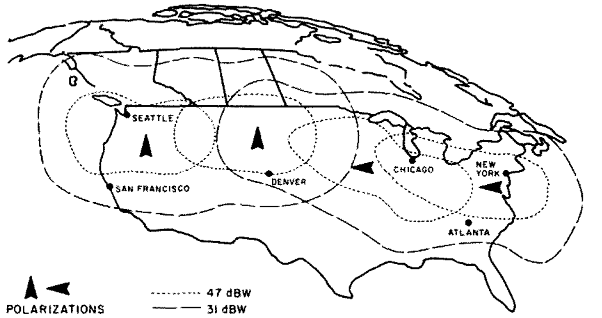

Fig. 3. ANIK C3, a Canadian satellite, may be the first source of North American 12-GHz television broadcasting. Its footprint will favor the northern United States. (Illustration from Satellite Communications, *July, 1982.)*

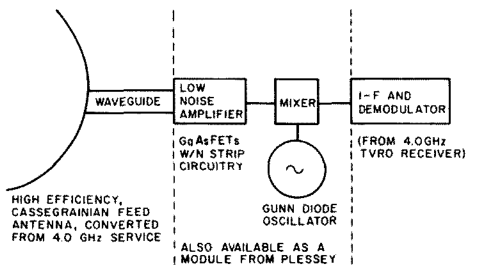

Fig. 4. By using a 4-GHz TVRO dish, front-end module from Plessey Corp. and integrated circuits for the i-f and signal-processing stages, a 12-GHz receiver could be within the reach of many hobbyists. For dyed-in-the-wool do-it-yourselfers, there are suitable GaAsFETs for building a 12-GHz low-noise amplifier, and a Gunn-diode oscillator could be used with a passive mixer for the downconverter stage.

corporation, already has introduced GaAs ICs that would follow the mixer stage in a DBS receiver.

A number of companies have finished prototype receivers and are laying the groundwork for manufacturing them in 100,000 quantity levels. European and Japanese companies like Plessey, Philips, Sony, NHK, and Siemans seem to be in the forefront. The late entry by American firms may be due to the lengthy FCC-approval process and lack of 12-GHz satellites for testing. Just who will dominate the US market remains to be seen. The ability to keep costs to a minimum could be the deciding factor.

Getting Started

If you have read this far and like a challenge, then consider getting in on the ground floor. In late 1980 a satellite built by Hughes Aircraft was put in a geosynchronous orbit of 106 degrees west. Operated by Satellite Business Systems (SBS), the spacecraft has ten-Ku-band transponders and is used by large corporations for high-speed data communication.

The all digital-time division multiple-access data format will make it difficult for hobbyists to receive any meaningful data from the SBS signals, but what the satellite does offer is a steady source for testing antennas and receivers. The transmitter footprint is said to be in the 43-dBW range, favoring the east central and western United States. SBS recommends that users have a 5.5- or 7.5-meter dish.

The first North American satellite to carry 12-GHz video on a regular basis will probably be ANIK C3, which was launched from the Space Shuttle last November. (See Fig. 3.) Built by Hughes Aircraft for Telesat Canada, ANIK C3 has 16 12-GHz transponders that can accommodate data traffic or two FM TV channels each. Telesat Canada plans to lease most of the transponder space to US companies, including several interested in experimenting with direct broadcasting. Although ANIK C3 transmissions aren't as strong as future DBS signals, they should be easier to receive than those from the SBS satellite, especially if you live in the northern US.

Finding suitable 12-GHz hardware will be the biggest problem facing pioneer tinkerers. One logical starting point is the dish antennas for 4-GHz TVRO reception. Some manufacturers even claim that their antenna will work just as well at the higher frequency. Whether you build or buy, remember that any dish antenna's performance is severely degraded if flaws in the surface accuracy exceed .1 times the wavelength of operation. For 12-GHz work, this means a tolerance of less than a tenth of an inch!

When choosing an antenna, pay close attention to the feed since it plays a big role in determining an antenna's efficiency. Remember, the feedhorn designed for a 4-GHz satellite system is *not* what is best for 12-GHz experimentation.

Choosing receiver components could be tough. If you have the necessary experience and test gear, you can roll your own 12-GHz LNA. Otherwise, you'll have to scour the surplus markets or save up enough money for a commercial-grade unit. Engineering evaluation models are starting to become available; Plessey Corp., for example, offers a complete receiver front-end module.

Hams who have experimented with Gunn-diode-based oscillators may want to try building their own local oscillator and diode mixer. The secret seems to be keeping the local oscillator's frequency stable and reducing unwanted sideband noise. Once you have perfected the preamplifier, local oscillator, and mixer stages, you can rely on proven intermediate-frequency and signal-processing designs. Fig. 4 shows one possible approach at assembling a working 12-GHz terminal.

Does all this sound like too much—an impossible feat? Then think about the not-so-distant past when Bob Coleman K4AWB built a 4-GHz satellite terminal using a few hundred dollars worth of surplus "junk" and a VTVM. For him, satellite TV was an opportunity rather than a roadblock and there was no need to wait for someone else to lead the way.

Who will be the first to master the 12-GHz DBS challenge?

Author's Note

Since the legality of unauthorized reception of satellite signals has not been decided, readers are urged to use discretion in decoding or disseminating any information they might receive. ■

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The Fun-Vac: A Synthesis of Old and New

This one-tube transmitter combines the circuits of the fifties with the technology of the eighties. It also keeps your coffee warm.

Ed. Note: PC boards for this project are available from the author for $7.00 ppd.

The response to my series of articles on Fun home-brew gear has indicated that there is a diverse group of people building gear today. Without question, the one central and overwhelming theme of the response has been about *simplicity*!

The emphasis in home-brew products has changed dramatically over the years. Nearly everyone has as his main rig a factory-built transceiver which is good on today's crowded bands. However, the lure of home-built gear seems to entice even more hams than before, quite possibly because they are building for fun and challenge and not because of necessity or lower cost.

The "Fun-Vac," the 2-to-5-Watt 40-meter CW transmitter described here, is in response to requests from both old-timers and newcomers for a different kind of transmitter—a *tube* transmitter. Believe it or not, I did say *tube* (hence the "Vac" for vacuum). What a challenge it was to design and build a tube transmitter based on the Fun-gear principles of no adjustments and all parts coming from Radio Shack! It really *was* fun to return to the early days of my ham career (mid-sixties) and work with vacuum tubes. However, modern construction practices and the 1980s philosophy of home-brew gear were used in designing this very simple, very reliable, one-tube, 40-meter transmitter.

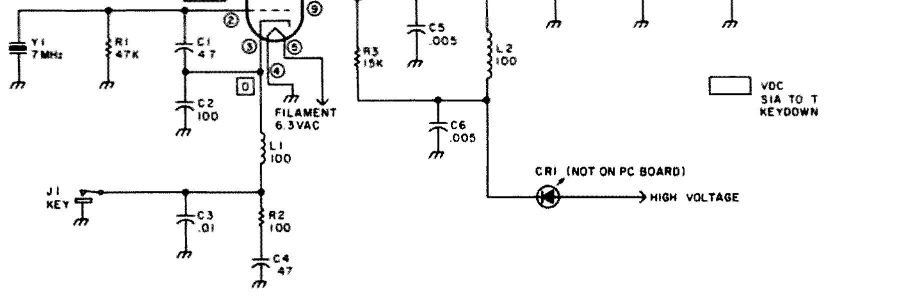

Fig. 1. Fun-Vac schematic.

Why use a tube?

First, it is nostalgic for the many who entered the ham-radio field before the seventies.

Second, many older hams have stopped building due to the extinction of tube circuits. This project hopefully will bridge the gap for them between current transistorized gear and the older, massive, point-to-point construction-type tube rigs which required hours and hours of wiring, sheet-metal work, and critical adjustments.

Third, many new hams have virtually no experience or education regarding tubes, and a simple one-tube project is a good way of discovering our tube heritage (which may help in understanding transistor circuits).

Fourth, it is just plain fun to integrate the fifties and sixties home-brew ideas with the home-brew philosophy of the eighties!

I firmly remain, however, a proponent of state-of-the-art gear. Transistors are much more efficient with their use of power, and 12 V

to 24 V is much, much safer to work with than 300 V!

Objectives

My main objective with this rig was to design a tube transmitter that fit in with the entire Fun series of simple, low-cost gear. It would be worthwhile to review the entire series, particularly the article on the Fun-Mitter (*73 Magazine,* February, 1981; see also "Fun-Equipment Revisited" in the January, 1983, issue). The Fun-Mitter is a 5-Watt, 80- through 15-meter solid-state transmitter. The characteristics of the Fun gear are: small size, simple construction, no adjustments, and all parts available from Radio Shack.

The objectives of the Fun-Vac were, in addition:

- PC board construction with the same size board as other Fun gear (2¼" × 3")
- a cost less than $25
- easy assembly
- 2 to 5 Watts output

All of these objectives were met. Even a 300-volt power-supply design is included here.

Circuit

The basis of the transmitter is a 6BQ5, a 9-pin miniature beam-power pentode available from Radio Shack. The 6BQ5 is a rugged device capable of dissipating 10 to 15 Watts under a 50% CW duty cycle.

The 6BQ5 functions as both oscillator and amplifier. The oscillator uses FT243 fundamental crystals in a Pierce configuration. C1 and C2 provide feedback between the control grid and cathode. The oscillator is keyed by breaking the cathode-to-ground connection. L1, R2, C3, and C4 comprise a wave-shaping circuit to eliminate clicks and sluggish starting of the oscillator.

The big power-waster of this circuit (as with all tube circuits) is the filament. A tube works by heating the cathode to jar electrons loose from its specially-coated surface. This is the function of the filament (or heater) which actually glows orange, warming the cathode. The 6BQ5 requires 6.3 V at .75 Amps applied to the filament. (This is about 4½ Watts, or as much as the total output power of the tube!)

The plate operating voltage (250 to 300 V) is applied through plate choke L2. In order to meet the objective of using Radio Shack parts, L2 was required to be 100 uH. This is somewhat less inductance than the normal value of plate choke, but absolutely no problems were encountered. Rf output is taken from the plate through C7 and applied to the matching network, L3, L4, C8-C10. This network serves two purposes and is different from the norm in tube circuits.

Its first purpose is to match the impedance of the plate (about 2500Ω) to a 50Ω antenna load. This is accomplished by C8, C9, and L3. The second purpose is harmonic filtering, which is accomplished by both sections. The matching network is actually two pi networks combined. One matches 2500Ω to 50Ω and the other is a 50Ω-to-50Ω match.

Although the pi network is a standard method of matching impedances in a plate circuit, this network is different in one aspect: it is fixed-tuned. Normally, a variable-load capacitor would be used at C10 to adjust for an antenna load of between 30Ω and 70Ω. All of today's equipment is fixed-tuned for a 50Ω antenna load, and with antenna transmatches in abundance, the necessity for a variable load control no longer exists. Another norm in tube circuits is to use a variable-tune-control capacitor at C8. By designing for a somewhat lower Q, this capacitor was made fixed. No tuning adjustments are required! The entire transmitter can be built on a small PC board just like today's solid-state rigs, with no bulky front-panel variable capacitors!

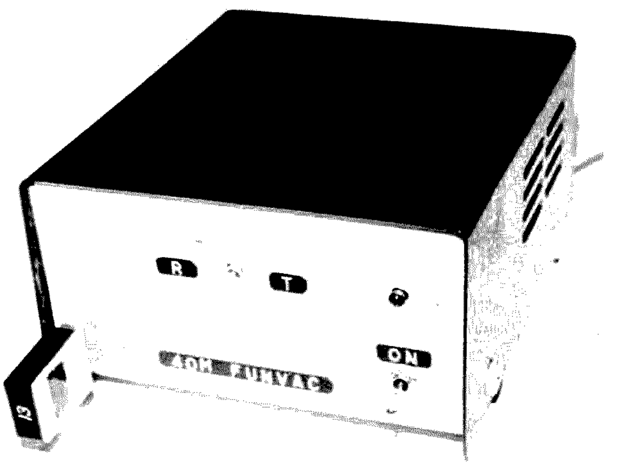

Photo A. Front view of the Fun-Vac.

The matching inductors, L3 and L4, are made from Radio Shack 10-uH chokes as has been done with all previous Fun gear. By removing the required amount of turns, the needed inductance is easily obtained. These chokes make for small and easy-to-make inductors—again, something quite unusual in a tube circuit.

The LED, CR1, was included to provide a method of monitoring plate current. The LED is wired in series with the plate voltage and lights brightly when the plate current passes through it. Because of the very low voltage drop across the LED, no power is lost in it. (It also is fun to use a modern solid-state device to monitor current in a tube rig!)

Power-Supply Circuit

The Fun-Vac operates from two power-supply voltages, 6.3 volts ac and approximately 300 volts dc. The 6.3-V-ac filament voltage is somewhat critical in value, but the high voltage can vary between 200 and 350 volts. These voltages can be obtained from an existing supply or a supply can easily be built and incorporated into the same box with the Fun-Vac PC board. I chose to include power supply and Fun-Vac in one box, as shown in Photo B. However, the voltages can easily be "stolen" from a tube-transceiver supply or a similar supply by using the appropriate connector on the Fun-Vac chassis.

A simple circuit to obtain the needed voltages is shown in Fig. 2. An attempt was made to design a supply that also met the Fun gear objective of obtaining all parts from Radio Shack. The design shown meets that objective although it represents a rather unorthodox approach. By using two step-down transformers

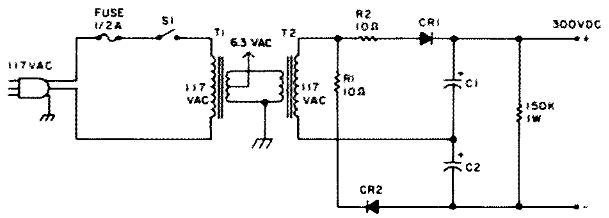

Fig. 2. Fun-Vac power-supply schematic.

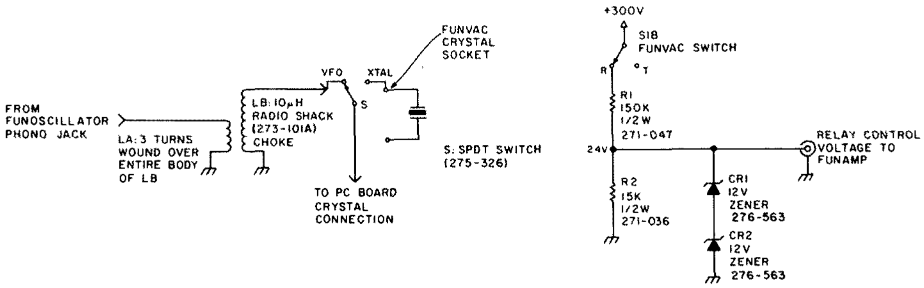

Fig. 3. Using the Fun-Oscillator and Fun-Amp with the Fun-Vac. The Fun-Amp relay-control voltage is needed due to the methods used with the Fun-Mitter. Mount resistors R1 and R2 very close to S1.

back to back, a secondary ac voltage of 117 volts is obtained. This is possible because of the relationship of the turns ratio of the transformer. (It is an old trick, used in the past to obtain a negative bias voltage for tube rigs.) The 117 volts ac is applied to a full-wave voltage doubler which provides 2.8 times the rms voltage (2.8 × 117) to provide about 320 volts dc.

This arrangement is not extremely efficient and the parts shown do not provide a very "stiff" high-voltage supply. This results in less power output than the tube is actually capable of, but the parts are easy to obtain and the circuit is easy to build. The transformer windings must be connected in phase in order to add voltages. If, after the supply is wired, no ac output occurs at T2 secondary, then reverse the connections at T1 secondary.

Using the Radio Shack parts shown does make the power-supply portion of the Fun-Vac nearly as expensive as the rf circuitry. It may be possible to substitute for the filter capacitors by using the junk box or buying from a local TV repair shop. A value of 50 to 100 uF will work fine, and even less capacitance can be used at the expense of less filtering and regulation. Also, the transformers can be replaced by any transformer that can supply the needed voltages.

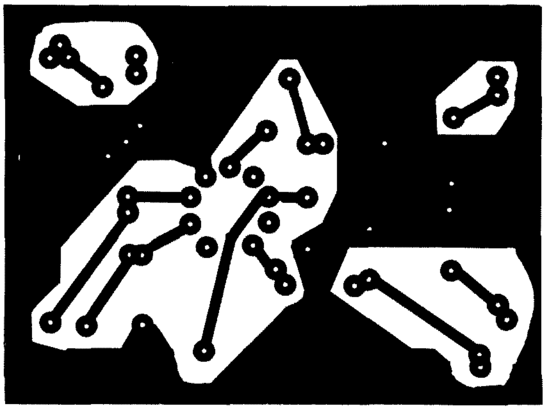

Fig. 4. PC board.

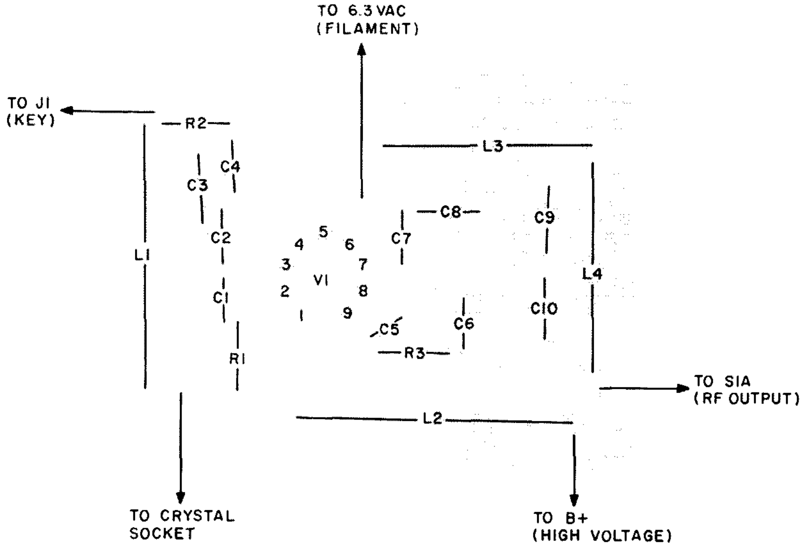

Fig. 5. Component layout.

Construction

Before beginning the actual construction of the Fun-Vac, a review of safety practices with high voltages is necessary. *The high voltage used in this circuit can be lethal!* When voltage is applied, never touch anything on the PC board or in the box. Always keep one hand away when making any measurements.

Using PC board construction for the Fun-Vac greatly simplifies building the rig and makes it as simple to build as solid-state gear. PC board use also eliminates wiring errors. All of the parts except the jacks, switches, and the plate-current LED are mounted on the board.

The 6BQ5 tube can be soldered directly to the PC board without a tube socket. This makes the loaded board shorter, which is important in mounting. If you purchase a new 6BQ5 from Radio Shack, there should not be a need to replace the tube, rendering the usual practice of using a tube socket unnecessary.

FT243 crystals and sockets can be obtained from a number of sources and are quite inexpensive. Mount the socket on the front panel to facilitate easy changing during operation.

The plate-current LED should be mounted in a hole on the front panel and glued in place. Route the wires to the LED carefully since these wires carry the high voltage. If possible, don't leave bare wire exposed anywhere in the high-voltage circuit.

The sheet-metal work necessary with the Fun-Vac is much simpler than it was in a comparable tube transmitter from fifteen years ago. Before, heavy metal was used, often even steel, and it had to be punched for tube sockets, variable capacitors, and large coils. Using the Radio Shack cabinet makes sheet-metal work easy. The light-gauge alumi-

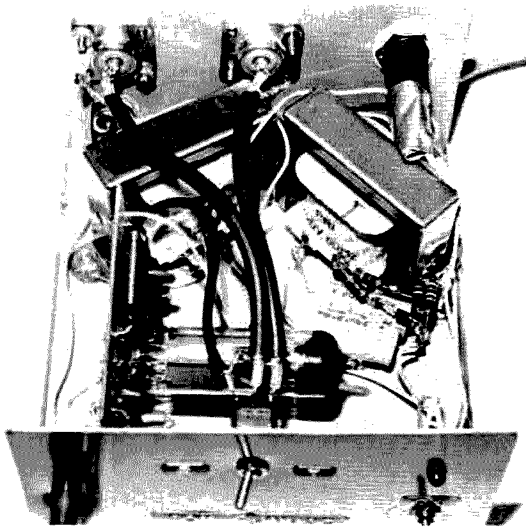

Photo B. Inside view of the Fun-Vac.

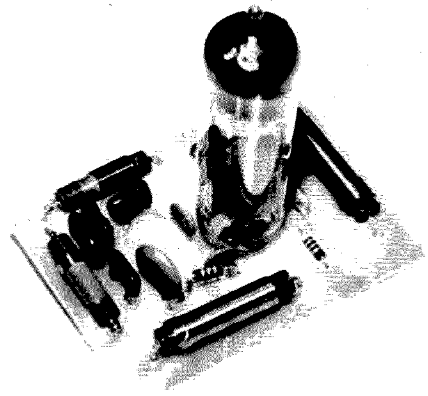

Photo C. PC board for the Fun-Vac.

num is easily worked using a hand drill and a knife.

Mounting of the PC board in the cabinet should be done with care. If the Radio Shack cabinet is used, it will be necessary to mount the board at right angles to the case, as shown in Photo B. If desired, the bottom of the board can be covered with electrician's tape to keep fingers from accidentally touching the high voltage.

The wiring used is not particularly critical. The filament wire should be at least 22 gauge. All rf wiring should be with coax, and RG-58 will work fine.

After the power-supply section is completed, do not connect the voltages to the Fun-Vac PC board. This will be done after proper operation of the supply is verified.

Vfo and Amplifier Use

The Fun-Vfo (2/82) and Fun-Amp (5/82) can be used with the Fun-Vac easily. Using the Fun-Vfo requires the addition of a step-up transformer to match the output impedance of the Fun-Vfo to the high impedance of the control grid of the Fun-Vac. The vfo signal is applied to the crystal socket. A switch can be used to switch between vfo and crystal. Details of the impedance transformer and possible switching arrangement are shown in Fig. 3.

The Fun-Amp is easily added to the Fun-Vac. It requires a control signal to control the Fun-Amp relay; this can be brought out of the Fun-Vac through a phono jack. The Fun-Amp will provide around 20 Watts of output power from the Fun-Vac. Details of the Fun-Amp use are given in Fig. 3.

Adjustment

The safety factor cannot be overemphasized. During adjustment, with the case open, it is very easy to accidentally touch the high voltage. Whenever the cover is off, always be aware of where the high-potential voltage points are.

The only adjustments of the Fun-Vac are really not adjustments at all; they are checks to ensure proper operation. If possible, obtain a voltmeter capable of measuring ac and dc voltage of greater than 300 V. At this time the two power-supply voltages should not be hooked up to the Fun-Vac. With the power on, carefully measure the high voltage. The reading should be between +250 volts and +350 volts.

Next, connect the filament-voltage wire to the PC board. Switch the voltmeter to the ac range and measure the filament voltage. It should be around 6.3 V. If it reads more than 7 volts ac, a filament-voltage dropping resistor may need to be added—$R = (V - 6.3)/.75$. At this time, with 6.3 V ac on the filament, there should be an orange glow from the tube, indicating that the tube filament is working.

Next, with power off, connect the high voltage to the circuit board through the front-panel plate-current LED. Also, hook up a dummy load to the antenna connector and insert a key into J1.

Turn the power switch on and wait at least 30 seconds for the filament to warm up.

Fun-Vac Parts List
(with Radio Shack numbers)

C1	4.7 pF	272-120	
C2	100 pF	272-123	
C3	.01 μF	272-131	
C4	.47 μF	272-1071	
C5	.005 350 V	272-1051	(Two in series)
C6	.005 350 V	272-1051	(Two in series)
C7	.005 350 V	272-1051	(Two in series)
C8	94 pF 100 V	272-121	(Two 47 pF in parallel)
C9	940 pF	272-125	(Two 470 pF in parallel)
C10	470 pF	272-125	
CR1	LED	276-041	
J1	Phone jack	274-252	
J2	SO-239 ant. jack	278-201	
J3	SO-239 ant. jack	278-201	
L1	100 uH choke	273-102	
L2	100 uH choke	273-102	
L3	Remove 7 turns from 273-101A choke		
L4	Remove 17 turns from 273-101A choke		
R1	47k, 1/4 W	271-1342	
R2	100, 1/4 W	271-1311	
R3	15k, 1 W	271-040	(Two in parallel)
S1	DPDT	275-1546	
V1	6BQ5		
Y1	7-MHz FT243 crystal		
Case		270-253	

Fun-Vac Power Supply Parts List
(with Radio Shack numbers)

C1	Each capacitor should be about 25 μF at a	
C2	voltage rating of at least 200 volts. This can be done by wiring four 272-1044 100-μF 50-volt caps in series for each.	
CR1	400-V, 1-Amp diode	276-1103
CR2	400-V, 1-Amp diode	276-1103
R1	10Ω ½ W	271-001
R2	10Ω ½ W	271-001
S1	SPDT switch	275-324
T1	Transformer, 12.6 V ac, 1.2 Amps	273-1505
T2	Transformer, 12.6 V ac, 1.2 Amps	273-1505
	Fuseholder	270-365
	1/2-Amp fuse	270-1271
	Line cord	278-1255

With a 40-meter crystal installed and the receive/transmit switch set to transmit, close the key. The front-panel plate-current LED should light, indicating the plate current of around 30 to 50 mA. This indicates proper operation. If a wattmeter is connected between the antenna jack and the dummy load, a power output of between 2 and 5 Watts should be observed, with the key closed.

For vfo operation, merely substitute the Fun-Oscillator for the FT243 crystal and proceed as above.

If problems are encountered, a logical analysis should reveal the trouble. If power-supply voltages are correct, then the problem can be isolated to the Fun-Vac PC board. Measure the voltages at the various points around the board corresponding to the indicated voltages on the schematic. If your voltages vary significantly from those given, then check and re-check for improperly soldered connections, miswiring, or faulty components.

Operation

Using the Fun-Vac for contacts is almost as much fun as building it! As with the Fun-Mitter, a 50Ω resonant antenna must be used. This usually will provide an swr of 1 to 1, which is a good method of monitoring load conditions. With today's stations, the necessary 50Ω-load antenna probably already exists due to the prevalent use of transmatches.

Allow the Fun-Vac to warm up for at least 30 seconds before use. In some ways, the soft warm glow of the tube as you operate is a reassuring feeling—reminiscent of days gone by. Incidentally, the heat generated by the soft, warm glow of the tube literally will keep your coffee warm—a side benefit of the Fun-Vac.

To operate, merely select the correct operating frequency, switch S1 to transmit, and begin keying. The receiver is connected to the receive antenna jack on the rear panel of the Fun-Vac. The low power of the Fun-Vac eliminates the necessity of a sidetone or receiver mute control since the actual signal can be listened to on the receiver without overloading.

Conclusion

The Fun-Vac provides a means of experimenting with tubes using modern methods. (If other band coverage is desired, refer to the Fun-Mitter articles.) It's amazing how simple those massive old rigs can be. Happy nostalgia! ■

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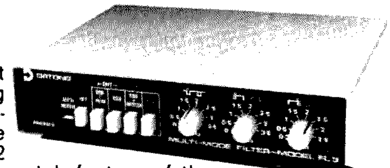

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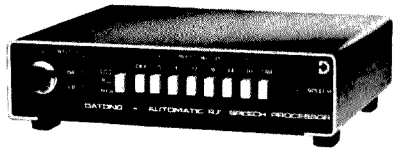

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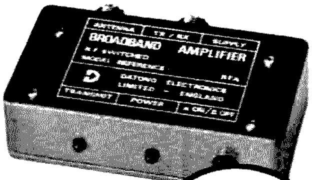

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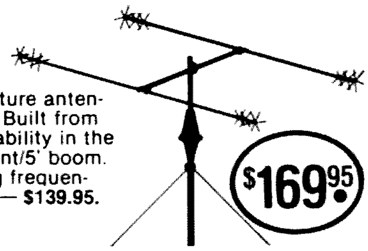

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Adventure in Sarawak

Two DXpeditioners journey to the land of headhunters— and send a signal to the rest of the world.

Kirsti Jenkins-Smith VK9NL
PO Box 90
Norfolk Island
Australia 2899

The three 9M8s; left to right, Jim 9M8JS, Paul 9M8PW, and Kirsti 9M8NL.

Jim at the rig.

Sarawak—the land of the Hornbills, in Northwest Borneo: It is a country of rain forests, rivers, and unexplored areas. It is also a country of culture, arts, and handcrafts. Once the domain of headhunters, Sarawak is now the largest of Malaysia's 13 states.

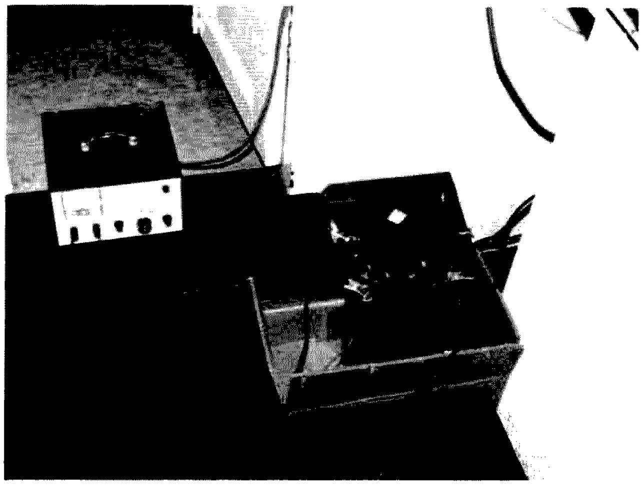
So reads the caption on our QSL card from this operation. The idea of visiting Sarawak during our holidays came to us early in the year. It did not seem to appear on any of the guided-tour brochures which came our way, and as we are not very tourist-minded, this made us look into the possibility of visiting and also doing some operating from there.

There were no problems regarding travel and visas. Modern jet-liners connect with Kuching daily, and for us it was a matter of traveling Norfolk Island—Sydney—Singapore—Kuching. We had contacted Paul 9M8PW beforehand and he was most helpful in arranging accommodations for us in the Anglican Church hostel. Here we were able to rent a small flat and thus be independent.

This is necessary in this sort of venture since not everyone appreciates their houseguests staying up through the night making cups of coffee and shouting into a mike. And hotel accommodations—apart from being expensive—present a problem in that hotel mealtimes do not coincide with the times of the day when band conditions are down to nothing and it is most suitable foı the operators to take a meal. In fact, they have a way of serving dinner and breakfast at peak operating times. So the hostel was ideal in many ways. It also was central and close to shops and restaurants.

We had applied for our licenses months before, and on arrival in Kuching were informed that these would be issued for the period of time we were visiting the country. This was good news indeed, as we were well aware of the reluctance to issue guest-licenses in Malaysia.

It now was a matter of proceeding to set up our operating quarters and station. Jim got busy with the multiband dipole which we eventually were able to hang from under the roof of the building across the yard and make fast in a suitable tree. Paul had a beam he was not using which he lent us. It needed some repairs and handiwork done to it, and Jim got busy with this chore. At the same time, we were making enquiries as to where we might be able to obtain a steel water pipe to mount the beam on. We were met with a strange re-



The battery setup after the lightning strike.

Our water-pipe antenna, overlooking Kuching.

luctance which we did not get to understand until over a week later, but we decided to find pipe for ourselves.

Nowhere did we see such an item, but after making our way through nooks and crannies in the shopping center, we finally found a shop where they said that they could help. So across the street we went; a large storage room was unlocked, and there within were literally hundreds of pipes. We selected a 20-foot piece and asked if it could be brought home to us.

"No, no (with an apologetic smile)!" Well, by this time we thought we had wasted enough time on the project, and the main thing was that we had the pipe within our reach. So resolutely we picked it up between us and paraded home through the streets to the vast enjoyment of the locals. Once home, there were no more difficulties. The caretaker and one of the gardeners came along, offered to help us put it up, and the job was done in minutes.

Later on, visiting the police museum at Fort Marguerita, we realized why we had experienced some reluctance in "operation water pipe." There on display were several guns and mortars homemade from water pipes which had been confiscated from terrorists. We hasten to say that Sarawak is a well-ordered and safe state at present, but obviously they have learned from history and are not taking any chances.

We were now in business. We had decided to concentrate on CW contacts as this mode was more needed from East Malaysia. We did not have a thundering success that first day. We had the dipole only up to the first floor and there was a CW contest on that weekend. So, unless people were looking for us, we could not break through on the busy bands. We also found that propagation was not the best to America and Europe, but was excellent to Asian countries and the Pacific. It took a couple of days to get the antennas erected to their full potential, but gradually we worked our way into the rest of the world.

Openings to America and Europe continued to be a bit tricky, but with cooperation from the people calling, we were able to work pileups giving such reports as 529 and even 429. This is not possible unless there is some restraint on behalf on the ones awaiting their turn. The bands usually opened properly for a few hours from midnight on and the path would be open to the USA and Europe, which created some tremendous pileups. The Europeans are not known for their patience and restraint in these circumstances, so it was plain hard work. It was, on the other hand, a pleasure to work a pileup of JA-boys. Their operating manner is above reproach.

Anyway, we continued in this manner for the first week and were looking forward to the weekend when lots of people who have only weekends available for their hobby would be around. On Saturday afternoon, however, there was a tremendous flash of lightning simultaneous with a deafening crash of thunder. Jim was outside making improvements to the antennas and was holding the 40-meter dipole in his hand at the time. It was lucky that he escaped being sizzled. That the power supply to the rig died instantly is really of minor importance in comparison. However, we were effectively shut down for 24 hours while we tried to repair the power supply.

We were able to buy some of the components we knew had blown, but after struggling until 2:00 am Sunday replacing these and still not making it work, we realized we were going nowhere unless we could gain access to a good ham shop. With one resident ham in the country, the shops did not stock ham gear. We finally arranged to hire a battery and charger which gave us 25 Watts, and by borrowing Paul's linear, we could bring this up to 100-150 Watts and continue operation.

The second week was mostly a continuation of the first week. The number of QSOs crept upwards, and it was nice to meet old friends in the pileups. We had realized by now that checking into nets we usually checked into from Norfolk Island was virtually impossible due to lack of propagation at those specific times. So, we carried on with the pileups, still concentrating on CW, Jim with his fancy electronic keyer and I with my old faithful straight key. (I want to go down in history as the only DXpeditioner stubbornly sticking to a 1940-model straight key in 1982, hi.)

We had by now been in Sarawak long enough to have spent time sightseeing and getting the feel of the place. Kuching is a fascinating city with all its old-world charm intact. There are the old narrow streets lined with shops absolutely spilling goods of every description out onto the footpaths. There were the handmade souvenirs made from local materials, and there were

The author stayed at the rig when the aerial fogging to kill mosquitoes began.

A typical shop in Kuching.

the friendly people, hardworking and cheerful. We spent many hours in the museum, learning a lot about the culture and history of the country.

And not far out of town was the jungle, practically undisturbed. We also were aware now that the dreaded dengue fever was around. We swallowed anti-malaria tablets against malaria and kept our fingers crossed against cholera, but as far as dengue was concerned, we just did our best to keep the mosquitos at bay by spraying the rooms and burning mosquito-coils through the night. We still became covered with bites and just hoped it was not the dengue-carrying kind of mosquito that had feasted on us.

The authorities had an ongoing eradication scheme against this particular beast, and one rule was that if someone contracted dengue, every house in the neighborhood was treated with a sort of spray. So it was that on one fine evening there was a whirring sort of noise outside, and the next thing we knew the flat started filling up with a dense fog. (See photo of the author at the rig at the beginning of the fogging process.)

It got so thick that we could not see at all at a distance of 2-3 meters. We could not breathe, either, so we agreed there was a limit to how devoted one can be, hi, and we would not be much use to our fellow amateurs if we suffocated. There was also the fact that we did not know exactly what the fog contained and just how harmful it might be to humans. So it was a matter of QRT and escape downtown for a meal. (The frogs were particularly noisy that night. We think they were kicking up a row because their favorite food had been done away with!)

All things come to an end, and so also did our stay in Kuching. We had settled in properly and were most reluctant to leave. We took one last look out the window at the view of tile-covered roofs, charcoal smoke rising amongst them, and one last admiring look at the orchids growing in a hedge along the footpath. Then a quick good-bye and *au revoir* to Paul's family and Paul drove us to the airport.

We really had not wanted to go, but we had received the good news that we had been successful in chartering a vessel, the *Cheynes II*, for our January, 1983, Heard Island DXpedition. So, although we had an unforgettable holiday and made 10,500 QSOs in Sarawak, we knew that loads of work regarding our Heard Island trip would be waiting for us at home and we just had to move on.

Afterthought: It was very hot in Kuching. There never seemed to be any breeze to relieve the heat of the day. And as the bands closed in the middle of the day, this was when we emerged outside for sightseeing and shopping. Strange how that old tune kept coming into my mind all the time: Mad dogs and Englishmen go out in the midday sun . . . It could just as well read: Mad dogs and ham-band-fans go out . . . etc.! ■

Put 2 Meters in Your Shirt Pocket

Radio Shack's Pocket Weatheradio makes a dandy 2-meter receiver. A few quick modifications will get it right on target.

Lester Kolb K3PJG
PO Box 161
Lebanon OR 97355

Quality, simplicity, and low price make this shirt-pocket two-meter receiver surpass anything on the market, if indeed such a compact gadget with these features is available.

The heart of the FM monitor is a "Pocket Weatheradio" which is listed in Radio Shack's 1982 catalog for $12.95 and measures less than 4 × 3 × 1¼ inches. Originally covering the 162.40-162.55-MHz weatherband, the state-of-the-art circuit features of the Weatheradio make it an ideal choice for conversion to two-meter FM. The frequency modification consists of simply adding three 5-pF capacitors across three inductors. This modification alone makes a dandy monitor, but the addition of a simple squelch circuit puts icing on the cake.

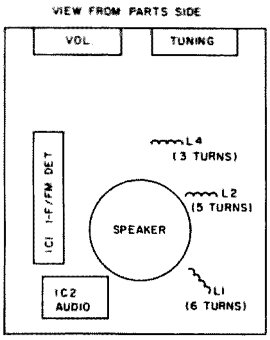


Fig. 1. Weatheradio component layout.

Weatheradio Circuit

The schematic included with the radio shows a simple, well-designed circuit consisting of a zener-regulated, three-transistor front end followed by a 4.5-MHz ceramic filter and a total of two ICs for i-f amp/FM detector and audio amp. The local oscillator is tuned by a varicap diode, and a 10k pot serves as a tuning control. The rf amp is not variably tuned since the small frequency range does not require it. Selectivity and frequency stability are excellent for a tunable VHF receiver, but don't expect top sensitivity.

Disassembly

Snap the plastic cover off the Weatheradio case. A cardboard insert over the circuit board is firmly glued to one of the electrolytic caps. Carefully remove this insert from the cap to have a look at the board. The cardboard insert can be cut off permanently except for the nine-volt-battery area. With a miniature phillips screwdriver, remove the two screws holding the volume and tuning knobs to their shafts. Also remove the two screws from the circuit board and the one anchoring the whip antenna. Remove the whip through the top of the case and take out the circuit board. Unsolder the leads from the speaker itself to avoid errors when reconnecting. Use small clip leads to the speaker while testing.

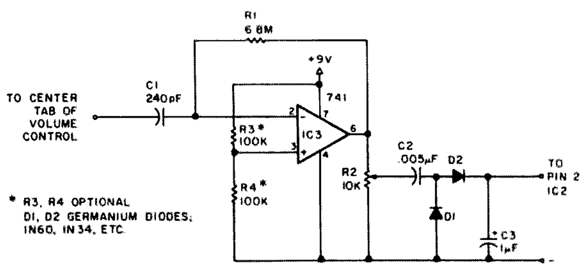
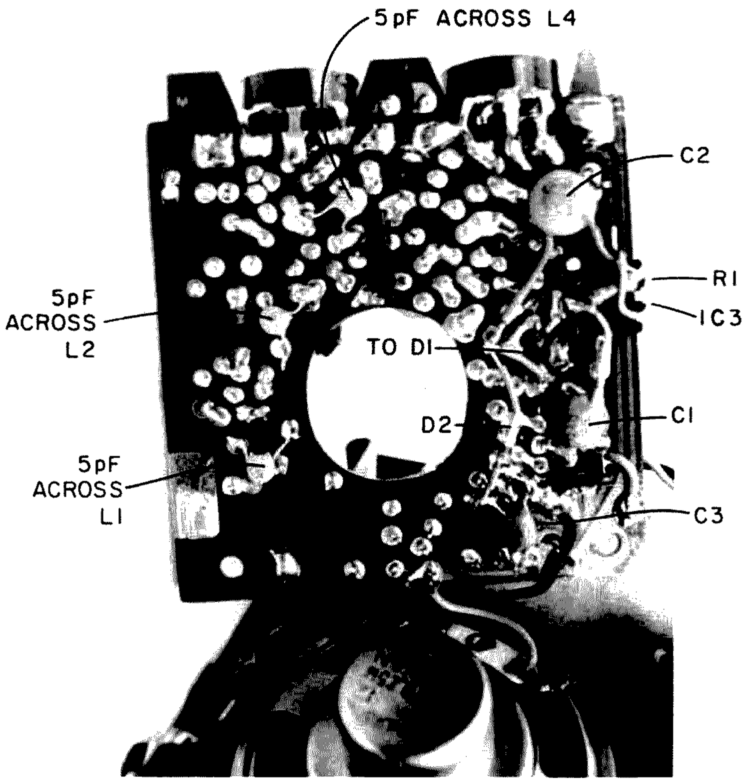


Fig. 2. Hybrid squelch circuit.

Frequency Modification

All that is required to cover two meters is the addition of a 5-pF capacitor (parallel) directly across inductors L1, L2, and L4. The locations of these coils are shown in Fig. 1. No existing parts are removed. After soldering these caps into place on the foil side of the board, reconnect the speaker, slip the board back into the case, and install the knobs and

whip for final testing. Reconnect the battery, set the tuning knob to mid-position, and with a toothpick or pointed nonmetallic tool, spread or compress L4 (local oscillator) until you hear a local repeater signal or desired center frequency from a signal generator. L2 and L1 (rf amp) should be spread or compressed in the same manner for maximum quieting, which can be accomplished only with a weak signal, preferably from a signal generator. Even though coupling between the local oscillator and the rf amp is very light, peaking of L2 for maximum sensitivity will shift the receive frequency slightly, so keep retuning onto frequency as L2 is being peaked; an increase in noise may be a shift off frequency rather than a decrease in sensitivity. Strong signals can be received even without adjustment of L2 and L1, but peaking (especially L2) is recommended for best sensitivity.



Circuit modifications.

Hybrid Squelch

Drilling holes or adding controls and switches to an otherwise attractive custom case is both difficult and unsightly. With this in mind, I came up with a novel idea which I call a hybrid squelch; the volume control doubles as a squelch control. The squelch engages at (and remains engaged above) any preset volume level suited to preference by varying the squelch sensitivity setting of R2 (Fig. 2). Once this R2 level is set, it needs no further adjustment. Although the most sensitive volume/squelch setting is just at threshold, a moderately strong signal will open squelch even if set at full volume. The use of the volume control as a squelch control is accomplished by coupling the input of the 741 op amp directly to the center tab of the Weatheradio volume control with a 240-pF capacitor. Thus, the input level to the noise amp/squelch switch varies with the volume setting.

Fig. 2 shows the complete squelch circuit. The 741 (DIP) op amp serves as a high-gain noise amplifier. Germanium diodes D1 and D2 provide a dc voltage which mutes the Weatheradio audio amp (IC2) at pin 2 when no signal is present. The 240-pF coupling capacitor helps eliminate passage of voice frequencies. However, if you find that, at high-volume settings, heavy modulation activates the sensitive squelch during voice peaks, reduce squelch sensitivity R2 until a compromise position is reached. To save space and eliminate the need for a subminiature pot, I adjusted R2 to the desired level, measured the resistance on each side, and substituted fixed resistors as a divider. An alternative would be to substitute a fixed 10k resistor for the R2 pot (connecting C2 to the junction of R2 and pin 6 of IC3) and to lower the gain of IC3 by reducing R1 to anywhere between 6.8 and 2.2 megohms. For this approach, I found the optimum value to be somewhere between 2.2 and 4.7 megohms. R3 and R4 on pin 3 of the 741 are standard practice, but optional; mine functions perfectly without them.

Construction Notes

Store all tiny screws and the knobs in a cup; they have a tendency to wander off. All parts for these modifications were soldered directly to the foil side of the Weatheradio board, each supported by its own leads or short lengths of thin but rigid wire. Space is limited, requiring ¼-Watt resistors and other parts of miniature variety. The 741 DIP was mounted against the foil side of the board, leads up, between IC1 and the immediate side edge of the board, with leads trimmed short. Keep parts placement near the board edges, as the speaker magnet area has the least room for clearance. The protective coating on the foil can be scraped away at points needing the solder connections. Watch battery polarities and note that the Weatheradio schematic chassis symbol designates nine volts *positive*. Be sure to connect the positive lead of the squelch circuit to a point *after* the on/off switch so it does not draw current when the radio is turned off. A circuit modification or error on the Weatheradio schematic has pins 2 and 3 of audio amp IC2 reversed. Squelch output (from D2 and C3 of Fig. 2) goes to actual pin 2 of IC2. As each part is added to the board, it is a good idea to seat the board into position in the plastic case to check for parts clearance and to avoid shorting leads to the metal speaker. Care and patience cannot be overemphasized. It is quite easy to make optical reversals while looking at both sides of the board for circuit points of inductors and IC pin numbers. Triple check. Insert a milliam-

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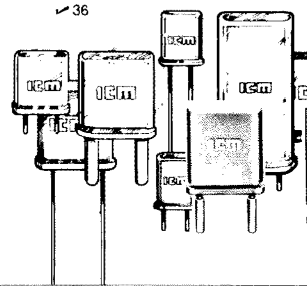

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meter in series with one of the battery leads after the completed unit is in the case. If it draws more than 25-30 mA, recheck for shorts or solder bridges.

Final Touches

Frequency coverage of the tuning range can be increased or decreased by increasing or decreasing (respectively), by a few picofarads, C18 which couples the varicap tuning to the local oscillator. I made no modification here, as frequency coverage was adequate for the repeater portion of two meters. A tiny dot of white paint or nail polish on the tuning knob, with frequency-reference dots on the case, will prove useful. If you want to turn this into a deluxe model, drill a tiny hole on top of the plastic case and install a subminiature LED for an on/off indicator. At the expense of a slight increase in current drain, this feature will remind you to turn the radio off at night and might save you a battery. If space can be found to neatly install a small battery cut-off jack for an external nine-volt supply, it would do wonders for your budget; nine-volt batteries are not noted for their longevity. With a little ingenuity, the local oscillator could even be converted to single-channel crystal control.

My FM monitor keeps me in touch with what's going on without my having to pull my rig out of the car every evening. For a while, it also kept me from jumping in on every QSO. Eventually, I broke down and built a 50-mW companion FM transmitter which easily hits the local repeater. It measures only 1½ × 1 × 1 inches. So now I have a $25 hand-held, but—you guessed it—no matter how hard I tried, I couldn't squeeze it into the Weatheradio case. ■

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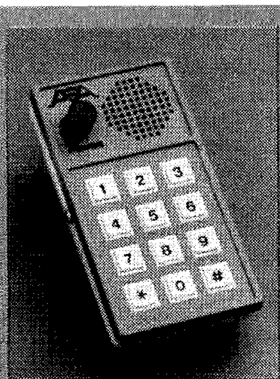

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*Education Technology & Services, see page 81 October 1981 issue of Ham Radio Magazine.

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The Secret Telemetry of OSCAR 8

Do those numbers from the sky mean anything? You bet.

Joe Magee K5OM
3928 Tacoma
Irving TX 75062

Do these numbers mean anything to you: 101, 245, 376, 449, 549, 601? Well, this is the data I received from OSCAR 8. Since first learning about amateur satellites with signals I could hear on my Kenwood R-599, I have often copied this type of data.

The above sequence, when decoded, says that the total solar-cell current was 0 mA, the battery current was −285 mA, the battery voltage was 15.85 volts, the base-plate and battery temperatures were 23.28° C, and the Mode J power output was 0 mW. The math is pretty simple, so the numbers are easy to calculate. A pocket calculator does the job in no time.

The data comes from OSCAR encoded into six different number groups. These groups are assembled into a certain order by OSCAR before transmission. Each number group is called a channel and the assembly is called a frame. Thus, the numbers above are considered as one frame. Each frame is separated from the rest by "HI." So, the frame above was actually copied as "101 245 376 449 549 601 HI."

Notice that each channel is composed of a three-digit number. The first digit tells what channel is being sent and the next two digits are the data for that channel. Each frame will always have all six channels.

The data is encoded in each channel. Since two digits can have only 100 different values, equations must be used to decode the data into something useful (see illustrations). In addition to the equations, graphs are presented so that you can get approximate values. You can locate the received values on

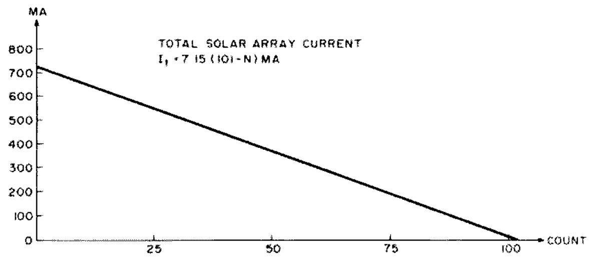

Fig. 1(a). Channel 1.

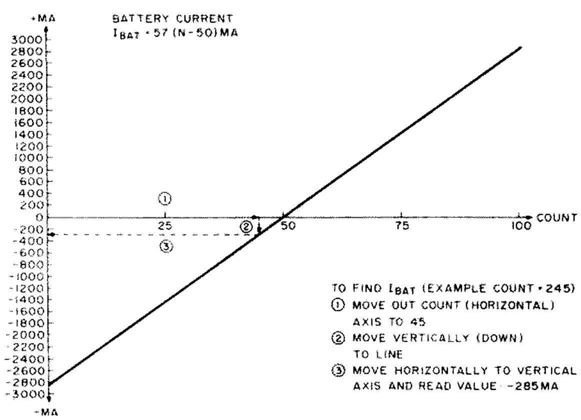

Fig. 1(b). Channel 2.

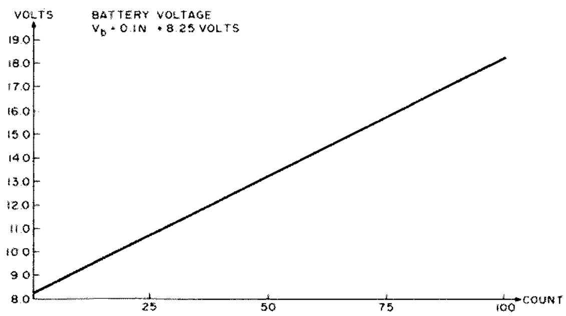

Fig. 1(c). Channel 3.

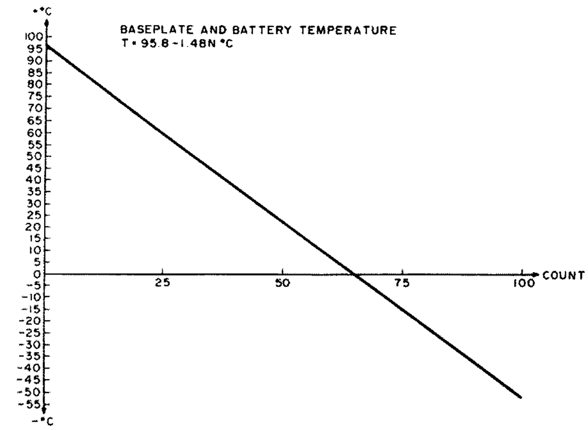

Fig. 1(d). Channels 4 and 5.

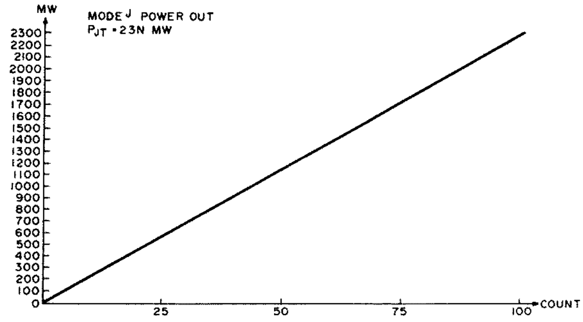

Fig. 1(e). Channel 6.

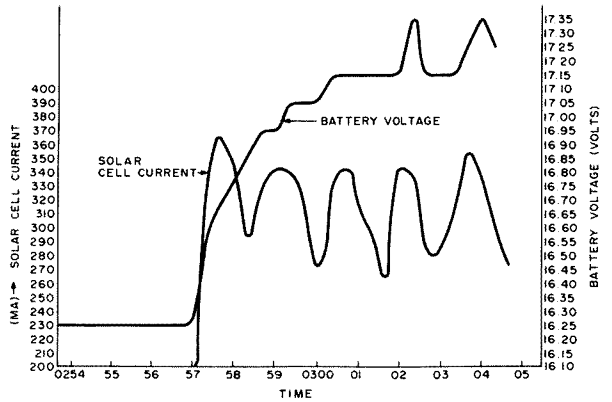

Fig. 2.

the horizontal axis and find the decoded values on the vertical axis—as is shown in Fig. 1(b).

Knowing the numbers still doesn't tell you what they mean. For instance, the 1xx sequence gives solar-cell current. Above, it was 0, but sometimes you may copy several sequences and the 1xx may change. This happens when OSCAR goes from light to dark or dark to light. Since this happens rather quickly, one should notice a dramatic change.

Once OSCAR is in the sunlight, a more subtle change should be noticed. The solar cells that are used to charge the batteries are mounted on the faces of the satellite. Thus, as it turns, the solar-cell output current will vary correspondingly. On April 17, 1979, during orbit 5683 (for example), I monitored the telemetry. I plotted the solar-array current (Fig. 2). The passage into the sun is clearly evident. Before passing into the sun, the 1xx data should be 00, 01, or 02. The 01 or 02 results from voltage offsets and counting errors. (Each channel is subject to a 1-count error.) Also, note any changes in the current resulting from the spin. As the sun shines on a corner, two sides are lighted, resulting in more current than if only one side were illuminated. Also, since there are four corners, there will be four current peaks per revolution. By looking at the graph in Fig. 2, we can see that OSCAR 8 was rotating once about every four or five minutes.

Channel 2 is a measure of the battery current. It tells how much current is flowing into the battery. When in the dark, with no solar-cell current, it will show how much current is being used by the satellite. This value, in conjunction with Channel 3 (battery voltage), can be used to determine the Mode A power output. Simply determine how many Watts the battery is delivering and then subtract 3 (the power consumed by the rest of the satellite except the Mode A transmitter). In my original example, the Mode A power is about 1.52 Watts (15.85 V times .285 A minus 3 Watts).

As mentioned, Channel 3 is the battery voltage. Out of curiosity, I plotted it along with the solar-cell current in Fig. 2. The rises in battery voltage corresponded to the peak current from the solar array, as one would expect.

Channels 4 and 5 measure temperature. Channel 4 is the base-plate temperature and 5 is battery temperature. The base-plate temperature will stay fairly constant when OSCAR is in the dark and will become warm in the sun. This warming will occur at various rates, depending on the angle of the sun in relation to the satellite.

The battery temperature can vary much more rapidly. As nicads are overcharged, their temperature rises. When in the sun, OSCAR will warm up from the sunshine and perhaps from battery heating as well. Battery temperature is important because high temperatures will cause cell damage. In space, there is no shade; thus, if the batteries start to overheat, something must be done to reduce charging current. This is most easily accomplished by putting the satellite into a high-power mode, such as Mode J, which draws more current from the battery.

Finally, Channel 6 is a measure of the Mode J power output. Naturally, it will show 00 (or 01 or 02 as does Channel 1) when in Mode A.

Working with the numbers once you have them isn't half as much fun as getting them. You must listen to OSCAR 8 as it makes a pass within range of your QTH. This procedure is covered well in other places, but if you are in the US, any evening Sunday through Thursday (except Tuesday) will be a Mode A night. Now, turn to the Table of Contents of your *73 Magazine* and find the page number for Satellites. By turning to that page you will find a listing of reference orbits for each day of the month (remember that

```
INPUT PARAMETERS

101.
245.
376.
449.
549.
601.

COMPUTED RESULTS

    0.     ITMA
 -285.     IBAT
15.85      VBAT
23.28      TBP
23.28      TBAT
    0.     PJT
```

Fig. 3. Output of program.

these dates and times are GMT). In general, you can hear two or three passes in any one evening. On Mode A, the telemetry is on 29.40 MHz. (The actual received frequency may vary a few kHz due to Doppler shift.) As OSCAR is approaching, the frequency will be high; it will be low as it is departing.

If your QTH is close enough to a particular orbit to hear OSCAR 8, you should hear some activity within one to five minutes after the predicted crossing time. The length of time that OSCAR is within range will vary, from less than five minutes to nearly twenty minutes.

One big problem with OSCAR is that it is addictive! I am torn between listening to either the telemetry or to QSOs. To help make the telemetry more fun, I wrote a program for my TI-59 calculator to perform the math needed to decode the data. For added interest and experience, the program that I wrote used the PC-100A print cradle with its 20-column thermal printer, providing an informative and permanent printout. The printout of the data in the first paragraph of this article is shown in Fig. 3.

Fig. 4 is a listing of the program. It is made up of three sections. Section 1, lines 000 through 029, is used to enter the data into the calculator memory for later use. In Section 2, lines 030 through 164, the OSCAR data is converted to the proper value. Lines 375 through 390 are a subroutine and are used to determine if the 1xx and 6xx values are very small, in which case they really should be 0.*

The last part, lines 165 through 374, is used to print out the answers. This is where the alphanumeric capabilities of the TI-59 are used. When printing out the

*Glassmeyer and Harris, *QST*, July, 1978.

Fig. 4. TI-59 program listing.

```
000  76 LBL
001  11  A
002  42 STO
003  11  11
004  91 R/S
005  76 LBL
006  12  B
007  42 STO
008  12  12
009  91 R/S
010  76 LBL
011  13  C
012  42 STO
013  13  13
014  91 R/S
015  76 LBL
016  14  D
017  42 STO
018  14  14
019  91 R/S
020  76 LBL
021  15  E
022  42 STO
023  15  15
024  91 R/S
025  76 LBL
026  16 A'
027  42 STO
028  16  16
029  91 R/S
030  76 LBL
031  10 E'
032  69 OP
033  00  00
034  43 RCL
035  11  11
036  75  -
037  01  1
038  00  0
039  00  0
040  95  =
041  71 SBR
042  34 √X
043  77  GE
044  45 YX
045  00  0
046  42 STO
047  21  21
048  61 GTO
049  33 X2
050  76 LBL
051  45 YX
052  07  7
053  93  .
054  01  1
055  05  5
056  65  ×
057  53  (
058  01  1
059  00  0
060  01  1
061  75  -
062  43 RCL
063  17  17
064  54  )
065  95  =
066  42 STO
067  21  21
068  76 LBL
069  33 X2
070  05  5
071  07  7
072  65  ×
073  53  (
074  43 RCL
075  12  12
076  75  -
077  05  5
078  00  0
079  75  -
080  02  2
081  00  0
082  00  0
083  54  )
084  95  =
085  42 STO
086  22  22
087  93  .
088  01  1
089  65  ×
090  53  (
091  43 RCL
092  13  13
093  75  -
094  03  3
095  00  0
096  00  0
097  54  )
098  85  +
099  08  8
100  93  .

101  02  2
102  05  5
103  95  =
104  42 STO
105  23  23
106  09  9
107  05  5
108  93  .
109  08  8
110  75  -
111  01  1
112  93  .
113  04  4
114  08  8
115  65  ×
116  53  (
117  43 RCL
118  14  14
119  75  -
120  04  4
121  00  0
122  00  0
123  54  )
124  95  =
125  42 STO
126  24  24
127  09  9
128  05  5
129  93  .
130  08  8
131  75  -
132  01  1
133  93  .
134  04  4
135  08  8
136  65  ×
137  53  (
138  43 RCL
139  15  15
140  75  -
141  05  5
142  00  0
143  00  0
144  54  )
145  95  =
146  42 STO
147  25  25
148  43 RCL
149  16  16
150  75  -
151  06  6
152  00  0
153  00  0
154  95  =
155  71 SBR
156  34 √X
157  02  2
158  03  3
159  65  ×
160  43 RCL
161  17  17
162  95  =
163  42 STO
164  26  26
165  98 ADV
166  00  0
167  00  0
168  00  0
169  00  0
170  02  2
171  04  4
172  03  3
173  01  1
174  03  3
175  03  3
176  69 OP
177  01  01
178  04  4
179  01  1
180  03  3
181  07  7
182  00  0
183  00  0
184  03  3
185  03  3
186  01  1
187  03  3
188  69 OP
189  02  02
190  03  3
191  05  5
192  01  1
193  03  3
194  03  3
195  00  0
196  01  1
197  07  7
198  03  3
199  07  7
200  69 OP

201  03  03
202  01  1
203  07  7
204  03  3
205  05  5
206  03  3
207  06  6
208  00  0
209  00  0
210  00  0
211  00  0
212  69 OP
213  04  04
214  69 OP
215  05  05
216  98 ADV
217  43 RCL
218  11  11
219  99 PRT
220  43 RCL
221  12  12
222  99 PRT
223  43 RCL
224  13  13
225  99 PRT
226  43 RCL
227  14  14
228  99 PRT
229  43 RCL
230  15  15
231  99 PRT
232  43 RCL
233  16  16
234  99 PRT
235  98 ADV
236  00  0
237  00  0
238  00  0
239  00  0
240  01  1
241  05  5
242  03  3
243  02  2
244  03  3
245  00  0
246  69 OP
247  01  01
248  03  3
249  03  3
250  04  4
251  01  1
252  03  3
253  07  7
254  01  1
255  07  7
256  01  1
257  06  6
258  69 OP
```

input data, a header is printed. This is accomplished by filling the print buffer with 40 numbers that correspond with the 20 characters that are to be printed (two numbers per character; sorry, not ASCII) and then issuing a print command (lines 166 through 215). In lines 217 through 234, the values are recalled and printed.

Another handy feature of the TI-59/PC-100A is the ability to print 4-character subscripts. The calculated data is output this way in lines 287 through 373 (236 to 285 are used to print the output header). This is done by putting the eight numbers which correspond to the characters in the subscript into the right-most segment of the print buffer, recalling the data from memory, and then printing the line.

I am glad that I had to tell the TI-59 how to do all this only once! From now on, I will just read the program in on a mag card. ■

```
259  02  02
260  00  0
261  00  0
262  03  3
263  05  5
264  01  1
265  07  7
266  03  3
267  06  6
268  04  4
269  01  1
270  69  OP
271  03  03
272  02  2
273  07  7
274  03  3
275  07  7
276  03  3
277  06  6
278  00  0
279  00  0
280  00  0
281  00  0
282  69  OP
283  04  04
284  69  OP
285  05  05
286  98  ADV
287  02  2
288  04  4
289  03  3
290  07  7
291  03  3
292  00  0
293  01  1
294  03  3
295  69  OP
296  04  04
297  43  RCL
298  21  21
299  69  OP
300  06  06
301  02  2
302  04  4
303  01  1
304  04  4
305  01  1
306  03  3
307  03  3
308  07  7
309  69  OP
310  04  04
311  43  RCL
312  22  22
313  69  OP
314  06  06
315  04  4
316  02  2
317  01  1
318  04  4
319  01  1
320  03  3
321  03  3
322  07  7
323  69  OP
324  04  04
325  43  RCL
326  23  23
327  69  OP
328  06  06
329  03  3
330  07  7
331  01  1
332  04  4
333  03  3
334  03  3
335  00  0
336  00  0
337  69  OP
338  04  04
339  43  RCL
340  24  24
341  69  OP
342  06  06
343  03  3
344  07  7
345  01  1
346  04  4
347  01  1
348  03  3
349  03  3
350  07  7
351  69  OP
352  04  04
353  43  RCL
354  25  25
355  69  OP
356  06  06
357  03  3
358  03  3
359  02  2
360  05  5
361  03  3
362  07  7
363  00  0
364  00  0
365  69  OP
366  04  04
367  43  RCL
368  26  26
369  69  OP
370  06  06
371  98  ADV
372  98  ADV
373  98  ADV
374  92  RTN
375  76  LBL
376  34  ΓX
377  42  STO
378  17  17
379  03  3
380  32  X:T
381  43  RCL
382  17  17
383  77  GE
384  35  1/X
385  00  0
386  42  STO
387  17  17
388  76  LBL
389  35  1/X
390  92  RTN
```


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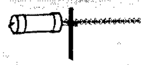

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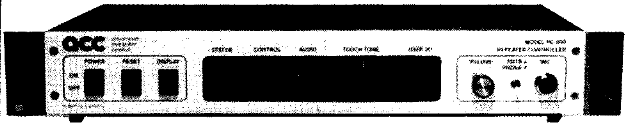

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Scandinavia: The 2-Meter Dream Vacation

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Pack your bags for a great Scandinavian vacation! The land of the midnight sun beckons and it's more fun with 2 meters. If you want to take that rig with you, plan in advance.

Getting Your Licenses

You need sufficient time for processing through the FCC, the Scandinavian authorities, and for any international mail delays. Allow 6 months if possible. Send the ARRL (225 Main Street, Newington, Connecticut 06111, Attn: International Affairs) an 8½" by 11" SASE and they will send you application forms for each country. If time is short, Fig. 1 is a form which includes all of the necessary information for each country. The address for each licensing authority is also given.

For each country (except Finland, where the form is sent directly to SRAL), send the completed form to the FCC requesting endorsement and forwarding. Enclose a stamped airmail envelope addressed to the proper foreign authority. If you furnish an SASE, the FCC will confirm the date on which your papers were mailed. Send to: FCC, PO Box 441, Gettysburg, Pennsylvania 17325.

TO: (See Below for Addressee)

APPLICATION FOR PERMISSION TO OPERATE AN AMATEUR RADIO STATION IN ____________ (Country)

I, the undersigned, hereby respectfully apply for a temporary permit or license to operate an amateur radio transmitter in ____________

License period requested: ____________
Name in full: ____________ Occupation ____________
Address in my own country: ____________
Date and place of birth: ____________
Nationality: ____________
Call Sign: ____________ License Class: ____________ Expires: ____________
Address in ____________: ____________
Vehicle Registration Number: ____________
Mailing Address of Fixed Station: ____________
Object of stay: ____________
References in ____________: ____________
Member of following amateur organization: ____________
Place and date: ____________
Signature: ____________

Opinion of applicant and comments or endorsement by licensing authority of home country:

General Directorate of
Post and Telegraphs
1st Technical Office
17, Farvergade, 1st Floor
DK-1007 Copenhagen K
DENMARK

Norwegian Telecommunications
Administration
Postboks 6701 St. Olavs pl.
Oslo 1, NORWAY

Swedish Telecommunications
Administration
Radio Department, Stockholm
Licensing Section
S-123 86 FARSTA
SWEDEN

SRAL
P.O. Box 306
SF-00101 Helsinki 10
FINLAND

Fig. 1. Sample form for requesting license to operate in a foreign country.

Look for me on 2m as I drive around Scandinavia in April. I'm open for ham talks in Copenhagen 3-5th April; Oslo, 6-9th; and Stockholm, 10-13th. If there is any interest, please get in touch.—Wayne Green W2NSD/1.

Denmark. Application should be filed at least a month before the requested license period. Attach a photocopy of your license. Within a few weeks you will receive the license and a payment form. When you arrive in Denmark, go to the nearest post office, pay the fee (only 20 kroner for a short stay), and your license is then valid. A temporary license will be issued for up to three months.

In Copenhagen, there is 24-hour service at the post office in the Central Railroad Station. This is right in the center of the city, next to Tivoli Gardens.

When applying for your license in any country, if you do not know the exact dates of your arrival and departure, allow a few extra days on each end. If you have no references in the country, enter "none" on the reference line.

Norway. In addition to a copy of your license, Nor-

REPEATER CHANNELS

Channel #	Receive Frequency*
R0	145.600
R1	145.625
R2	145.650
R3	145.675
R4	145.700
R5	145.725
R6	145.750
R7	145.775
R8	145.800
R9	145.825

*Transmit 600 kHz down

SIMPLEX CHANNELS

145.250 to 145.575 at 25-kHz spacings
145.500 used as calling frequency
145.550 mobile channel
145.525 and 145.575 probably most used simplex channels other than 145.500

Fig. 2. Two-meter repeater and simplex channels most frequently used.

STANDARD

	Receive*
R1	434.600
R2	434.625
R3	434.650
R4	434.675
R5	434.700
R6	434.725
R7	434.750
R8	434.775
R9	434.800
R10	434.825

*Transmit 1.6 MHz lower

SWEDISH

	Receive**
RU0	437.600
RU1	437.625
RU2	437.650
RU3	437.675
RU4	437.700
RU5	437.725
RU6	437.750
RU7	437.775
RU8	437.800
RU9	437.825
RU10	437.850
RU11	437.875
RU12	437.900
RU13	437.925
RU14	437.950
RU15	437.975

**Transmit 4.6 MHz lower

Fig. 3. UHF repeater channels.

way requires a "certificate of good conduct" from your local police department. This can be a letter on police department stationery stating that you are of good character and reputation and that the police know of no reason why you should not be issued an amateur license in Norway. Your application should be on file at least a month before the operating period requested. A temporary license will be issued for up to three months.

The fee of 50 Norwegian kroner must be sent with your application. Buy an international draft or money order payable in Norwegian currency. If you send a personal check or dollar instrument, you may cause substantial delay or return of your application. I suggest that you staple *all* of the documents together.

Sweden. A police good-conduct letter is required for Sweden just as in Norway. Your application should be filed at least two months prior to the requested license period. The Swedish authorities will send you a license with a request for any fees. Fees can be paid by mail or upon arrival in Sweden at a post office. The fee will vary with the length of the requested license period.

Finland. The amateur society, SRAL, handles all license applications. SRAL tells you to allow at least 4 to 8 weeks, more in summer, for issuance. It took me considerably longer than 8 weeks. If your license is for less than one month, a fee of 58 markka must be paid with your application. This includes the processing charge by SRAL. For a license for more than a month, you must join SRAL and the fee is higher. The maximum temporary license period is three months, subject to renewal. Your mailing address in Finland must be given exactly. This may be the address of your hotel.

You must furnish a copy of those pages of your passport containing personal data and of your amateur license certified by two signatures. I photocopied my amateur license and the pages of my passport with my name, date of birth, etc., and my picture onto a single sheet. At the bottom I typed this certification: "Each of the undersigned certifies that he has examined original passport No. ______ and the amateur radio license of Charles R. Perelman and that the above are true and correct copies. Executed on______, 1981, at Beverly Hills, California, under penalty of perjury." Two signatures followed.

Each country will send you a translated copy of rules and regulations. Your license will bear your home call with the appropriate country designation, for example: WA6OGW/OZ. Low-band and UHF privileges will depend upon the class of license you hold in your home country. In Denmark, Norway, and Sweden, you

QTH	Channel
DENMARK	
Verhoj	R0
Ringsted	R1
Esbjerg	R2
Alborg	R2
Bornholm	R2
Hvidovre	R3
Yding Skovhoj	R3
Odense	R4
Copenhagen	R4
Thy	R4
Kvinsbjerg	R5
Vejby	R5
Ostervold	R6
Lysnet	R6
Lindeballe	R7
Herning	R8
Arhus	R9
Fredrikshavn	R9
Sakskobing	R9
NORWAY	
Oslo	R0
Horten	R1
Rinsaker	R1
Flekkefjord	R1
Grenland	R2
Kongsvinger	R2
Oslo stad	R2
Harstad	R2
Hallingdal	R2
Trondelag	R3
Ringkollen	R3
Sandnes	R3
Arendal	R4
Kongsberg	R4
Drammen	R5
Egersund	R5
Gudbrandsdal	R5
Bergen	R6
Oslo, Enebakk	R6
Bodo	R6
Kristiansand	R6
Tromso	R6
Vardo	R6
Trondheim	R6
Sondeled	R7
Stavanger	R7
Sandefjord	R8
Vestland, Stord	R8
Tromso Fjellheisen	R8
Telemark	R9
Follo S. Oslo	R9
FINLAND	
Turku	R0
Helsinki	R1
Pietarsaari	R1
Kotka	R2
Antari	R2
Mariehamn	R3
Lahti	R3
Seinajoki	R3
Jyvaskyla	R4
Salo	R4
Pori	R5
Kuusankoski	R5
Espoo	R6
Tampere	R6
Vaasa	R6
Lappeenranta	R7
Turku	R7
Hameenlinna	R8
Kuopio	R8
SWEDEN	
Bjorna	R3
Bollnas	R2
Boras	R8
Bracke	R4
Backefors	R4
Edsbyn	R0
Falkenberg	R1
Falkoping	R5
Falun	R8
Gladsaxe	R0
Glommerstr.	R6
Gallivare	R2
Goteborg	R2
Hagfors	R0
Halmstad	R9
Helsingborg	R2
Hudiksvall	R7
Hallnas	R2
Harnosand	R1
Jonkoping	R6
Kalix	R5
Kalmar	R8
Karlskoga	R6
Karlskrona	R6
Karlstad	R3
Katrineholm	R3
Kiruna	R8
Kramfors	R0
Kristineberg	R3
Kungsbacka	R7
Kyrktasjo	R5
Linkoping	R8
Ludvika	R5
Lulea	R8
Lycksele	R7
Lysekil	R0
Mariefred	R9
Motala	R1
Malmo	R7
Norberg	R3
Norrkoping	R0
Nykoping	R4
Nassjo	R2
Olofstrom	R1
Orsa	R6
Oskarshamn	R5
Pitea	R0
Sanviken	R4
Skelleftea	R4
Skovde	R9
Solleftea	R2
Solna	R5
Sorsele	R0
Stockholm	R1
Stockholm	R8
Storuman	R5
Sundsvall	R8
Sunne	R7
Tanumshede	R3
Tranas	R7
Tarnaby	R2
Ulricehamn	R3
Umea	R8
Uppsala	R6
Vetlanda	R9
Vilhelmina	R4
Visby	R6
Vimmerby	R1
Vargarda	R1
Varnamo	R0
Varobacka	R4
Vastervik	R3
Vasteras	R7
Vaxjo	R4
Vannas	R5
Ystad	R8
Orebro	R2
Ornskoldsvik	R7
Ostersund	R6

Note: Above are in alphabetical order. In Swedish, the letters a and o with special phonetic marks come at the end of the alphabet. I could not print these marks.

Fig. 4. Two-meter repeaters in Scandinavia.

are permitted to work mobile. Although local amateurs have been working diligently to obtain this privilege for visiting amateurs in Finland, at this time non-residents are not permitted to operate mobile in Finland.

Gear to Pack

If you are traveling other than by car, a synthesized handie-talkie would certainly be the most versatile rig. In the older crystal-controlled radios, the Kenwood TR-2200 (same as the Drake TR-22) with sockets for 12 channels will permit you to crystal up for the 10 repeater channels and two popular simplex channels. However, unless you already have some of the crystals on hand, the cost of all those rocks will probably convince you to buy a synthesized rig.

Scanning is useful, particularly if you will be operating mobile. Even though you may have looked up the local repeater frequencies, changes do occur; you may not know exactly where some of the repeater sites are located or the extent of coverage of some repeaters, or you may desire to check simplex channels.

I suggest that you take the following in addition to your 2-meter rig:

- Mag mount and cigarette-lighter power-supply cord for mobile use.
- Quarter-wave or 5/8-wave telescoping antenna for HT. You may be in a poor location or want to extend the range beyond that feasible with a rubber ducky.
- Shortened or flex-type rubber ducky. If you carry the HT on your belt, both the rig and antenna are less likely to be damaged if either of these types of antennas are substituted for the regular rubber ducky.
- Battery charger and transformer or solid-state converter for 220 volts to 110 with sufficient wattage rating. Conversion plug with large round prongs. Some hotels furnish a 110 outlet for shavers which can be used to charge HT batteries. Ordinary wall outlets are 220 volts, 50 cycles requireing the round prongs and converter or transformer.
- 1750 tone burst with duration of at least 1 second. Some repeaters are carrier-operated. Most require the 1750 tone burst. Length of burst required appears to be longer than typical in some other parts of Europe. You may be able to obtain a whistle from a friend in Scandinavia which will produce the 1750 tone. It looks like a single pitch pipe.

If you are a good whistler, unless your musical talents are sufficient to approximate 2 octaves higher than A (440 Hertz) above middle C, the technique is to start high and slowly descend in pitch to be sure you've covered the right frequency. This sounds something like the second part of the whistle when you gaze approvingly at one of the local beautiful blonde blue-eyed YLs. If all else fails, you can still get into the repeater after a local ham has accessed it with the tone burst.

- Earphone. There are times when people on a bus, the street, or elsewhere may not take too kindly to the sounds of the QSO you may be holding with a local amateur. This is particularly true if there is a lot of noise coming in with his signal. The earphone solves these problems.

To avoid possible customs questions, either upon entry into one of the Scandinavian countries or when returning to the US, it is a good idea to register your radio gear (and cameras as well) with US customs. Call your local customs office to find the location for this service. It only takes a couple of minutes to fill out the form which will be stamped and inserted into your passport. In Los Angeles this can be done at a little cubicle on the second floor of Los Angeles International Airport.

Repeater Frequencies

Fig. 2 lists the repeater frequencies and most-often-used simplex frequencies for 2 meters. Fig. 3 contains information on UHF repeaters. Most of these are located in Sweden and follow the Swedish band plan with a 4.6-MHz separation rather than the typical 1.6-MHz separation used elsewhere. With my Kenwood 2400, I found it most convenient to program the 10 repeater channels into memories 0 through 9. Scanning the memory channels would then locate an active repeater. As in the United States, the repeaters are busier in the morning just before working hours and in the evening than they are during the working day. However, the level of activity appears to be considerably less than on a busy repeater in one of our metropolitan areas.

During the summer months, working hours often begin at 7 or 8 am and end by 4 pm. The first three weeks in July are usually an "industrial holiday," vacation for much of the work force. This often means deserting the city for a cottage in the country or at the coast. If you want to be sure to make contact with a particular ham, by all means arrange your meeting in advance. Use the low bands or a letter before your trip to be sure of his or her location when you will be in his country.

Fig. 4 contains information on the location of 2-meter repeaters in each of the Scandinavian countries. With the harsh winters, antennas are often damaged so that some of the stations may be off the air at times. Fig. 5 shows locations of UHF repeaters.

Enjoying Your Fellow Hams

For information on everything from directions to a Chinese restaurant (yes, there are some in Scandinavia) to an interesting art exhibit, try your friendly local repeater. As elsewhere in Europe, many of the hams save pins, banners, or patches from radio societies of other countries. This kind of item makes a nice token

QTH	Channel
DENMARK	
Lindeballe	RU0
Copenhagen	RU0
Ringsted	RU1
Alborg	RU2
Esbjerg	RU2
Copenhagen	RU3
Fredericia	RU3
Se nedan	RU4
Knivsbjerg	RU5
Arhus	RU5
Yding Skovhoj	RU6
Purhoj, Horsens	RU7
Hillerod	RU7
Randers	RU8
Copenhagen	RU8
Sakshobing	RU8
Abenra	RU8
Nord-Fyn	RU9
Copenhagen	RU9
NORWAY	
Kongsvinger	RU1
Horten	RU2
Bergen	RU4
Gjovik	RU6
Oslo	RU7
FINLAND	
Salo	RU4
SWEDEN	
Bollnas	SRU2
Eskilstuna	SRU10
Falun	SRU8
Halmstad	SRU9
Helsingborg	SRU2
Hudiksvall	SRU7
Hono	SRU10
Karlstad	SRU7
Kungsbacka	SRU4
Linkoping	SRU8
Lund	RU5
Mariefred	SRU9
Sandviken	SRU4
Solna	SRU5
Stockholm	SRU1
Stockholm	SRU2
Stockholm	SRU8
Vasteras	SRU7
Orebro	SRU2

Fig. 5. UHF repeaters in Scandinavia.

gift. Yaesu and Kenwood rigs are widely used and you make a friend for life by obtaining a needed service manual for a Scandinavian ham. If a radio friend is contemplating a trip to the US, he may appreciate a repeater directory or road maps. An auto club is the best source for maps.

I think the most enjoyable contact in a foreign country is with a ham with whom you've talked on the low bands. When your itinerary is firm, set up a definite rendezvous. You will probably learn more about life in that country in an evening than during the rest of your trip.

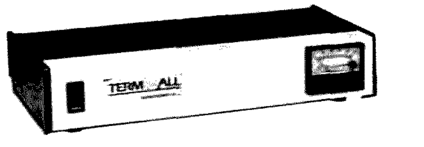
Chance contacts resulting in bending elbows together at one of the local pubs can make new friends and be a lot of fun as well. However, alcohol and driving definitely don't mix in Scandinavia. Penalties for driving with even a very small quantity of alcohol in the blood are severe. Therefore, expect your friend to pass up the beer for a soft drink if he is driving.

In Copenhagen, don't be surprised to have Swedish stations from Malmo, Falkenberg, or some of the other southern towns come back to you through the local repeaters. In Finland, the repeaters in the less populous parts of the country, north of Hameenlinna, Tampere, and Lahti, may not be operational from time to time. You should check this out through low-band QSOs if you are planning to travel in the more northerly areas.

Two meters can be your key to opening up better paths of understanding of the beautiful countries and people of Scandinavia. Plan ahead, make new friends on the low bands, and have the fun of eyeball QSOs far from home. You will learn more, have more fun, and have some unforgettable memories through the power of amateur radio. ■

TERMINALL

RADIO MODEM



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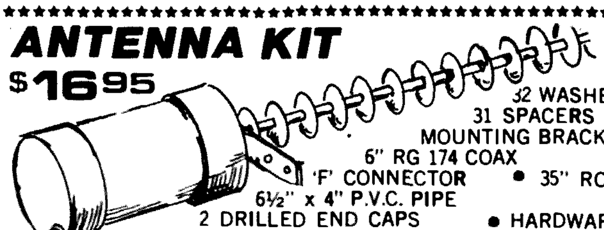

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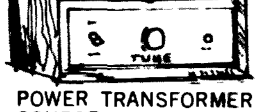

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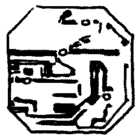

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✔146

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Oklahoma City OK 73135

Twisted Remote Control

This circuit is easy to build and easy to use.
The twist is that you probably own the most important part.

Described here is a simple and inexpensive remote-control system, the major component of which you probably already have on hand: an AM-FM receiver, either portable or table model. As with any remote-control system, it has many uses. It may be used as a television commercial killer, to turn on or off a distant light, etc.

If you have tried to build any of the light-operated-relay type of remote-control devices in the past, you must surely have noted two distinct disadvantages of that type of system: 1) They are usually very sensitive to ambient light levels and therefore difficult to adjust, and 2) You must be able to see the device in order to control it. Since this system uses radio waves as the controlling medium, these drawbacks are readily overcome.

Receiver-Transmitter

It is certainly not difficult to generate a low-power rf signal that can be used for remote control, but the difficulty begins when trying to design and build a receiver with sufficient gain to amplify the low-power signal to a usable level. To circumvent this problem, a conventional table model or portable-type AM-FM receiver can be used along with a tone-modulated FM wireless microphone to generate the control signal.

Switching Circuit

With the problem of the receiver-transmitter solved, all that is needed is a switching circuit that can be operated by an audio tone taken from the receiver. The circuit shown in Fig. 1 does this job very nicely.

The heart of the switching circuit is U2, the CMOS 4027 J-K flip-flop. This particular type of flip-flop has the unique characteristic that if both the J and K inputs are held in a high state and a clock pulse is applied to the clock input, the output will toggle to a high or low depending on its previous state. The output will continue to toggle back and forth as long as clock pulses are applied to the clock input.

Referring to Fig. 1, assume that the output of U2 is in a low state and Q2 is off. Also assume that the primary of T1 is plugged into the earphone jack of an FM receiver tuned to the operating frequency of the wireless microphone. When the transmitter (wireless microphone) is momentarily turned on, an audio pulse is applied to the primary of T1. This audio pulse is then rectified and used to forward bias Q1. With Q1 momentarily turned on, a negative-going trigger pulse is seen at the trigger input of U1 (used here as a one-shot).

This trigger pulse causes the output of U1 to switch to a high state where it will remain for a period of time determined by the series combination of R1 and C2 (in this case about 1 second). This positive-going

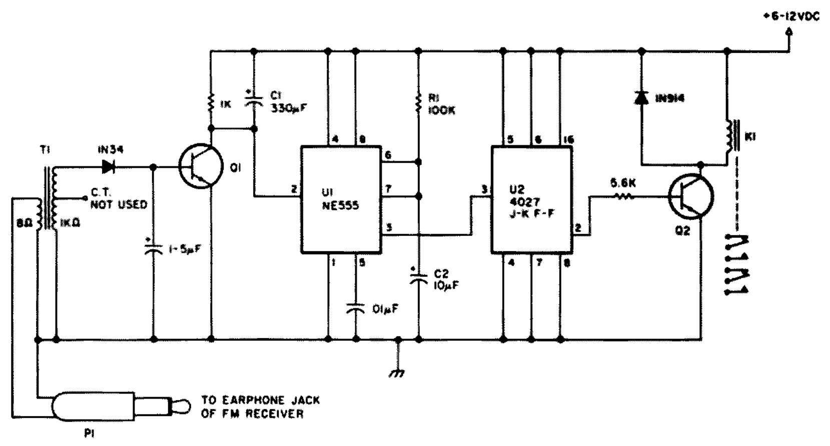

Fig. 1. Schematic diagram of the switching circuit. The transistors and transformers used in both circuits are 2N2222 or Radio Shack 2009 and Radio Shack 273-1380, respectively.

pulse at the output of U1 is applied to the clock input of U2, causing the output of U2 to toggle to a high state which turns on Q2 and energizes relay K1. The output of U2 will remain high until another pulse is applied to the clock input, at which time it will toggle back to its original low state.

Since the limiting action of most inexpensive FM receivers is not what it should be, C1 (connected across the Q1 collector resistor) is included to prevent possible false triggering caused by noise spikes from the output of the receiver.

No power supply is shown in Fig. 1, since these have been extensively covered elsewhere in the ham literature. As shown, any voltage from 6 to 12 volts will work. The amount of supply voltage you decide to use will depend upon the voltage rating of the relay you purchase, or that of one you may have on hand.

It should be mentioned here that the receiver you use must have some type of external antenna, and an earphone jack. If your receiver has no earphone jack, one must be added, which is simple to do using a three-conductor phone jack.

Transmitter Circuit

The FM wireless microphone circuit shown in Fig. 2 was originally published in the April, 1969, issue of *Popular Electronics*. The circuit, as shown in that issue, used an RCA KD-2114 linear IC for the active device but discrete transistors were used here since they were more readily available. The circuit is shown here with one modification; the microphone input network has been replaced with a simple tone-generating circuit composed of R1, C1, Q1, and T1. It has an output of about 800 Hz and provides the necessary control signal.

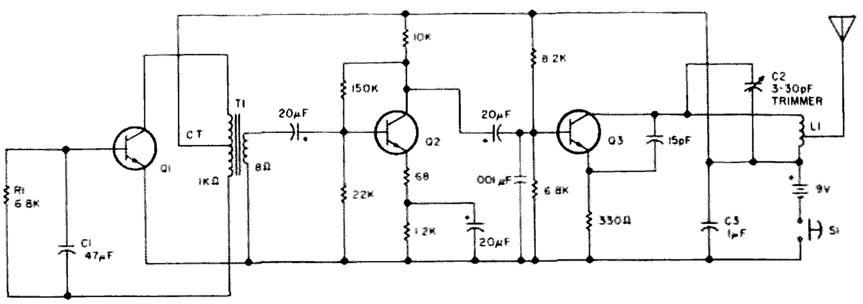

Fig. 2. Schematic diagram of the transmitter. See text for L1 dimensions.

Switching Unit and Transmitter Construction

The switching unit can be built most easily using perfboard construction, and sockets should be used for both U1 and U2, in case replacement becomes necessary. The unit may be enclosed in any type of case you may have on hand.

Perfboard construction also may be used for the transmitter, although I have used the PC board square block method with good success. This means using a hacksaw to cut the foil side of a piece of PC board into squares and mounting the components on the squares. Placement of parts in the transmitter is not too critical, but an orderly in-line layout ought to be used. The connections in the rf portion of the circuit should be kept as short and as direct as possible.

Coil L1 consists of 6 turns of #12 tinned copper wire with an inside diameter of 5/16 inches and spread to 3/4 inches in length. The antenna tap is made one and one-half turns from the cold, C3, side, and tuning capacitor C2 is soldered directly to the top and side of the first and last turns of the coil. Coil L1 should be mounted as firmly to the board as possible to enhance frequency stability. The antenna can be fashioned from a piece of heavy-gauge copper wire, and can be anywhere from 3 to 12 inches in length. A plastic case similar to those sold by Radio Shack can be used for housing the transmitter.

Test and Adjustment

First, the transmitter should be tested and adjusted to a clear operating frequency. To do so, turn on your FM receiver and tune for a clear spot on the dial. The afc should be turned off, if possible, to prevent the receiver from tuning automatically to a strong adjacent channel. Once a clear spot is found, apply power to the transmitter and adjust tuning capacitor C2 until an audio tone is heard from the receiver. Now, either continue adjusting C2 or vary the tuning of the receiver until the purest tone possible is obtained.

The switching unit may now be tested for proper operation. Plug P1 into the earphone jack of your FM receiver and apply power to the switching unit. At this point, the volume control of the receiver should be set at some low level. Each time the transmitter is momentarily activated, the relay on the switching unit should energize and stay energized until a second pulse is transmitted, at which time it will return to its normally-closed position. The volume control may have to be increased a small amount to ensure reliable operation at a distance.

If the switching unit does not operate as just described, then either a wiring error has been made or one of the active devices is defective.

The range of the transmitter will vary with operating conditions and depends to a certain extent upon the orientation of both the transmitting and receiving antennas. It has been my experience that reliable operation can be had with distances up to 75 feet.

Summary

The uses that may be found for this simple system are many and are limited only by your imagination. If you happen to own a video tape recorder and like to record movies *without* the commercials, then this remote-control system can be used to pause the recorder and to cut them out. It could also be used as a commercial killer for the television itself. To use it this way, one of the television's speaker leads is broken and connected to a set of the relay's normally-closed contacts. In fact, you might even connect your ham-band receiver's mute terminals to the relay's other set of contacts, and that way be able to listen to it while the television sound is off.

There are, undoubtedly, many other applications that can be thought of, but whatever you may use it for, always be careful to observe the relay's contact power rating, otherwise an expensive relay may be ruined. ■

Reader Service for facing page ✓15 →

Take Your IC's Temperature

Like people, solid-state devices get sick if they get too hot. W3KBM provides a way to answer the burning question, "How hot is hot?"

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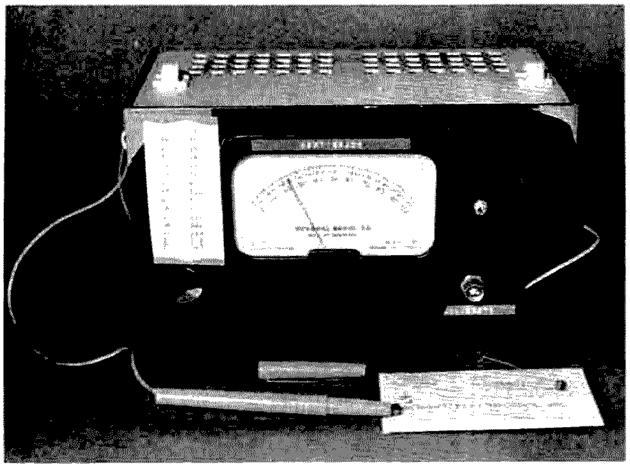
By now solid-state devices are old hat. We all know that too much heat is one good way to send such a device to semiconductor heaven. Since touching a hot transistor or IC with a finger either makes for one big "ouch" or leaves the question of "How hot is it?" largely unanswered, here is some surplus to the rescue.

Digital Research of Garland, Texas, has advertised "Thermistors . . . 5000 Ohms at 25 degrees centigrade," four for a buck. Upon arrival they proved to be Fenwal KA35J3 thermistors.

A quick trip to Herbach and Rademan in Philadelphia produced a surplus cabinet and a nice 200-microampere meter with a scale calibrated from 0 to 100. With the addition of very few parts, this collection was turned into a solid-state centigrade thermometer that allows me to answer "How hot is my IC?" very adequately.

The schematic in Fig. 1 shows the simplicity of the electrical hookup. Resistors R1 and R2 of the bridge should be as closely matched in value as possible. They can range from 4700 to 5000 Ohms; the important part of the matter is that they be as alike in value as possible.

Photo by Ira Joffe WA3PTC



Completed meter with probe attached.

Resistor R3 should be as close to the indicated 15k as you can get. The significance of R3 lies in the fact that at zero degrees centigrade the thermistor resistance will be rather close to this value. My four samples checked out this way as indicated by a fairly good digital meter. Thus, at zero degrees, the bridge will be balanced and the meter should read zero. Taking this route eliminates the need for a low-end calibrating element in the circuit. I used a fresh D-cell to drive the bridge; since the current drain is very low, the useful life of the battery should approach its shelf life.

My meter is 200 microamperes full scale, which is about the practical limit of usable sensitivity in the upward direction. That is to say, if you have a more sensitive meter, then use it, but avoid using a less sensitive meter. The reason for this is that even small currents flowing through the thermistor tend to produce "self heat" which changes its ohmic value just as much as heat from a device being measured. If you use a 50-microampere movement, you may have to increase the value of the variable resistor in series with the meter movement. This resistor is used as the sole calibrating element for the thermometer.

The photo shows the finished meter with its probe and also an unmounted thermistor which gives an indication of the size of this circuit element.

Now for some notes on the probe construction. The body of the probe was made from a discarded fiber-tipped type of marker such as a Flair or other brand. The point was pulled off and the residual ink was carefully wiped out of the barrel. I say carefully as there is enough ink left to ruin several sets of clothes, soil your hands, and provide some interesting comments from the family if care is not used in this regard.

The sides of the thermistor are painted with clear nail polish where the leads are attached. The same treatment is given to the first half inch of lead length near the body of the thermistor after a suitable length of cable

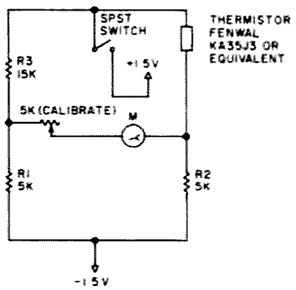


Fig. 1. Schematic diagram of meter.

has been soldered to the extreme ends of the leads.

The cable is then threaded through the empty pen body and the thermistor is checked for a good snug fit in the open end as shown in the photo. If you have to ream out the end a bit to achieve a snug fit, by all means do so. When this has been done, pull the thermistor and cable out an inch or so and work some artificial rubber compound like GE silicone seal into the end of the probe barrel. Pull the thermistor back in, seat it nicely, and put the assembly aside to dry. You may also want to use the silicone seal in the end of the probe from which the cable exits to provide a bit of strain relief. That is all there is to the probe.

When the construction of the probe and associated circuitry is finished, turn on the switch and the meter should be reading somewhere about 20 to 25 degrees on the meter face. Turning the calibration control should allow a meter variation of about eight to ten degrees total.

It may pay to make a "big deal" out of the initial calibration so you can see that it works. The big deal is as follows. Obtain a reliable thermometer such as a unit used to check the temperature of photographic solutions. Fill a jar with hot water from the kitchen tap. Check its temperature with your known good thermometer. Add a bit of cold water if necessary to get the water to about 120 to 125 degrees Fahrenheit. After this thermometer reading has stabilized for about one minute, gently place your thermistor probe into the water so that it just dimples the surface of the water. Give the meter a chance to settle to a reading, which may take as much as thirty seconds to ensure that a maximum has been reached. Multiply your meter reading by 1.8 and add 32 to the result to convert the meter reading to Fahrenheit degrees as shown on your comparison thermometer. If it is high or low, make an adjustment with the calibrating pot so that the two readings coincide.

If you do not want to go through the "big deal" version of calibration, then use one of the best thermal standards around. That standard is you and the normal temperature of your body, which is just about 98.6 degrees Fahrenheit or 37 degrees centigrade. Touch the tip of the probe to your tongue and hold it there until the meter reading stabilizes. Set the calibration control for a reading of 37 degrees on the meter and you are done. This is one instrument where you will never lose the source of calibration.

Do not use this thermistor thermometer to take the temperature of hot liquids. Use it for its intended purpose of measuring the temperature of ICs and discrete semiconductors. When you do this, I suggest that you take a small bit of thermal compound such as you would use on a power transistor to make sure that it is in good thermal contact with a heat sink. Place this on the semiconductor or IC of interest and then apply the probe tip to it so that you have good thermal contact with the subject at hand. This should give you reliable comparative readings. You can easily see the effect of different sizes and materials of heat sinks in terms of getting rid of heat from the power devices. Please note the use of the phrase "reliable comparative" readings. This simple device will not put the National Bureau of Standards out of work, but it is a nice adjunct to aid any ham working with power semiconductor devices. ■

THE RTTY ANSWER

IRL

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The Q-Master Cavity Filter

A high-Q filter that uses no copper and no silver-plating—just coffee cans and some ingenious thinking.

A few months ago, some experimental work I was doing with a low-power, home-brew repeater system required a sharp filter to restrict the bandwidth of the signal presented to the antenna terminals of the receiver section, particularly at the transmitter frequency. Since the cost and availability of commercially-produced cavities were prohibitive, I decided to research the problem and see if I could make my own.

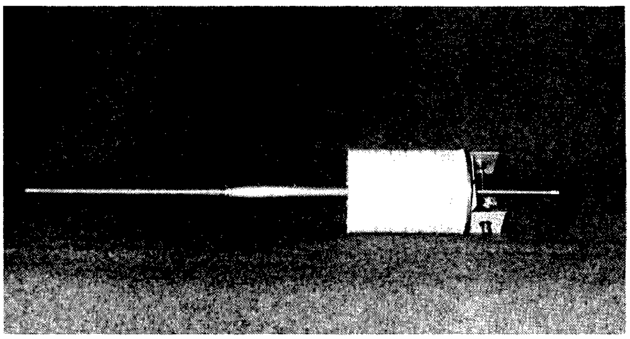
Several of the amateur publications, engineering texts, and reference books in my library discussed the subject (see reference list at end of article); some even gave dimensions and bills of materials. Since I live in a somewhat remote part of the Pacific Northwest, availability of many of the materials specified and machining services required was a problem. I decided that I should tackle the problem with the idea of using only readily-available parts and home-brew construction techniques and see what could be done. This is the story of that effort.

First, it was necessary for me to determine just how a cavity operates and what the critical conditions were. Research showed that the cavity is merely a tuned circuit, consisting of a quarter-wave stub centered in an enclosure. The combination results in a well-shielded, high-Q filter when inserted in series with the transmission line. As with any tuned circuit, the circulating currents are quite high at resonance, so losses must be kept low to ensure high Q. The losses are generally the result of the resistance of the materials from which the cavity is made. For this reason, most commercial units are made of brass or copper and silver-plated.

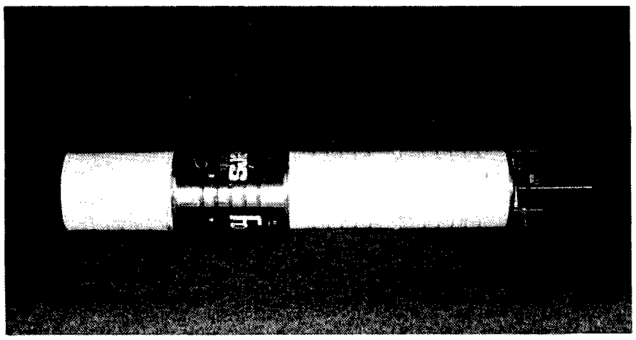
Coupling into and out of the cavity can be accomplished by any of several means, but the most common is inductive coupling, whereby small loops are positioned near the inner stub and act as transformer windings in relation to it. The loops are mounted on opposite sides of the stub so that there is minimum direct coupling between them. Thus, the input loop induces the signal into the stub (which is, remember, part of a resonant circuit), and the stub in turn induces the signal into the output loop. Since the response of the resonant circuit is appreciable only at or near the resonant frequency, appreciable coupling between the input and output loops occurs only in that range, and we have a bandpass filter.

Fig. 1 shows the low-frequency equivalent of the cavity filter, using discrete coils and a capacitor, and may help the reader to understand the operation of the circuit.

In order to build the device with a reasonable chance of success, it is necessary to identify the critical areas first. Obviously, the length of the center stub is critical. It must be an electrical quarter wave-



First coffee can soldered to the top plate. Note the telescoping tuning stub.



Overall view of the two-meter coffee filter. One can was left unpainted for effect.

length long and, since this dimension is influenced by conducting materials near it, we must make it adjustable so that we can tune it precisely to the desired frequency.

Also, we must minimize the losses to maintain high Q and the sharpness of the filter. Silver-plating was out—for economic as well as practical reasons. Previous research showed that silver-plating at two-meter frequencies yields only marginal improvement—unless the plating is very heavy, the signal still penetrates beyond it to the base metal. Several articles on homemade cavities reported using brass or copper with apparently satisfactory results.

Another way to reduce the losses when the housing of the device is a relatively high resistance material is to increase the spacing between the stub and the housing, thus reducing the magnitude of the induced currents and hence the losses; however, the impedance of the circuit is also dependent upon these dimensions. The question, then, was how to ensure a proper impedance match into and out of the completed cavity filter. None of the references available covered this point; they only gave dimensions that had been used and worked, but did not back them up with theory so that the effects of variations could be determined.

A little more thought provided the answer, though. If the input and output coupling loops were made identical and mounted so that the relationship of each to the stub was identical to the other, the problem would be solved without even knowing what the stub/cavity combination impedance was. It would be like two identical transformers connected back to back—the load impedance would be transformed to

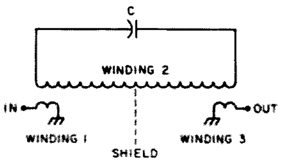


Fig. 1. Equivalent circuit of cavity filter.

whatever the stub/cavity combination required and then back down to the same impedance level in the other coupling loop.

With this encouraging reasoning, construction was begun. A source of brass tubing, of thin wall but quite rigid, was found at the local hobby shop. It comes in varying diameters and 12″ (30.48-cm) lengths and is not expensive in the quantities required. I used a 1″(2.54-cm)-diameter length for the upper section of the stub, and a ¾″(1.91-cm)-diameter length for the lower section, so that they could telescope together, allowing the length of the completed stub to be varied as required.

Since circulating currents in any resonant circuit can be quite high, as mentioned earlier, it appeared essential that the two sections be in very good electrical contact at all times. I used some finger stock from the junk box for this purpose, soldering it to the bottom of the upper tube and another piece to the top of the lower one. In this manner, when the two were telescoped together, we not only had good electrical connection, but also the smaller tube was held centered in the larger. The brass tubing used, however, is sufficiently "springy" that the finger stock is not necessary. You can simply saw a number of narrow slits in the ends of the tubing and form the fingers from the resulting tabs. It is a good idea to deburr the fingers thus formed with steel wool and to form slight "hooks" in them so that the contact is not made by sharp corners that

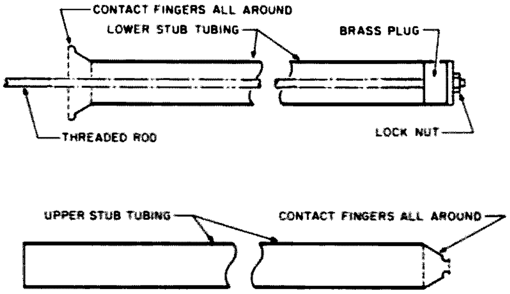


Fig. 2. Details of tuning stub construction.

might bind and hinder adjustment. Fig. 2 shows both the upper and lower stub assemblies in greater detail, including the homemade finger contacts.

Adjustment of the length of the assembled stub is accomplished by means of a threaded rod from the local hardware store. I chose a ¼-20 size. It is secured to the bottom of the inner stub section by means of a brass plumbing fitting. I chose one just slightly larger than the inside diameter of the stub tubing; I ground and filed it down to a snug fit and used it as the plug shown in the drawing. It is soldered to the stub and a nut, threaded over the end of the shaft, is soldered to it, thus ensuring that the threaded shaft is fairly well centered in the stub for smooth operation when tuning. Any of several standard brass plumbing fittings, such as adaptors to couple one size of pipe to another, will be satisfactory. Note that the threaded rod is soldered to the plug and the nut so that it may turn in relation to them.

A top plate for the cavity was made from some 1/16″ (0.64-cm)-thick copper plate I had on hand. Any material could be used that is a good conductor, but brass, copper, or aluminum would be best. The latter, however, would require different (and probably difficult) methods for making mechanical and electrical connections to it; the copper or brass stock allows soldering them directly to it.

A clearance hole for the threaded rod was drilled in the center of the top plate and a suitably-sized nut soldered over it. The two sections of the stub were assembled and the threaded rod screwed into that nut. The upper tube of the stub assembly was then soldered to the top plate, centered as closely as I could manage.

A note here about soldering these pieces together: Trying to accomplish this task with a torch or large soldering iron proved difficult. Either I couldn't heat the entire assembly enough to get a good solder connection or it was heated so much that previously sol-

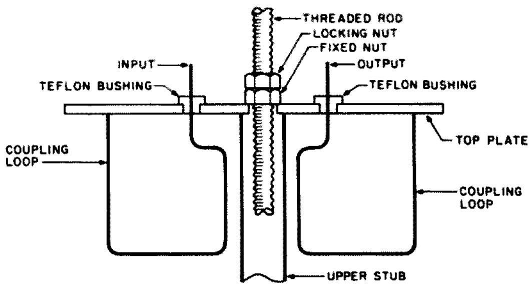
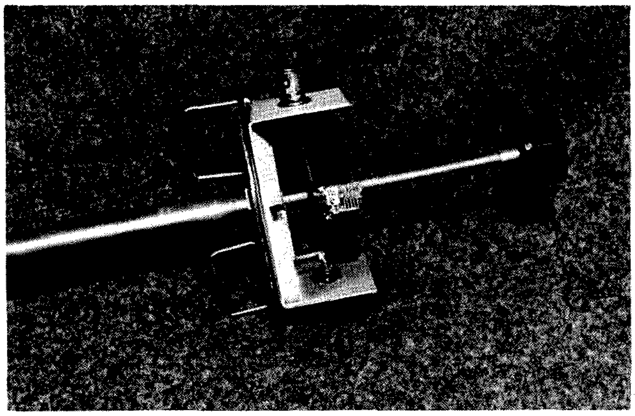


Fig. 3. Top plate assembly.

dered parts came loose. The solution was to preheat the material in the kitchen oven to some temperature below the softening point of the solder; then a relatively small iron could be used to attach new pieces, without heating the surrounding area sufficiently to loosen previously-made joints.

The coupling loops were formed from 1/16" (0.64-cm) brass tubing from the same hobby shop source. They are formed to be 1¼" (3.18 cm) wide overall by 1½" (3.81 cm) high, with extra material on the inner leg to protrude through the top plate, allowing for connection to the outside world. The offset shown in the accompanying drawings was used to provide clearance between the loop and stub adjustment screw as they came through the top plate and is ½" (1.27 cm) in sjze. I used a Teflon™ bushing, as shown in Fig. 3, to insulate the inner end of each loop where it passed through the top plate, but if not available, one could be fashioned from almost any scrap plastic. Be very careful that each loop is identical to the other and that both are mounted in an identical manner so that the impedance transformation for each is correct, as mentioned earlier.



Close-up of the tuning stub, coupling loops, and shunt capacitor.

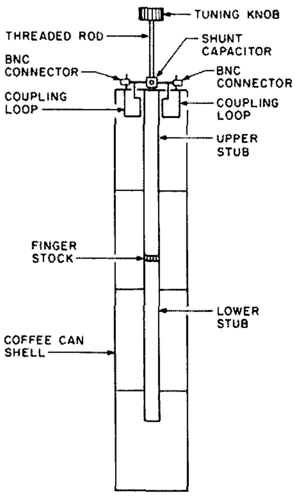


Fig. 4. Cutaway view, assembled cavity filter. The trimmer capacitor used to insert a notch in the response curve is included.

The two loops were soldered to the top plate, positioned so that their inner side cleared the stub by ¼" (0.64 cm), as shown in Fig. 3. It will be easier to position them accurately if a hole is drilled in the top plate where the outer leg of the loops should go and then the loops are soldered in these holes.

Next, I was faced with the problem of finding a suitable outer housing for the cavity. The construction articles in the references available included one calling for a 4"(10.16-cm)-diameter copper pipe for this material, 22½" (57.15 cm) long. Such pipe is not readily available in my area and has to be ordered from some distance away. Also, it is available only in much greater lengths than required and is relatively expensive. I decided to find an alternative.

A search of the local hardware stores yielded nothing that would be adequate. Then, one day while doing my grocery shopping, I noticed that some brands of coffee came in one-pound cans that appeared to be about the desired diameter! Eureka! Remember the "beer-can" antennas of some years back? I had found my source of material for the cavity. The only question was if the tin-plated steel cans would have too much loss to be usable. I decided to try and see.

I wanted new cans that weren't corroded or dented; this meant stocking up on quite a bit of coffee. I decided to try four cans, giving an overall length of 22" (55.88 cm). After storing the fresh coffee in everything I could find in the kitchen, I proceeded to cut both ends out of three of the cans and leave the bottom in the other. They were soldered end-to-end, and then the open end was soldered to the underside of the top plate, centered on the stub.

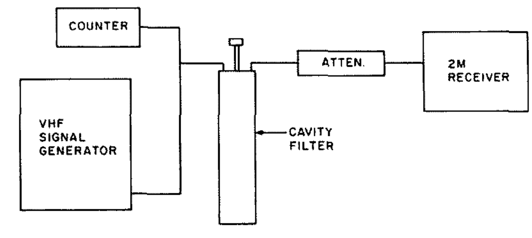


Fig. 5. Test setup for tuning and evaluating the cavity filter.

The addition of a small aluminum box to the outside of the top plate and mounting two BNC connectors on its ends allowed connection to be made to the ends of the coupling loops. Adding a second nut to the threaded shaft to allow it to be locked in place after tuning and a knob to the top of the threaded shaft to make it easier to adjust completed the job. I had a cavity filter, but would it work?

Fig. 4 shows a cutaway view of the entire assembly and may be of use to those desiring to build their own cavity filter.

Tuning the filter and evaluating its performance showed promise of being a problem without the availability of a well-equipped laboratory. I had an old VHF signal generator and a frequency counter available; that combination would serve as an adequate source with precise frequency calibration. The signal generator had an output meter so I could keep the input signal constant, and valid measurements could thus be made. But I needed a detector to permit measurement of the output of the filter. If the attenuation of the filter was anywhere near as great as it should be, I would be trying to measure signal levels far below those readable on a VTVM with *an rf* probe.

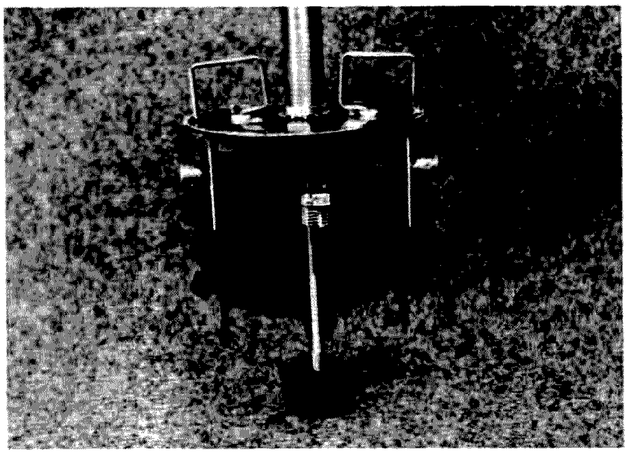
Finally, I borrowed a technique used by hidden transmitter hunters—I used a two-meter receiver with an S-meter and a calibrated step attenuator between it and the filter to keep the signal out of the limiting range of the receiver. Fig. 5 shows the test setup. With this arrangement, I was able to make measurements of sufficient accuracy to tune the filter and to gain a reasonable feel for how it worked.

Actual tuning proved unexpectedly easy. Adjust the threaded rod for maximum

output at the frequency desired. Results indicated that the response was similar to that shown in Fig. 6; I had a filter. But it wasn't sharp enough for my needs—I needed (or at least wanted) additional attenuation at the repeater's transmitter frequency, 600 kHz above the receiver's frequency. Something else was needed.

Let's go back to theory for a minute. At resonance, the inductive reactance is exactly equal to the capacitive reactance of the circuit and each cancels out the other; that's the very definition of resonance. At frequencies below resonance, the inductive reactance is smaller than the capacitive reactance; hence, the overall result is a circuit that looks like a capacitor. Above resonance, the reverse is true, and the circuit appears to be an inductor. Since my transmitter frequency was above the receiver (filter) frequency, the filter would look like a small inductor there. If I put a small value of capacitance in parallel with the filter, it should be possible to make it resonate with this apparent inductance, hopefully at the frequency of the (undesired) transmitter output. This would, in effect, form a parallel resonant trap in series with the receiver input, just as the traps in many multiband antennas are formed. The results should be similar.

I used a 2-15-pF air trimmer. By alternately tuning the threaded rod for maximum output at the receiver frequency and the trimmer for minimum output at the transmitter frequency, I was able to achieve results similar to those shown in Fig. 7. The peak of the response fell at the desired receiver input frequency, while the notch in the response curve fell at the transmitter output frequency. The difference between the two measured on the order of 16 to 18 dB and, because of suspected leakage around the cavity, is probably greater. Since some references claimed that the maximum rejection for such a cavity is about 20 dB, I wasn't doing too badly. I couldn't measure the insertion loss accurately, but it appears to be about 1.5 dB, which is entirely satisfactory and near the values quoted for commercially available cavities.



Detail showing top plate, coupling loops, and upper portion of tuning stub. Stub in this version was soldered to a threaded fitting which in turn was fastened in a hole in the top plate.

Subsequent investigation revealed that at the higher end of the tuning range, the Q appeared to be substantially higher, as evidenced by a sharper filter response. This is probably due to the fact that the distance between the center stub and the inside of the cavity is larger (in terms of a wavelength), so losses are reduced; also, the end of the stub is further from the bottom of the cavity, also reducing losses. If I were planning to build another of these filters, I would try the larger 2-pound coffee cans and use five rather than four of them.

It has been many months since I built this filter. Rechecking its tuning and response curve indicates no change, even though I live in a high humidity area and some corrosion was expected; apparently it is tight enough that this will be no problem. I have detected no noticeable shift in its parameters due to temperature excursions, although I have not subjected it to wide extremes.

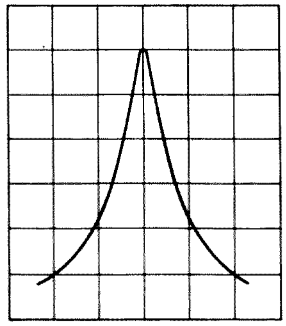


Fig. 6. Shape of the response curve of the cavity filter without shunt trimmer.

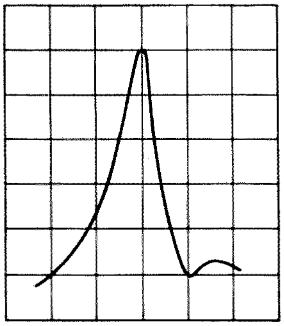


Fig. 7. Shape of the response curve of the cavity filter with shunt capacitor included.

The proof of the pudding is in the eating, they say, and the proof of this filter is in the system it was intended for. Without the filter, the very poor receiver I had responded to a 10-Watt signal anywhere in the two-meter band when the source was a few feet away from it; with the filter inserted between the antenna and receiver, an 80-Watt signal, at the same distance, has no effect until it is within about 30 kHz of the receiver frequency—the bandwidth of the filter included in the receiver's first i-f.

So what have we learned? It is possible, even easy, to make a cavity for your own use. It isn't expensive. Home tools and building techniques are more than adequate. Readily-available components can be used, and most dimensions are not at all critical. It is not difficult to tune up, and readily-available equipment can be used.

We don't have to pay a fortune for commercial cavity filters or duplexers for low-power use. While it may be advisable to do so for wide-coverage, heavily-used machines, we can quite easily use these for low-power, local-coverage machines. By substituting a small inductor for the trimmer capacitor, the notch can be moved to the low side of the response curve so several cavities can be connected together to form a duplexer; although adjusting the inductor would be more difficult than the trimmer, it can be done. Maybe now we can see more of these low-power, local-coverage machines, reducing the load on the wide-coverage systems. ■

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Electronics Engineers' Handbook, 2nd Edition, Fink and Christiansen, McGraw-Hill.

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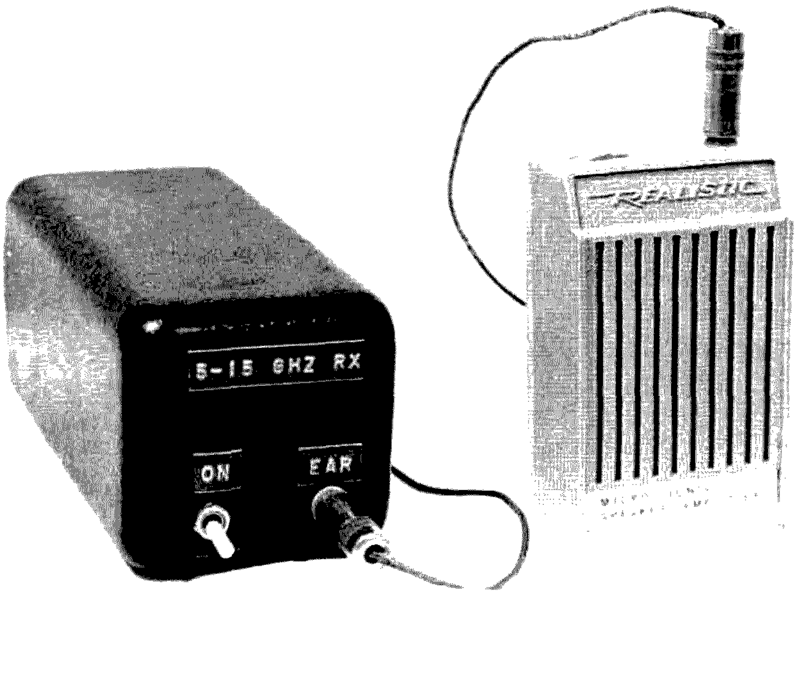
San Antonio TX 78213

Push Your Radar Detector to the Limit

Without this simple modification, you won't know what you are missing—until it's too late.

The use of speed-detection radar devices by law-enforcement agencies as a means of enforcing speed-limit laws is becoming very controversial in the United States. A court in Miami, Florida (Dade County) already throws out radar speeding cases if there is no other data presented. The State of Kentucky has a court case pending to determine the validity of radar as a speed-law enforcement tool. If the courts later rule that radar cannot be used as a means of enforcing the speed laws of the country, radar sets will probably not be used by enforcement agencies. The auto radar detector thus would no longer have an operational requirement. What will you do with your radar detector which has accompanied you so faithfully in your auto all these past years?



The author's radar detector modified to receive signals from 5 to 15 GHz. Both receiver and audio amplifier operate off 9-volt batteries and are self-contained.

Extend Its Usefulness

Until such time that auto radar detectors become "useless," in the sense that they may not be needed to provide an alerting function for you, a simple modification to almost any detector will let you extend your use and interest in a radar detector. Before we go into how the simple modification works, let's review how the speed radar works so we will better understand our radar detection operation.

Law enforcement agencies use the familiar Doppler shift principle (named after Johann Doppler, 1803–1853) to determine the speed of a vehicle. A hand-held radar transmitter emits about 100 milliwatts of continuous microwave energy

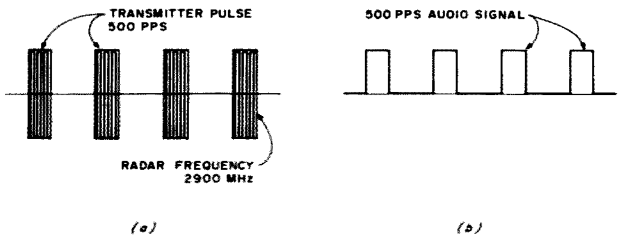


Fig. 1. Pulse radar signal (a) and audio signal (500 pps) when detected at a distance (b).

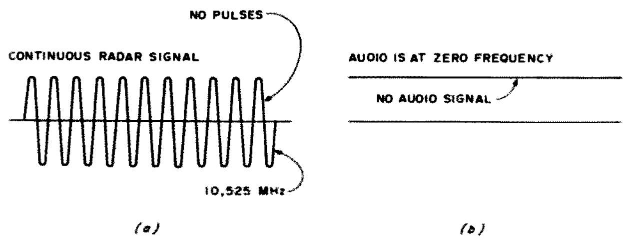


Fig. 2. Continuous-wave (CW) radar signal (a) produces no audio signal when detected at a distance (b).

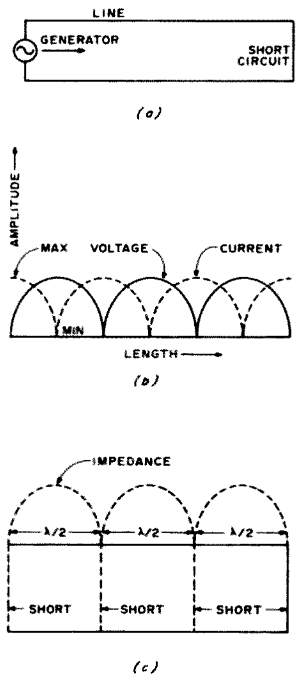


Fig. 3. Standing waves on a shorted transmission line. In (c) we see that a short is reflected every half wavelength.

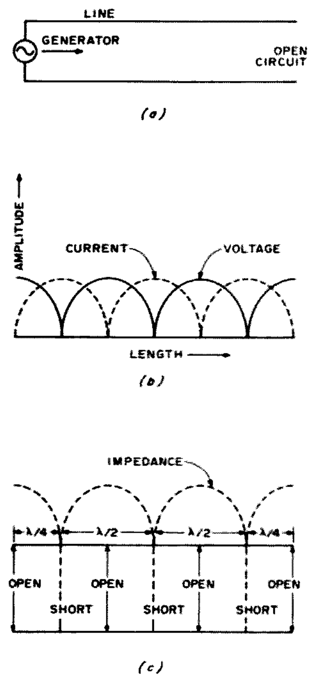


Fig. 4. Standing waves on an open transmission line. In (c) we see that an open is reflected every half wavelength.

at 10,525 MHz (X-band) or 24,100 MHz (K-band). The radar signal is concentrated in a narrow beam by a horn-type antenna so that the target vehicle is illuminated with the maximum amount of energy. Because of the movement of the vehicle, the 10,525-MHz signal is Doppler-shifted up in frequency about 940 Hz for an auto traveling at 60 mph. This upward Doppler shift is obtained for the emitter stationary (but vehicle moving) and is arrived at by the expression: Emitter stationary: $f_{D1} = f_1[(V + V_0)/V]$, where f_{D1} is the Doppler shift frequency in Hz, f_1 is the operating frequency (10,525 MHz), V is the velocity of light, and V_0 is the velocity of the vehicle in same units as V.

However, the transmitted signal must now be returned (reflected) to the radar receiver. So now the vehicle acts like a transmitter and originates (reflects) a signal (emitter moving) which also is Doppler-shifted up in frequency when it arrives at the radar receiver. The returning signal is shifted up in frequency according to the expression: Emitter moving (vehicle): $f_{D2} = f_2[V/(V - V_S)]$, where f_{D2} is the Doppler shift frequency in Hz, f_2 is the reflected frequency (vehicle)(10,525 MHz + f_D), V is the velocity of light, and V_S is the velocity of source (vehicle) in the same units as V.

We thus find that the total Doppler-shifted frequency is equal to $f_{D1} + f_{D2}$. For a vehicle traveling at 60 mph toward a radar, the total Doppler-shifted frequency is equal to 950 Hz + 950 Hz for a total shift of 1900 Hz. We arrive at this frequency after accounting for the original frequency of 10,525 MHz. This is about 31 Hz per mile for a radar operating at a frequency of 10,525 MHz. The total Doppler shift for a K-band radar would be about 2.3 times greater, or 72.5 Hz per mile.

The speed radar receiver must now process the Doppler-shifted frequency into miles per hour and then display and store it for record until the display is reset, awaiting another vehicle. The speed radar has to be triggered on for only a few seconds in order to lock on and obtain a good speed reading on a vehicle, although older units may be left on all the time. The time available to "hear" the radar transmitter, therefore, isn't very long.

How the Auto Radar Detector Works

Pulse Radar. Before the auto radar detector came along, there was only the radar speed detector. But with the advent of the auto-equipped radar detector, the *detector* became the *detectee*! (Or the *chaser* became the *chasee*.) And so the hunt has continued for about 30 years.

Old speed radar sets used the pulse principle as was used during World War II. Fig. 1 shows a series of radar pulses used to determine range to a target and the audio (500 pulses per second) produced by a diode detector receiver when listening to the radar. The rapid turning on and off of the radar carrier produces a music-like audio tone when the radar signal is detected and amplified.

Doppler Radar. Speed radar sets for the past 20 years or so have employed a continuous-wave transmitter, that is, one not modulated with any type of signal. It depends on the rapid Doppler shift in frequency (up in frequency when approaching and down when receding) to produce a shift in frequency which can be equated to *velocity* of a target rather than *distance* to a target as in the pulse-radar case. However, as we see in Fig. 2, the continuous carrier signal does not produce an audible signal when you detect and *listen* to it. Since there is no modulation on the signal at the transmitting end, we must do something to it at the receiving end so that we can detect its presence. And, of course, we must do this as inexpensively as possible as many consumer units will be bought.

Chopping the Radar Signal. You have no doubt driven or walked down a tree-studded roadway when the

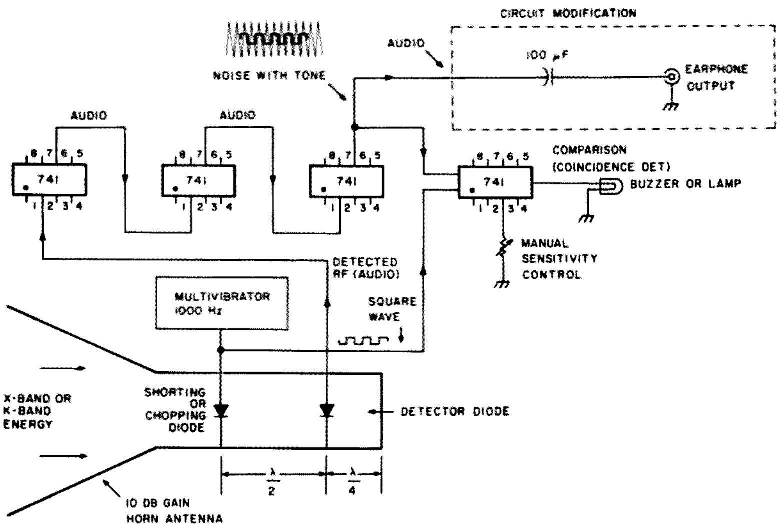


Fig. 5. Auto radar detector diagram showing chopping diode, detector diode, audio amplifiers, comparison circuit, and alerting buzzer or sounder.

sun is shining brightly. As you move along, bursts of sunshine are seen to stream through the foliage between patches of shadows. We are observing the modulation of the sun's steady rays of light where they are rapidly "turned on and off" by the foliage. In much the same manner, we will interrupt, or chop, the radar signal we receive so that we can process it to turn on an audio-altering device or a visual indicator.

In order to fully appreciate the uniqueness of the technique used to "chop" the radar signal, let's take a look at some fundamentals as they relate to antenna transmission lines.

The Shorted Transmission Line. When you take a transmission line such as an open-wire line or coax line as used in your amateur radio or CB mobile installation and short it at the antenna end, you will have zero volts across the end (as shown in Fig. 3). We see a generator sending a signal down the lines with a short at the right-hand end (a). In (b) we see that on a line terminated in a short, the voltage is zero at the end and maximum one-quarter wavelength back from the end. We see, also, that the short is repeated every half wave at the operating frequency (c). No voltage exists at the short, although the current is maximum. This can be likened to placing a screwdriver (zero Ohms) across an ac outlet of 115 volts. There will be a lot of current flowing till the fuse blows or the circuit breaker trips out, but there won't be any voltage! (Don't try this at home!)

The Open Transmission Line. Now let's look at an open terminated transmission line. In Fig. 4, we see a generator driving a signal down the line (a). In (b) we see that there is maximum voltage at the open end of the line and every half wave back toward the generator. In (c) we also see that the open circuit becomes a short circuit just one-fourth wavelength back from the open end.

What we have here is a means of chopping the radar signal as it comes down the waveguide transmission line from the horn antenna used in most radar detectors. What we do is to cause a diode placed across the transmission line to act as an open and a short, alternately, at an audio rate between 1000 and 3000 times per second. When a diode conducts in the forward direction, it acts like a short circuit (very low resistance) but when it does not conduct, it acts as an open circuit (very high resistance).

The Radar Diode Detector. An abbreviated circuit and block diagram of my Snooper (Autotronics, Inc.) radar detector is shown in Fig. 5. The shorting, or chopping, diode is turned on and off by the multivibrator circuit which puts out a square-wave signal at an audio rate of 1000 to 3000 pulses per second. Note that when the shorting diode is conducting (anode positive), it acts as a short in the waveguide. A half wave away, a short is also reflected so that the detector diode is shorted. The detector diode is one-fourth wavelength away from the short in the end of the waveguide so that it always appears as an open, free to detect and rectify any microwave energy coming down the waveguide from the 10-dB gain horn antenna that is chopped up by the shorting diode.

The Comparison Circuit. The detected audio from the detector diode is amplified in several IC chips (type 741) and then routed to a comparison or coherent detector where it is compared to an audio signal arriving from the 1000-Hz multivibrator. A manual sensitivity control is used to set a level at which the audio alarm buzzer or lamp is turned on. The comparison circuit is activated when the signal arriving from the detected audio channel (outside signal) is stronger than the signal from the multivibrator (inside signal). This means a radar signal is being received and the alarm is activated.

The Case of the False Alarm. There are a number of signals, however, that can activate the detector, other than a real speed radar signal. We will look at the signals in greater detail further on, but let's examine what happens when you receive a signal. The first thing you do is to look for the speed radar vehicle. Not seeing one, but the audio alarm is still sounding off, you turn the manual sensitivity control down until the sounder stops. However, what you have done is to make your detector less sensitive to outside signals. You are now very likely to get "pinged" by a real speed radar and not know it (till the bubble machine starts!).

Modify Your Detector to Receive Other Signals. What we will do at this time is to make a slight modification to your detector—to add an audio output capability. We then run this audio output to a small self-contained packaged audio amplifier so that we can listen to *all* signals that are detected by your receiver. We will let your ear become trained so that it can tell the difference between a pulse radar from an airplane, an airport radar, a strong TV station, or a real bubble-machine emitter!

Referring to Fig. 5, we see a dotted area which shows the added circuitry to provide the audio output capability. Any battery-operated audio amplifier will do the job, and one readily-available is the speaker/amplifier from Radio Shack No. 277-1008 for under $12.00. The

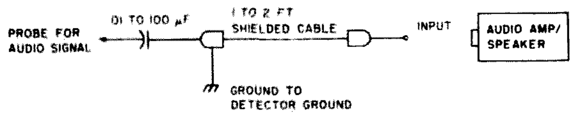


Fig. 6. Arrangement to probe for detector audio circuit. A hiss shows you have located a suitable point to connect the audio output.

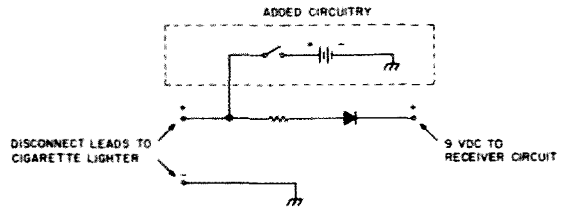


Fig. 7. Radar receiver modified to operate off a 9-volt battery for hand-carry operation.

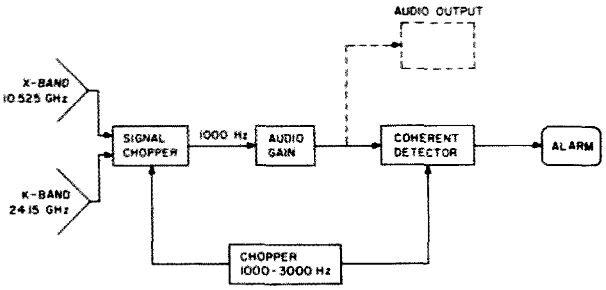


Fig. 8. Block diagram of typical X- and K-band radar detectors. Audio output modification covers both hands.

photo shows my Snooper detector modified for earphone output and an audio amplifier connected by a short piece of shielded audio cable which has male miniature audio connectors on each end.

In order to locate a circuit connection point in your detector which has sufficient audio voltage to drive the amplifier, use the arrangement shown in Fig. 6. Remove your detector from its housing, and with power applied to both units, probe the circuit board near where the manual sensitivity control is wired. There will be several points in the circuit where you will hear white noise, or hiss. This tells you that you have located an audio tone present of 1000 to 3000 Hz. This is the chopping or switching rate that you are hearing and it tells you that the unit is operating properly. When you shut off the radar detector (but leave the audio amplifier on), you may hear the tone become very clear as the white noise disappears before the switching tone. This may not occur in all modified units.

I have added a 9-volt transistor battery and switch to the detector/receiver so that the unit is entirely self-contained and can be hand-carried anyplace. It can be used on aircraft, boats, bicycles, and the like. Connect the battery to the same circuit point as the auto cigarette lighter as shown in Fig. 7. A battery will operate the radar receiver for a number of months with several hours use each day.

Connect the audio circuit as shown in Fig. 5 using a capacitor of 0.01 to 100 μF. To help you make the simple modification to your detector, ask a radio amateur or CB repair shop for assistance. You need not alter the appearance of your detector if you run a pair of small size wires outside your unit where the audio pair can connect to the amplifier.

Radio Signals You Can Receive

Now that you have modified your radar detector, you will be able to receive other radio signals. So that you will now know *what* signals you are receiving, leave your unit operating at its maximum sensitivity while you *ignore* those signals, keeping an alert ear open for the pure tone of a speed radar as it grows slowly out of the noise level. Remember, your detector is a fairly inexpensive device which is called upon to do a rather scientific task—receiving weak continuous-wave radar signals. As such, it is also subject to receiving and detecting any radio energy which is able to enter its detection circuits. You will use your ear to reduce the false alarm rate, and at the same time greatly increase your interest in your electronic surroundings. Let's look at some of the radar signals you may receive on your converted radar detector.

Speed Radar. Two bands are authorized by the FCC: X-band—10.525 GHz (10.5-10.55 GHz), and K-band—24.15 GHz (24.05-24.15 GHz). Power output—100 milliwatts (times antenna gain).

Stationary hand-held units are usually detected at about a half-mile away. If the transmitting unit is on continuously, you will hear the signal begin weakly as a pure tone of 1000 Hz or so, growing out of the white noise hiss. This hiss will not disturb you as it will be masked by road and car noise. But when that pure tone-signal jumps up at you, you'll know you have a live one! Remember—the signal you hear out of your detector (1000 Hz or so) is the switching frequency of the chopping diode. It has nothing to do with any Doppler frequency shift associated with vehicle velocity. You will hear the signal with both vehicles stationary if the radar is transmitting. The longest distance over which I have detected signals, over several hills and dales, is 8 miles. But you must be line-of-sight to the radar to hear him and hope he "pings" someone else so you will be able to hear him.

My modified Snooper covers only the X-band, so you may be pinged on K-band and not know it unless your unit has both X- and K-bands. There is presently little operation in K-band, but its use is increasing. In Fig. 8 we see the block diagram of typical X- and K-band detectors, with one modification covering both bands since there is a common audio channel.

Many law-enforcement vehicles will drive around with the radar switched on and transmitting all the time. The hand-held unit, aimed like a spot light, is temporarily placed face down on the front passenger seat. However, enough radio energy is scattered out of the vehicle so that you can detect it several blocks away, be it moving or stationary. You will also be able to detect a radar vehicle passing in the opposite lane of a divided highway from several blocks away. When you receive these signals on your receiver, you will know that you have achieved a good sensitivity level as the radar unit does not have its antenna beam aimed out of the car.

Aircraft Radar. These radars operate in the range of 9300-9500 MHz and usually are heard during inclement weather when the radar is used to navigate around bad weather. You'll hear a "zip-zip" as the airborne antenna sweeps back and forth. You'll be able to track it for many miles as you aim your

detector in azimuth and in elevation to the aircarft. Remember, these are pulse radars with high-power output and you can hear them for about ten miles from your location.

Ship and Coastal Radar. These radars operate in the 2900–3100-, 5350–5650-, and 9300–9500-MHz bands. Rotate your detector around slowly as you look for them near the coast as they will have an antenna rotation rate of 5–10 rpm. Large ships will move slowly as you track them while small vessels will move more rapidly and you may soon lose them. While driving along, you'll hear them for 5 to 10 miles before they fade out.

Weather Radar. These radars operate around the clock from a number of locations in the country as part of the NOAA weather service, in a band of frequencies from 2900-3100 MHz. These signals are heard on occasion from as far away as 40 miles when the sky is filled with clouds of rain or heavy moisture. The radars have a low antenna-rotation rate as well as a low pulse-recurrence frequency (prf) which sounds like "burt, burt." On occasion, you may find these signals being reflected off large thunder clouds that are 10 to 20 miles away.

Microwave Communications. These signals will fool you the most as they sound like a real Doppler (continuous-wave) radar. As you drive around in the city or country, you may pass into their beam and hear the pure tone increase in intensity. You'll look around for a bubble-machine car but not see anything. Then, as you drive further, the signal may disappear as you get closer to, and pass under, the beam from the antenna (probably a 3′ to 5′ dish) mounted on the side of a building or on a tower.

These signals usually lie in the frequency range of 12.985-13 GHz. Other users might lie in the 7-9-GHz band. These systems usually operate with just a few Watts of power to the antenna but with a high-gain beam. Once you locate the position of such a signal, you can use it to check the proper operation of your receiver each time you drive by. In the event a real Doppler radar were to begin operation in that same area, your trained ear will still be able to discern a difference between the two.

CB Transmitters and Mobile Radiotelephones. On occasion, you will hear a brief whistle of a signal as you pass other vehicles on the highway. The signal might last for just a few seconds and you'll think you've been pinged. What you have done is pass very close to a CB or mobile radiotelephone in operation. If you glance quickly at the passing autos, you may observe someone talking into a telephone handset. These transmitters usually operate in the 150-170-MHz or 450-MHz range and you are hearing a harmonic due to the closeness of your receiver to them.

Television Stations. Depending upon the TV channels in your location, you may or may not hear false alarms. UHF stations which operate on channels 14-83 (470-890 MHz) at power levels up to 1 million Watts may be received up to 20 miles away, causing you to turn down your manual sensitivity to quiet the alarm. While driving in a strange city, you'll need the discerning power of your ears to tell you what sounds are a TV channel and what sounds are the pure tone of your friendly gendarme radar. These TV signals are so strong that they plainly drive through the X-band antenna and are detected (chopped) and you hear them as real "fake" signals.

Aircraft Runway Landing Aids. As you drive by or near some airports, you may hear all sorts of signals being picked up by your 5-15-GHz receiver. Some of the approach-control radars are at 2800 MHz and you'll hear their prf buzz each time the antenna rotates by your auto as you drive by. You may also hear reflections off buildings by aiming your receiver antenna at the buildings. You may also hear sidelobes from the radar as it sweeps in azimuth.

One very interesting airport radar operates at a frequency of 9080 MHz with prf of 5500 Hz as it sweeps in azimuth and elevation, looking down the runway at approaching aircraft. As you drive by, you will hear its signal. It goes "cheep, cheep" as it scans its pattern across your vehicle. You might hear this one as far as three miles from the end of the runway.

Other Signals You May Receive. There are now a number of microwave burglar alarm systems that operate throughout the country at X-band. As a consequence, depending on the sensitivity of your receiver, you may detect them when driving in residential areas, shopping centers, and industrial areas. Again, you will be able to recognize their sound and identify the area of the city where you receive them.

Other Receiving Considerations

Inverse Square Law ($1/R^2$). A radio signal undergoes a loss as it propagates through space; this is called the inverse square law. Double the distance, and the power received is one-fourth strength. For the radar receiver case, the signal suffers a $1/R^2$ power loss in reaching the target and a $1/R^2$ loss in the signal returning from the target to the radar receiver. For the radar case, therefore, the total power loss is figured by $1/R^4$. However, for the radar detector case, the power loss is only $1/R^2$, not $1/R^4$, as it does not have to look at reflected (bounced) radar energy. Thus, the *detector* can see the *detectee* twice as far away. All things being equal, you should hear him at twice the distance that he can see you. That provides a beep to the wise.

X-Band Radars. There are over 70,000 speed radar sets in operation in the US—about 95% in X-band.

K-Band Radars. About 5% of the radars operate in this band, and this number is increasing as equipment-design technology for this band improves.

Radar Detectors. It is estimated by manufacturers that there are approximately 2 million radar detectors in use in the US. Their use probably will increase as federal laws are enforced additionally by state authorities.

The Superheterodyne Radar Detector. The superheterodyne receiver is the best type of circuit that you can buy. They are just now becoming available in quantity on the radar-detector market and range in price from about $150 to $300. The circuit is the same as that employed in most AM, FM, and TV receivers and is very selective in frequency. Because of this feature, the receiver is able to reject almost all the signals that can be found in the outside world of the present-day radar speed detectors.

Use of the 5-15-GHz Receivers. The modified receiver you are using covers about 5-15 GHz. You'll hear many different kinds of signals in this frequency band, some of interest, some of no interest, and some a bother. Whatever the reason for you to use it, remember—the FCC under Title 47 of the Communications Act of 1934 states that no radio receiver can be licensed, restricted, or banned. And that includes any government agency or state. Happy listening! ■

Bill Bowman VE4AFO
744 Christie Avenue
Selkirk, Manitoba
Canada R1A 2H9

Personalize the M800 RTTY Program

Now you can design and save your own version of this popular software package. All it takes is a POKE or two.

Since the introduction of the low-priced microcomputer for the home market, radio amateurs have quickly taken advantage of the fact to modernize their ham shacks. These individuals very quickly realized that not only was the machine capable of doing housekeeping chores, but also it could be used on the air. The first software for the TRS-80's use on CW and RTTY was the Macrotronics M80 written by Dr. Ron Lodewick N6EE. This program was a fantastic learning experience for all users and the enthusiasm generated was sufficient to convince Ron to create the M800. As the FCC opened the door for the use of ASCII in the USA, shortcomings were found in that portion of the program. It was not long at all before Ron issued FREE a corrected version called the M800 1.1.

Now come the shortcomings of any software that is mass-produced. Being mass-produced, one must organize the program to suit his or her operating circumstances. I do not fault Macrotronics for this because to maintain a viable operation, one soon has to lose the personal touch. If the software was to be constructed tailor-made for the individual, the cost would be astronomical, as you can well appreciate.

To get started, simply load and run the M800 as usual (make sure you have the hardware turned on). Once you have entered your name and callsign, you can proceed to set the program as you would for operating, such as CW shift, ignore returns, fast diddle, etc. Now that you are satisfied, run through the operating steps until you are sure you have it the way you want. Proceed to program the three message memories and try them out as well just to be sure that they function correctly. Once satisfied, go to the receive mode and enter the name of the station that you work most often. This is an added touch that saves time.

Now that the program is running properly, break the out by resetting (don't forget to use the break key if you have the expansion interface) and POKE the number of diddles and lines of CQ, RY, and QBF. You can now load TBUGHI and punch a new tape with the P command as follows:

P 43FO 6652 4575 M800 <ENTER>

This will give you a permanent copy. It would be advisable to make a few backups prior to trying out the tape as TBUG does not verify. I have made several different copies, for normal operating, contesting, DXing, and other operations.

The information that I have to pass on to you is very simple and should make the software a dream to use. The program will come up running in the receive mode with all of your information stored as an integral part of the program. The only other software that you require to accomplish the task is TBUG, but this must be relocated out of the way of the M800. If you have trouble with the relocation, an excellent article is available in *80 Microcomputing*, issue #1, January, 1980, page 118.

Disk users will also benefit as the program can be auto-loaded. Using the Apparat 40 Track Newdos+, it takes less than five seconds to receive. Also using Newdos SUPERZAP, you can change the CQ, RY, and QBF messages to suit the operation. I have changed the CQ message from

CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ

to

CQ TEST CQ TEST CQ TEST DE VE4AFO CQ TEST CQ TEST CQ TEST DE VE4AFO.

This is only a simple example of program manipulation; you are limited only by your own imagination.

An added feature is one that should make people very happy: The troublesome keybounce can be overcome using the utility DBNC found in *80 Microcomputing*, issue #1, January, 1980. If you have more than 16K, it is very simple to relocate by changing the ORG statement.

I hope this will help your operating; your comments would be appreciated. Special thanks go to my father, Jim Bowman, and to Bert Anderson VE4AP. Without their help, this article would not have been possible. ■

HAM HELP

I need an audio frequency counter which will work with a Swan 350. I am blind and need some way of determining the exact frequency I am working.

Norm Fettig K0GIR
309 E. Yorkshire Dr.
Stockton CA 95207

I need information on the US Navy's WWII MBM transceiver. I am also looking for technical information and parts for the General Dynamics AM/PRC-70 (XE 2) or a similar model.

Tony Grogan WA4MRR
5 Rollingwood Dr.
Taylors SC 29687

I am looking for schematics and technical manuals for the Exam-eter solar capacitor checker, model CF, type 1.60; Graetz 2000 long-wave, medium-wave and broadcast radio, nr. 87(267)x53, series 171/7, 586828; US Navy model RBB-1 CRV46147 receiver; Hanimex model TDP 850 calculator; and Collins ART-13 transmitter.

Roger Moe N7KGG
Route 1, Box 1140
Wapato WA 98951

I would like to start an Alcoholics Anonymous net. Any recovering alcoholics or others interested in such a net, please contact me.

Raymond W. Guenther N2CWB
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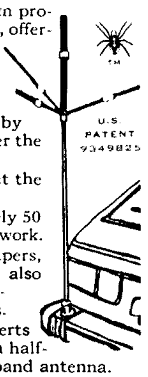

- The Spider™ Antenna is less than six feet high and the longest resonator projects out from the mast 24 inches. This gives a slim profile, low height and light weight, offering little wind resistance and eliminating the need for a spring mount.
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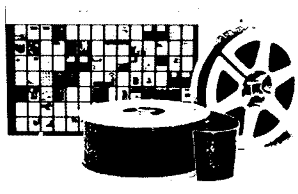

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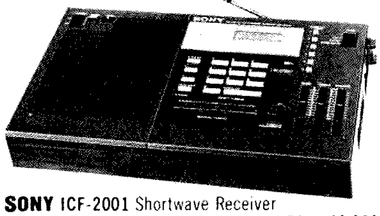

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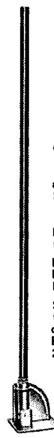

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SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received at 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458.

MORRIS PLAINS NJ
MAR 4

The Split Rock Amateur Radio Association will hold its sixth annual electronics auction on Friday, March 4, 1983, at VFW Post #3401, State Route 53, Morris Plains NJ. The Morris Plains VFW hall is located a short distance from US 202 and NJ 10 and is easily reached via I-80, I-287, and US 46. Admission is $1.00. Doors will open at 7:00 pm for unloading and inspecting equipment and the auction will commence at 8:00 pm sharp. Items to be sold must be working equipment and loose parts must be bagged in the largest quantity possible. A commission of 10% will be taken on the first $50.00 of each sale. Commissions are payable in cash only. Refreshments will be available. Talk-in on 146.385/146.985 (WR2ADB) and 146.52. For more information, please write to SARA, PO Box 3, Whippany NJ 07981.

OLD BRIDGE NJ
MAR 6

The Old Bridge Radio Association will holds its third annual auction on March 6, 1983, at the K of C Hall, Pine Street (just off Route 18), Old Bridge NJ. Doors will open for registration and inspection at 9:00 am and the sale will begin at 10:00 am. Admission is $2.50. On successful sales, there will be a club commission of 10% on the first $100 and 5% on the remainder. Food and drink will be available. Talk-in on .72/.12, .34/.94, and .52. For more information, contact Fred Goldberg WA2BJZ, 29 Clearview Road, East Brunswick NJ 08816, or phone (201)-257-8753.

SOUTH ST. LOUIS MO
MAR 11

The Jefferson Barracks Amateur Radio Club will hold its annual auction and hamfest on March 11, 1983, at the Carondelet Sunday Morning Athletic Club in South St. Louis MO.

EGG HARBOR CITY NJ
MAR 12

The Shore Points Amateur Radio Club will hold Springfest '83 on Saturday, March 12, 1983, from 9:00 am to 3:00 pm, at the Atlantic County 4-H Center, Route 50, Egg Harbor City NJ (near Atlantic City). Admission is $3.00 at the gate and $2.50 in advance; XYLs and children will be admitted free. Sellers' space is $5.00 and sellers must bring their own tables. There will be a large, heated building with commercial power, as well as outside covered tailgating spaces. Refreshments will be available. Talk-in on 146.985 and .52. For more information and reservations, write SPARC, PO Box 142, Absecon NJ 08201.

LAFAYETTE LA
MAR 12-13

The Acadiana Amateur Radio Association will sponsor the ARRL-approved 23rd annual Lafayette Amateur Radio Hamfest on Saturday and Sunday, March 12-13, 1983, at the Carencro High School, Highway 182 North, 2½ miles north of I-10, Lafayette LA.

FORT WALTON BEACH FL
MAR 12-13

The Playground Amateur Radio Club will hold its 13th annual North Florida Swapfest on Saturday, March 12, 1983, from 8:00 am to 4:00 pm, and on Sunday, March 13, 1983, from 8:00 am to 3:00 pm, at the Okaloosa County Fairgrounds, Fort Walton Beach FL.

MARTINSVILLE IN
MAR 13

The Morgan County Amateur Radio Club will sponsor the Martinsville Hamfest on March 13, 1983, beginning at 8:00 am, at the Morgan County 4-H Building and Fairgrounds. Admission is $3.00 in advance and $4.00 at the door; children 11 and under will be admitted free. Flea-market space with a table is $5.00 and flea-market space without a table is $3.00. Premium tables are $20.00. Tables will be available on a first-come basis and the best spaces will be assigned first. Vendor setups will start at 5:00 am and parking will be free. Talk-in on 147.66/.06. For tickets, table reservations, and information, send an SASE to Aileen Scales KA9MBK, 3142 Market Place, Bloomington IN 47401.

TRENTON NJ
MAR 13

The Delaware Valley Radio Association will hold its 11th annual flea market on Sunday, March 13, 1983, from 8:00 am to 4:00 pm, at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township. Registration is $2.50 in advance and $3.00 at the door. There will be an indoor and outdoor flea-market area and refreshments, including breakfast at 7:00 am. Sellers must bring their own tables. Talk-in on 146.52 and 146.07/.67. For further information, send an SASE to DVRA, PO Box 7024, West Trenton NJ 08628.

WINCHESTER IN
MAR 13

The Randolph Amateur Radio Association will hold its 4th hamfest on Sunday, March 13, 1983, from 8:00 am to 5:00 pm, in the National Guard Armory, Winchester IN. Ticket donation is $3.00 and children under 12 years old will be admitted free. Table space (by reservation only) is $5.00 with a table and $2.50 without. There will be a flea market, dealers, programs, food, and drink. Setups will be on Saturday from 6:00 pm to 8:00 pm and on Sunday from 6:00 am to 8:00 am. Talk-in on 147.90/.30, 224.90/223.30, and 146.50. For reservations and more information, contact RARA, Box 203, Winchester IN 47394, or phone Jake Life W9VJX at (317)-584-9361.

ERIE PA
MAR 19

The Radio Association of Erie PA will hold The RAE Eyeball QSO Party on Saturday, March 19, 1983, at the Perry Highway Hall, 8/10 of a mile south of I-90 on the west side of Route 19. Admission is $2.00 per person. Tables (8-foot) are $3.00 each and are by reservation only. Food will be available. There will be FCC testing for applicants that mail Form 610 to the Buffalo office by February 22nd. Talk-in on .01/.61 and .22/.82.

MARSHALL MI
MAR 19

The Southern Michigan ARS and the Calhoun County Repeater Association will hold the 21st annual Michigan Crossroads Hamfest on March 19, 1983, beginning at 8:00 am, at the Marshall High School, Marshall MI. Tickets are $2.00 at the door and $1.50 in advance. Table space is $.50 a foot. Doors will be open at 7:00 am for exhibitors and there will be plenty of carry-in help and free parking. Food service will be available in the cafeteria. For tables or tickets, contact SMARS, PO Box 934, Battle Creek MI 49016, or phone Chuck Williams at (616)-964-3197.

SAN FRANCISCO CA
MAR 19

The ARRL will sponsor the second Amateur Radio Computer Networking Conference on March 19, 1983, in San Francisco CA. The conference will be in cooperation with the 8th West Coast Computer Faire being held March 18-20, 1983. This event will be hosted by the Amateur Radio Research and Development Corporation (AMRAD) and the Pacific Packet Radio Society (PPRS). For more information, contact Paul L. Rinaldo W4RI, 1524 Springvale Avenue, McLean VA 22101, or phone (703)-734-0678.

UPPER SADDLE RIVER NJ
MAR 19

The Chestnut Ridge Radio Club will hold a ham radio flea market on Saturday, March 19, 1983, in the Education Building, Saddle River Reformed Church, East Saddle River Road at Weiss Road, Upper Saddle River NJ. Admission is free. Tables are $10.00 for the first and $5.00 for each additional one. Tailgating is $5.00. Food and soda will be available. For further information, phone Jack Meagher W2EHD at (201)-768-8360 or Roger Soderman KW2U at (201)-666-2430.

MIDLAND TX
MAR 19-20

The Midland Amateur Radio Club will hold its annual St. Patrick's Swapfest on March 19-20, 1983, from 8:00 am to 6:00 pm on Saturday and from 8:00 am to 3:00 pm on Sunday, at the Midland County Exhibit Building, east of Midland on Highway 80 on the north side. Pre-registration is $5.00 (at the door, $6.00). Tables are $4.00 each. Refreshments will be available. Talk-in on .16/.76 and .01/.61. For further information and reservations, please contact Midland Amateur Radio Club, PO Box 4401, Midland TX 79704.

JEFFERSON WI
MAR 20

The Tri-County Amateur Radio Club will hold its annual hamfest on March 20, 1983, from 8:00 am to 3:00 pm at the Jefferson County Fairgrounds, Jefferson WI. Tickets are $2.50 in advance and $3.00 at the door. Tables are $2.50 in advance and $3.50 at the door. Parking is free and there will be plenty of food available. Talk-in on 146.52, 146.22/.82, and 144.89/145.49. For more information, advance tickets, and tables, send an SASE to Horace Hilker K9LJM, PO Box 204, 281 E. High Street, Milton WI 53563.

MAUMEE OH
MAR 20

The Toledo Mobile Radio Association, Inc., will hold its 28th annual auction and hamfest on Sunday, March 20, 1983, from 8:00 am to 5:00 pm, at the Lucas County Recreation Center, Key Street, Maumee OH. Tickets are $2.50 in advance and $3.00 at the door. The auction is free and starts at 10:00 am. Ample free parking will be available all day and overnight. Flea-market tables will be available and displays will be limited to electronics and ham gear only. There will also be commercial exhibits, special programs for the ladies, and refreshments. Talk-in on 146.01/.61, .19/.79, .34/.94, 147.87/.27, .975/.375, and 148.52/.52. For more information, send an SASE to J. Honisko KB8YD, 1733 Parkway Drive N., Maumee OH 43537.

MAUMEE OH
MAR 20

The annual meeting of the American Signaling Society is scheduled for March 20, 1983. The meeting will begin promptly at 0100 hours UTC. Members and guests will convene in the Main Exhibit Hall of the Lucas County Recreation Center, 2901 Key Street, Maumee OH. In addition to the election of officers, the ever-popular forum on the latest signaling techniques will be offered. A Century Club confab will also be held. For additional information, please send an SASE to The American Signaling Society, 4015 Windermere Road, Columbus OH 43220.

CIRCLEVILLE OH
MAR 20

The Teays Amateur Radio Club will hold its sixth annual King of the Pumpkin Hamfest on Sunday, March 20, 1983, from 8:00 am to 4:00 pm, at the Pickaway County Fairgrounds Coliseum. Tickets are $2.00 in advance and $3.00 at the door. Tables (8-foot) are $4.00 in advance and $5.00 at the door. Doors will be open for setups on Saturday at 4:00 pm and overnight security will be provided. A large parking area and food will be available. Talk-in on 147.78/.18 and .52/.52. For additional information, please send an SASE to Dan Grant W8UCF, 22150 Hulse Road, Circleville OH 43113, or phone (614)-474-6305.

STERLING IL
MAR 20

The Sterling/Rock Falls Amateur Radio Society will hold its 23rd annual hamfest on March 20, 1983, beginning at 7:30 am, at the Sterling High School Field House, 1608 4th Avenue, Sterling IL. Tickets are $2.00 in advance and $2.50 at the door. Commercial tables and flea-market tables requiring electricity are $5.00; all others are $3.00. A concession stand, free parking, and overnight space for self-contained campers will be available. There will be commercial distributors, dealers, and a large flea market. Talk-in on 146.25/.85 (W9MEP). For advance tickets, tables, and information, contact Sue Peters, 511 8th Avenue, Sterling IL 61081, or call (815)-625-9262.

BLACKSBURG VA
MAR 21-24

The Virginia Polytechnic Institute and State University will hold a Personal Microcomputer Interfacing and Scientific Instrumentation Automation Workshop on March 21-24, 1983, on the Virginia Tech campus in Blacksburg VA. The workshop, directed by Drs. Paul Field, Chris Titus, Jon Titus, and Mr. David Larsen, is hands-on, with the participant designing and testing concepts with actual hardware,

The charge is $595.00. For more information, write Dr. Linda Leffel, C.E.C., Virginia Tech, Blacksburg VA 24061, or call (703)-961-4848.

CANTON OH
MAR 26

The Canton Amateur Radio Club will hold an auction on March 26, 1983, beginning at 5:00 pm, at the Nimishillen Grange, Easton Street NE, Canton OH. Admission is $2.00; flea-market table space is $2.00. Free parking will be available. Talk-in on 147.12/.72. For general information, phone Herb Bushong WD8IPE at (216)-488-2920.

JOHNSTOWN PA
MAR 27

The Conemaugh Valley Amateur Radio Club will hold its sixth annual hamfest on Sunday, March 27, 1983, from 8:00 am to 4:00 pm, at the East Taylor Fire Hall, which is located on Route 271, 5 miles south of Route 22 (4 miles north of Johnstown). There will be plenty of food and refreshments available. Talk-in on 146.34/.94.

GRAYSLAKE IL
MAR 27

The Libertyville and Mundelein Amateur Radio Society will hold LAMARSFEST 1983 on Sunday, March 27, 1983, beginning at 8:00 am, at the Lake County Fairgrounds, Routes 45 and 120, Grayslake IL. Tickets are $2.00 in advance or $3.00 at the door. Tables (9-foot) are $5.00 each. Reservations are encouraged because choice locations will be assigned first. Commercial setups will begin at 6:30 am and other setups will begin at 7:00 am. There will be free parking, and breakfast and lunch will be available. Talk-in on 147.63/.03 and 146.94. For tickets, table reservations, or exhibitor information, send an SASE to LAMARS, PO Box 751, Libertyville IL 60048.

MADISON OH
MAR 27

The Lake County Amateur Radio Association will hold their fifth annual Lake County Hamfest and Computer Fest on Sunday, March 27, 1983, from 8:00 am to 4:00 pm, at Madison High School, Madison OH (40 miles east of Cleveland). Admission is $2.50 in advance and $3.50 at the door. Table and display space (all indoors) is $5.00 for a 6-foot table and $6.50 for an 8-foot table. There will be plenty of free parking. Doors will open for exhibitors at 5:30 am. Talk-in on 147.81/.21. For reservations and more information, send an SASE to Lake County Hamfest Committee, 37778 Lake Shore Boulevard, Eastlake OH 44094, or phone (216)-953-9784.

BALTIMORE MD
MAR 27

The Baltimore Amateur Radio Club, Inc. (BARC), will hold the 1983 Greater Baltimore Hamboree and Computerfest on March 27, 1983, beginning at 8:00 am, at the Maryland State Fairgrounds Exhibition Complex (located east of I-83 exit 17, three miles north of I-695, north of Baltimore), Timonium MD. Admission is $3.00; children under 12 will be admitted free. Overnight accommodations are available in the immediate area. Amateur-radio, personal-computer, and small-business-computer dealers will be present. There will be an indoor flea market, a large hard-surfaced outdoor tailgate area, food service, free parking, and guest speakers throughout the day. For additional information and table reservations, contact GBH&C, PO Box 95, Timonium MD 21093-0095, or phone (301)-561-1282. For a recorded announcement, dial (301)-HAM-TALK.

SOMERSWORTH NH
APR 9

The Great Bay Radio Association will hold its 3rd annual hamfest-flea market on Saturday, April 9, 1983, from 9:00 am to 3:00 pm, at the Somersworth Armory, Somersworth NH. The entrance fee is $1.00 per person. Food, refreshments, and free parking will be available. For advance registrations and further information, write Great Bay Radio Associations, PO Box 911, Dover NH 03820.

MADISON WI
APR 10

The Madison Area Repeater Association, Inc. (MARA), will hold its eleventh annual Madison Swapfest on Sunday, April 10, 1983, at the Dane County Exposition Center Forum Building, Madison WI. Doors will open at 8:00 am for commercial exhibitors and flea-market sellers, and at 9:00 am for the general public. Admission is $2.50 per person in advance and $3.00 at the door. Children twelve and under will be admitted free. Flea-market tables are $4.00 each in advance and $5.00 at the door. Features will include commercial exhibitors, a flea market, an all-you-can-eat pancake breakfast, and a barbecue lunch. Plenty of parking space and nearby hotel accommodations are available. Talk-in on 146.16/.76 (WR9ABT). For reservations (early ones are advised) or more information, write to MARA, PO Box 3403, Madison WI 53704.

FRAMINGHAM MA
APR 10

The Framingham Amateur Radio Association, Inc., will hold its 8th annual spring flea market on Sunday, April 10, 1983, at the Framingham Civic League Building, 214 Concord Street (Route 126), downtown Framingham MA. Admission is $2.00 and doors will be open at 10:00 am. Tables are $10.00 (pre-registration required) and sellers may set up beginning at 8:30 am. Radio equipment, computer gear, and food will be available. Talk-in on .75/.15 and .52. For more information, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701.

SOUTH SIOUX CITY NE
APR 15-17

The 39 Hundred Club will hold the 1983 Midwest ARRL Convention on Friday, Saturday, and Sunday, April 15-17, 1983, at the Marina Inn, South Sioux City NE, directly across the river from Sioux City. On Saturday, features will include a QCWA breakfast, a 3900 Club luncheon, an all-day ladies' program, and an evening banquet with entertainment. There will be seminars, displays, commercial exhibits, and a 66-table flea market, all indoors in the same building. Tables (8 ft. × 30 in.) are $5.00 for the 3 days, $4.00 for Friday night and Saturday. For table reservations, contact Al Smith W0PEX, 3529 Douglas Street, Sioux City IA 51104. Exhibitors should contact Jim Boise KA0GZY, 22 LaSalle Street, Sioux City IA 51104. Setup time is Friday afternoon, April 15th. Convention fees are $6.00 for the 3 days; advance banquet reservations are $10.00 (at the door, $12.00). For advance banquet tickets and motel reservations, write to Jerry Smith W0DUN, Akron IA 51001. For general information, contact Dick Pitner W0FZO, General Chairman, 2931 Pierce Street, Sioux City IA 51104.

DAYTON OH
APR 23

The Washington University Amateur Radio Club will hold a reunion dinner on Saturday, April 23, 1983, at the Dayton Hamfest. All past members of the club are invited. For more information, contact Washington University ARC W0QEV, Box 1128, St. Louis MO 63130.

PARAMUS NJ
MAY 1

The Bergen ARA will hold a Ham Swap 'n' Sell on May 1, 1983, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. Admission for sellers is $3.00; buyers will be admitted free. There will be thousands of spaces but tailgating only. Sellers must bring their own tables. Talk-in on .79/.19 and .52. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

DULUTH MN
MAY 7

The Arrowhead Radio Amateur Club will hold its annual swapfest on Saturday, May 7, 1983, from 10:00 am to 3:00 pm, at the Holiday Inn, 207 West Superior Street, downtown Duluth MN. Admission will be $2.50 in advance or $3.00 at the door. Tables (4-foot) are $3.50 in advance or $4.00 at the door. There will be plenty of food, free parking in the ramp, and an enclosed shopping mall for the XYLs. Talk-in on .34/.94. For advanced reservations, room discount rates, or more information, send an SASE to Jerry Frederick N0BNG, 1127 104th Avenue West, Duluth MN 55808.

CEDARBURG WI
MAY 7

The Ozaukee Radio Club will sponsor its 5th annual swapfest on Saturday, May 7, 1983, from 8:00 am to 1:00 pm, at the Circle B Recreation Center, Highway 60, Cedarburg WI (located 20 miles north of Milwaukee). Admission is $2.00 in advance and $3.00 at the door. All 8-foot tables are $3.00. Sellers will be admitted at 7:00 am for table setups. Food and refreshments will be available. For tickets, tables, maps, or more information, send an SASE to 1983 Ozaukee Radio Club Swapfest, PO Box 13, Port Washington WI 53074.

ROCHESTER NY
MAY 20-21

The Rochester Hamfest, in conjunction with the ARRL New York State and Atlantic Division Conventions, will be held on May 20-21, 1983, at the Marriott Thruway Hotel and the Monroe County Fairgrounds. Tickets are $4.00 in advance and $5.00 at the gate. Flea-market tickets are $2.00 per space. The banquet will be held at 6:30 pm on Friday and be followed by the annual Funfest at 8:00 pm. The flea market will open at 6:00 am on Saturday; the commercial exhibits, at 8:30 am. The hamfest will close at 6:00 pm. There will be FCC exams given at the Rochester Hamfest for those who have sent Form 610 to FCC, 1307 Federal Building, 111 W. Huron Street, Buffalo NY 14202, by May 1st. A ladies' program will be available. Talk-in on 146.28/.88 and 144.51/145.11. For advance tickets, contact K2MP, 737 Latta Road, Rochester NY 14612. For more information, write Rochester Hamfest, 300 White Spruce Boulevard, Rochester NY 14623.

MUNCIE IN
MAY 22

The fourth annual MAARC Hamfest will be held on Sunday, May 22, 1983, in the Memorial Building located on the grounds of the Delaware County Fairgrounds. Advance admission tickets are $2.00 and tables are $5.00 each. Two new features are computer displays and the first annual Middletown USA QSO Party which will be run during this weekend. The MAARC club station will be in operation from the hamfest site. Electrical hookups and security will be provided during the entire show in a clean and fully enclosed building. For additional information, write Walt Robbins, Jr. WA9ZES, Publicity Chairman, RR 2, Box 340E, Muncie IN 47302.

CUMBERLAND ME
JUL 30

The Blackstrap Repeater Association will hold the second annual Greater New England Hamfest on Saturday, July 30, 1983, from 8:00 am to 5:00 pm, at Cumberland Fairgrounds, Cumberland ME. Tickets are $1.00 in advance and $2.00 at the gate. There will be forums, exhibits, meetings, speakers, dealers, and a giant flea market. Food and free camping will be available. Talk-in on 147.69/.09, 146.52, 3.940, and 146.13/.73. For more information, call Ed Williams KA1FZD at (207)-846-3509.

TRUMANSBURG NY
AUG 27

The annual Finger Lakes Hamfest will be held on August 27, 1983, from 8:00 am to 5:00 pm, at the Trumansburg Fairgrounds, Rt. 96, 12 miles NW of Ithaca NY. Admission is $2.00 at the gate. There will be a flea market, commercial exhibitors, a boat anchor auction, refreshments, and a craft show for the ladies. Talk-in on .37/.97 and .52. For further details, write Dave W2CFP, 866 Ridge Road, Lansing NY 14882.

HAM HELP

I have the following equipment available for cost of postage or free pickup; the Heathkit GR-88, which shorts the ac power supply, and the Heathkit GR-98, which drifts slightly.

Steve Clifton WA2TYF
800 W. End Ave.
New York NY 10025

I need frequency-determining networks with 2125-Hz and 2295-Hz center frequencies for use with a Northern Radio Company dual-frequency-shift tone converter, type 152, model 2.

Bob Workman WA4ZZN
PO Box 942
Atlantic Beach NC 28512

I would like to find a Knight KG687 sweep generator and the schematics for a Sony MX-12 microphone mixer and the Scott 299-T audio amplifier.

Dave Overton
1709 W. 30
Austin TX 78703

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

QCWA QSO PARTY—PHONE

Starts: 0001 GMT March 12
Ends: 2000 GMT March 13

This is the second part of the 26th annual QCWA QSO party. You can work the same station more than once providing it is on another band. Only the bands listed under frequencies will count in this QSO party.

EXCHANGE:

QSO number, operator's first name, QCWA chapter identification (official number or name), and state or country. Members not affiliated with a chapter should use "AL."

FREQUENCIES:

Any authorized amateur frequency in the bands that are listed below is permissible. The following suggested frequencies have been selected to minimize interference to others; however, please feel free to wander up or down from these if you so desire: 3900-3930, 7230-7260, 14280-14310, 21350-21380, 28600-28630. These frequencies are selected as a starting place. When pileups occur, don't be afraid to go either side of these frequencies.

SCORING:

Each contact made with another QCWA member will count as a single point. This year's contest has three multipliers: chapters, states, and countries. For each band, every new chapter is a multiplier of one, every new state (USA) is a multiplier of one, and every new country (ARRL DXCC list) is a multiplier of two. At the end of the party, add up your total contacts for all bands and multiply it by the sum of all your multipliers for all bands. This will give you your total and final score.

ENTRIES:

Please keep separate logs for each band. Logs should include the following information: time (GMT), call, QSO numbers, name, chapter number or name, and state or country. It is the responsibility of each contestant to provide a legible log, no carbon copies, and to list all claimed contacts. The total contacts and multipliers for each page should be recorded at the bottom of each page. The total contacts for the party will not be returned. Make sure you have correct postage when you mail your logs. Send logs no later than March 31st to: Spaceport Center #66, Donald McClenon N4IN, 3075 Florida Avenue, Melbourne FL 32901. Separate logs and scores must be submitted for both the CW and phone parties.

YL ISSB QSO PARTY—CW

Starts: 0001 GMT March 12
Ends: 2359 GMT March 13

Two six-hour rest periods are required. Operating categories include: single operator, DX/WK partners, and YL/OM teams. All bands will be used and the same station may be contacted on different bands for contact points but not as country multipliers. VHF and UHF may be used but all contacts must be direct and not through repeaters. Nets are not allowed!

EXCHANGE:

Name, RST, SSB number, country, W/K state or VE province, and DX/WK partner's call. If no partner, leave blank. If nonmember, send "no number."

FREQUENCIES:

On HF, use the USA General-class band portions. Check 80 and 40 meters on the hour.

SCORING:

Score 3 points for each member contacted on own continent, 6 points if different continent. Nonmember contacts count *one* point. Only member station contacts count for multipliers. Multipliers are each state, country, and VE province; also, each team contacted but only once for each team. When DX/WK partners contact each other, it counts as a double multiplier. If your total dc input power is 250 Watts or less during the entire QSO party, then count an additional power multiplier of *two*. Final score is sum of QSO points times the total multiplier.

AWARDS:

Special certificates will be awarded to the winners of each category. Regular certificates for country, US state, and Canadian province winners.

ENTRIES:

Logs must show date/time (GMT); station contacted; RST; mode; band; SSB number; US state, VE province, or country; and period of rest time. Summary sheets show states, Canadian provinces, countries, YL/OM teams, and DX/WK teams and partner contacts. Send logs and summary sheets to: Rick & Minnie Connolly (K0RDJ & KA0ALX), Star Rt. 1, Crocker MO 65452 prior to June 1st. Be sure to indicate who your DX/WK partner is!

WORKED ALL MORTON CONTEST

0001 GMT March 12 to
2400 GMT March 13

Morton stations will be working all bands, phone and CW, about 5 kHz apart up from the bottom edge of the General portion of each band. Contest exchange consists of RS(T) and state, province, or country. Certificates will be issued to those hams who have QSOs with five or more members of the Morton Amateur Radio Club or residents of Morton, Illinois during the contest period. To receive the award, applicants should send log information listing at least five Morton contacts along with a large SASE to: WD9AEU, 701 Columbus Ave., Morton IL 61550.

IDAHO QSO PARTY

Starts: 0000 GMT March 12
Ends: 2359 GMT March 14

Sponsored by the Kootenai Amateur Radio Society of northern Idaho.

EXCHANGE:

RS(T) and Idaho county, state, province, or country.

FREQUENCIES:

SSB—3920, 7260, 14250, 14325, 21325, 21380, 28550.

CW—50 kHz up from the lower band edge.

Novices—25 kHz up from their lower band. No net frequencies, please!

SCORING:

Idaho stations score 1 point for each QSO and multiply by the number of Idaho counties, states, VE provinces, and countries worked. Others score 1 point per Idaho QSO and multiply by the total number of Idaho counties worked.

AWARDS:

Awards will be issued to the top scorer in each Idaho county, state, VE province, and country.

ENTRIES:

Mailing deadline for all entries in the USA is April 16th, May 1st for all DX coun-

CALENDAR

Mar 5-6	**ARRL International DX Contest—Phone**
Mar 12-13	**YL ISSB QSO Party—CW**
Mar 12-13	**QCWA QSO Party—SSB**
Mar 12-13	**Morton Contest**
Mar 12-14	**Idaho QSO Party**
Mar 12-14	**Virginia QSO Party**
Mar 13	**Wisconsin QSO Party**
Mar 19-20	**Bermuda Amateur Radio Contest**
Mar 19-20	**Tennessee QSO Party**
Mar 19-21	**BARTG Spring RTTY Contest**
Apr 9-10	**CARF Commonwealth Phone Contest**
Apr 9-10	**ARRL QSO Party—CW**
Apr 16	**Holiday In Dixie QSO Party**
Apr 16-17	**ARRL QSO Party—Phone**
Jun 11-12	**ARRL VHF QSO Party**
Jun 25-26	**ARRL Field Day**
Jul 9-10	**IARU Radiosport Championship**
Jul 15-17	***A5 Magazine* SSTV DX Contest**
Aug 6-7	**ARRL UHF Contest**
Aug 19-21	***A5 Magazine* UHF FSTV DX Contest**
Sep 10-11	**ARRL VHF QSO Party**
Oct 8-9	**ARRL QSO Party—CW**
Oct 9-10	**ARRL QSO Party—Phone**
Oct 15-16	**ARRL Simulated Emergency Test**
Nov 5-6	**ARRL Sweepstakes—CW**
Nov 19-20	**ARRL Sweepstakes—Phone**
Dec 3-4	**ARRL 160-Meter Contest**
Dec 10-11	**ARRL 10-Meter Contest**

THE OLD TIMER'S BULLETIN

OFFICIAL JOURNAL, ANTIQUE WIRELESS ASSOCIATION, INC.

Published for the Old Time Wireless Operator, Historian and Collector

NEWSLETTER OF THE MONTH

Galena crystals, horn speakers, and 4-pillar tubes are all subjects you would not expect to find in a modern amateur publication—unless it happened to be the *Old Timer's Bulletin*, this month's winner in *73*'s newsletter contest.

The *Bulletin* is published by the Antique Wireless Association, which is devoted to the research and documentation of the early history of wireless communications.

What differentiates this bulletin from many others is the relatively little space devoted to organizational news; instead, the *Bulletin* contains a variety of construction articles, historical shorts, and sage antique-radio restoration advice.

The December, 1982, issue included construction plans for a 1928-vintage transmitter using two UX-210 tubes and the design parameters for Atwater Kent horn speakers. Another article, "Arthur Wehnelt and His Wonderful Cathode," looked at the contributions of this little known physicist, while contributor Alan Douglas pulled Raytheon's 4-pillar tubes out of the cobwebs.

Special sections include columns for antique-radio collectors, a section on home-brewing parts, and tips on restoring old radios.

The *Bulletin* is spiced with reprints of news articles and cartoons from early in the century, and the artwork throughout meshes with the publication's focus on that era. Reading it, you could almost imagine that you were back in the days of the spark gap.

The *Bulletin* is typeset and printed, with good-quality black and white photographs throughout. Even those who do not remember the days when the tube was king can enjoy reading about the early progress of electronics and probably learn a thing or two in the process.

Congratulations to the Antique Wireless Association for making the good old days alive and interesting.

If your club would like to enter *73*'s newsletter contest, send a copy to: Editorial Offices, *73*, Peterborough NH 03458.

tries and Canada. Send entries to: Vladimir J. Kalina KN7K, South 1555 Signal Point Road, Post Falls ID 83854.

VIRGINIA QSO PARTY

Starts: 1800 GMT March 12
Ends: 0200 GMT March 14

The 1983 QSO party is again sponsored by the Sterling Park Amateur Radio Club of Sterling Park, Virginia. The same station may be worked on each band and each mode. Virginia stations may contact in-state stations for QSO and multiplier credit. Virginia mobile stations may be worked in each new county they operate from for new QSO and multiplier credit regardless of whether or not previously worked on the same band and mode in another county. QRP stations must run 5 Watts or less for their entire operating time.

EXCHANGE:

QSO number starting with 001 and QTH consisting of state, province, DX country, or Virginia county. Virginia stations note that the reference for valid counties is *CQ's Counties Award Record Book* which lists a total of 95 countries.

FREQUENCIES:

Phone—3930, 7230, 14285, 21375, 28575, and anywhere on 160-meter band except in DX windows for US stations.

CW—60 kHz up from the low end of each HF band except anywhere in 10- and 160-meter bands or Novice subbands.

SCORING:

Count one point per QSO. Virginia stations multiply total QSOs by the sum of states, Canadian provinces, DX countries, and Virginia counties worked. Others multiply QSOs by the number of Virginia counties worked.

AWARDS:

Engraved plaques to the top scoring stations in the following categories: high Virginia single operator (fixed location), sponsored by K3RZR and KA3DTE; high Virginia mobile station donated by Electronic Equipment Bank of Vienna, Virginia; high out-of-state (including DX) station; high QRP station (if 5 or more QRP entries are received) donated by K7HMP.

ENTRIES:

Follow ARRL standard contest guidelines for logs. Indicate each new multiplier as worked. Send a summary sheet, with your log and an SASE for a copy of the results, to: Virginia QSO Party, c/o Barry Pybas KW4I, 313 W. Derby Avenue, Sterling Park VA 22170. Mailing deadline is April 15th.

WISCONSIN QSO PARTY

1700 TO 2400 GMT March 13

Use both CW and phone, stations may be worked once per mode on each band. Mobiles may be worked again when changing counties. No repeater QSOs!

EXCHANGE:

RS(T) and state, province, or Wisconsin county.

FREQUENCIES:

Phone—3990, 7290, 14290.
CW—3560, 7050, 14060.

SCORING:

Phone contacts count 1 QSO point while CW contacts count 2 QSO points. Wisconsin stations multiply QSO points by total number of states, provinces, and Wisconsin counties. DX countries count for QSO points but not multipliers. Non-Wisconsin stations multiply QSO points by number of Wisconsin counties (72 max). As a bonus, Wisconsin mobiles add 500 bonus points for each county that you operate from outside your home county with a minimum of 15 QSOs per county to qualify.

AWARDS:

Awards will be presented to the highest scores in each state and province, as well as to the highest aggregate club score.

ENTRIES:

All entries must contain a log consisting of: time in GMT, call, RS(T), state, Wisconsin county, mode, and a score summary. Logs containing more than 100 QSOs must be accompanied by a dupe sheet. Entries must be postmarked by April 15th and sent to: Wisconsin QSO Party, c/o West Allis Radio Amateur Club, PO Box 1072, Milwaukee WI 53201.

BERMUDA AMATEUR RADIO CONTEST

Starts: 0001 GMT March 19
Ends: 2400 GMT March 20

The Bermuda Amateur Radio Contest, in its 25th year, is again sponsored by the Radio Society of Bermuda. The contest *is* open to all licensed amateurs in Canada, the USA, the United Kingdom, and the Federal Republic of Germany. Of the 48-hour contest period, your total operating time cannot exceed 36 hours with off periods clearly logged. Each off period must not be less than three consecutive hours. All stations must be single operator only and must be operating from their own private residence or property. Use all bands, 80 through 10 meters. No crossband or crossmode contacts are permitted. Additionally, no phone contacts are allowed between W and G or West Germany on 40 meters.

EXCHANGE:

All stations will send RS(T) reports and give the following: Canadians add province, UK stations add county, US stations add state, West German stations add DOK number, and Bermuda stations add parish. US and Canadian stations may exchange reports with West German, UK, and Bermuda stations only. UK and West German stations may exchange reports with US, Canadian, and Bermuda stations only.

SCORING:

Each completed contact, on each band, counts 5 points. Only one contact per station on each band regardless of mode. For all stations outside Bermuda, the multiplier is the total number of VP9s worked on each band. For Bermuda stations, the multiplier is the total number of states, provinces, counties, and DOK numbers for West Germany worked on each band.

AWARDS:

Printed awards to the top scorer in each state, province, county, and DOK area in West Germany. The top scorer in Canada, US, UK, and West Germany shall receive a trophy to be awarded at the Society's annual dinner held in October of each year. Round trip air transportation plus accommodation will be provided to overseas winners to enable them to receive their awards. Top winners for the 1979 through 1982 contests shall be eligible for the area awards only.

RESULTS

1982 WASHINGTON STATE QSO PARTY CERTIFICATE WINNERS

Callsign	QSOs	Multipliers	Total
Alaska			
NL7D	28	16	896
Arizona			
W7ZMD	104	32	9,216
W7RIR	63	29	4,785
Arkansas			
WB5RYB	44	20	2,180
California			
N6QA	64	29	5,568
W6OUL	45	19	2,242
Colorado			
WA4EFE	55	24	3,936
Connecticut			
KA1ICX	28	14	1,176
Florida			
WA4FNA	49	16	2,352
Georgia			
N4NX	66	27	4,401
KE4XW	61	21	2,772
Idaho			
KU7Z	3	3	18
Illinois			
N9AUZ	59	25	4,050
K9HRC	37	20	2,220
W9QWM	28	16	1,200
Indiana			
KI9U	94	36	9,000
KK9G	46	21	2,415
WD8OBB	42	23	2,277
Kansas			
WDØCCW	96	34	6,528
KØFPC	37	23	2,438
Kentucky			
WA4EBN	50	26	3,900
Louisiana			
W5WG	101	33	9,174
Maine			
KA1HB	18	15	810
Maryland			
W3FG	40	18	2,106
Massachusetts			
W1AQE	26	17	1,326
KA1CLV	28	12	1,008
N. Michigan			
W8WVU	70	30	6,300
WB8WKQ	75	30	5,640
KS8Q	66	26	4,472
Minnesota			
WBØLNO	13	10	260
Missouri			
WA4PGM	19	13	494
Nebraska			
WØJJL	12	7	238
New Jersey			
W2CC	2	2	8
New Mexico			
K5QQ	11	8	184
New York			
W2WSS	25	15	1,125
N2DBD	25	12	900
North Carolina			
W4OMW	39	23	2,668
Oklahoma			
K5KW	40	20	2,380

Callsign	QSOs	Multipliers	Total
Oregon			
WA7RQS	120	36	9,432
Pennsylvania			
WA3JXW	30	16	1,296
South Carolina			
KE4VP	3	3	18
South Dakota			
WAØBZD	4	4	36
Tennessee			
WD4SIG	17	13	663
Texas			
W5PWG	73	27	5,724
N5QQ	37	25	2,775
WA5DTK	44	20	2,300
Utah			
W7LN	13	9	351
K7SQD	13	8	312
Vermont			
WB2NDE + K2QE	61	27	4,428
Virginia			
W4KMS	27	16	1,168
Wisconsin			
WB9PYE	47	19	2,489
Canada			
British Columbia			
VE7FBS	27	13	702
Manitoba			
VE4RF	29	18	1,566
Ontario			
VE3KK	42	18	2,268
Prince Edward Island			
VE1ABU	6	4	72
Brazil			
ZY1NEZ	11	7	154
Japan			
JA2YKA (JE2SRB, JA9SSY, JR2GMC)	51	25	3,250
JA1WVK	19	8	440
New Zealand			
ZL2RY	29	13	1,131
Washington			
Adams county			
N7AYF/M	92	37	6,808
Asotin county			
KN7L	181	46	24,426
Benton county			
K7FR	250	46	23,000
Chelan county			
K7GAH	63	28	5,292
Clallam county			
WA7YMC	175	44	18,832
Clark county			
W7GHT/M	25	15	1,125
Columbia county			
N7AYF/M	93	34	6,324
Cowlitz county			
KA7JVW	185	43	15,910
Douglas county			
N7AYF/M	52	27	2,808

ENTRIES:

Logs must show all dates and times in GMT. A separate sheet must be used for each band. All contestants to compute their own scores and check for duplicate contacts. Dupe sheets must be submitted with logs to cover each band where more than 200 contacts are logged. For every duplicate contact for which points are claimed, a penalty of three contacts will be deducted by the contest committee. An excess of claimed duplicates may mean disqualification. No penalty will be exacted against duplicates for which no points are claimed. Each page must be clearly numbered and marked with contestant's call, year, and band to which it refers. All contestants must sign a statement that they have complied with the rules and terms of their license. All logs must be received by the Contest Committee, Radio Society of Bermuda, Box 275, Hamilton 5, Bermuda, not later than May 31st. Overseas contestants are recommended to forward their logs via airmail. All decisions of the contest committee are final.

Bermuda parish abbreviations are as follows: SAN—Sandys, PEM—Pembroke, SOU—Southampton, HAM—Hamilton, STG—St. George, DEV—Devonshire, WAR—Warwick, SMI—Smiths, PAG—Paget.

TENNESSEE QSO PARTY

2100 GMT March 19 to 0500 GMT March 20, 1400 to 2200 GMT March 20

This is the 13th annual QSO party sponsored by the Tennessee Council of Amateur Radio Clubs. You may work the same station on different bands, modes, or counties. Repeater contacts are not allowed. Mobiles compete against mobiles, portables against portables. Single-transmitter entries only. No county line operations allowed for multiple contacts. Portable stations must set up per field-day rules. No "list" operations are allowed. No CW contacts in phone bands.

EXCHANGE:

Signal report and state, province, country, or Tennessee county.

SCORING:

Score one point per phone QSO; 1.5 points per CW QSO. Combine phone and CW scores as one contest. Recognition will be given for phone or CW only scores. Tennessee stations multiply QSO points by sum of number of different states, Tennessee counties, and VE/VO provinces. All others multiply QSO points by the number of different Tennessee counties worked (95 max). For each portable or mobile station working outside their home Tennessee county, score 500 bonus points for each county outside of home county with a minimum of 10 QSOs.

FREQUENCIES:

Phone—1860, 3980, 7280, 14280, 21380, 28580.

Novice—3725, 7125, 21125, 28125.

CW—1815 and approximately 50 kHz up from bottom of each band. Note, you must log a minimum operating time of 10 minutes for each change of band or mode.

AWARDS:

Plaque to highest scoring Tennessee fixed, Tennessee mobile and portable, plus out-of-state fixed. First place certificates to highest scoring station in each state, Canada, DX country, Tennessee Novice/Technician, out-of-state Novice/Technician, Tennessee phone only, and Tennessee CW only. Participation certificates to every station sending in logs with at least 15 contacts.

ENTRIES:

Logs must show date/time in GMT, station worked, band, mode, exchange, and score. Submit a cross-check sheet similar to ARRL CD77 for each band and mode with 100 or more contacts. Logs must be legible to avoid disqualification. Logs must be postmarked by May 1st and sent to: Oak Ridge ARC, Attn: Contest Coordinator, PO Box 291, Oak Ridge TN 37830. Please include a business-size addressed envelope with your logs.

BARTG SPRING RTTY CONTEST

Starts: 0200 GMT March 19
Ends: 0200 GMT March 21

The total contest period is 48 hours, but not more than 30 hours of operation is permitted. Time spent listening counts as operating time. The 18 hours of nonoperating time can be taken at any time during the contest, but off periods may not be less than 3 hours at a time. Times on the air must be summarized on the summary sheet.

There are separate categories for single-operator, multi-operator, and shortwave-listener stations. Use all amateur bands from 80 through 10 meters. Stations may not be contacted more than once on any one band.

EXCHANGE:

The message exchange consists of: 1) Time in GMT; this must consist of a full four-figure group, and the use of the expression "same" or "same as yours" will not be acceptable. 2) RST and message number; the message must consist of a three-figure group starting with 001 for the *first contact made.*

SCORING:

All 2-way RTTY contacts with other stations within one's own country are two points; outside your country are ten points. All stations can claim a bonus of 200 points for each country worked, including their own. Note that any one country may be counted again if worked on a different band, but continents are counted only once. The ARRL country list is used and, in addition, each W/K, VE/VO, and VK call area will be counted as a separate country. Final score is (sum of QSO points times the total number of countries worked) added to (the number of countries times 200 bonus points each times the number of continents).

Note, proof of contact will be required in cases where the station worked does not appear in any other contest log received, or the station worked does not submit a check log.

AWARDS:

Certificates will be awarded to the leading stations in each of the three classes, the top station in each continent, and the top station in each W/K, VE/VO, and VK area.

If a contestant manages to contact 25 or more different countries on 2-way RTTY during the contest, a claim may be made for the Quarter Century Award (QCA) issued by BARTG and for which a charge of $3.00 (USA) or 15 IRCs is made. Make your claim at the same time you send in your log. Holders of existing QCA awards should indicate and list any new countries to be added to their existing records. Make your claims at the same time that you send in your log. However, due to the high volume of work, it will not be possible to prepare and dispatch any new awards or update any existing awards until the final results of the contest have been evaluated and published.

Additionally, if any contestant manages to contact stations on 2-way RTTY on each of the six continents and the BARTG contest manager has received either a contest or check log from each of the six stations concerned, a claim may be made for the WAC Award issued by the *American RTTY Journal*. The necessary information will be sent to the *Journal* who will issue the WAC Award free of charge.

ENTRIES:

Use a separate sheet for each band and indicate all times on the air. Logs should contain: date/time in GMT; callsign of station worked; RST and message number sent; time, RST, and number received; and points claimed. Logs received from shortwave listeners *must* contain the callsign of the station heard and the report sent by that station to the station he is working. Incomplete loggings are not eligible for scoring. The summary sheet should show the full scoring, the times on the air and in the case of multi-operator stations, the names and callsigns of all operators involved with the operation of the station. All logs must be received by May 31st in order to qualify. Summary and log sheets are available from the contest manager at the address shown below. The judges decision will be final and no correspondence can be entered into, in respect of incorrect or late entries, and all logs submitted will remain the property of the British Amateur Radio Teleprinter Group. Send entries to: Ted Double G8CDW, 89 Linden Gardens, Enfield, Middlesex, England EN1 4DX.

SPRING VHF/UHF QSO PARTY

Starts: 2100 GMT March 26
Ends: 0400 GMT March 27

Sponsored by the Ramapo Mountain Amateur Radio Club, this year's rules for this VHF/UHF contest are similar to last year's rules and current ARRL contest rules. Operating classes are defined as follows: single operator—one person performs all transmitting, receiving, spotting, and logging functions; multi-operator—those obtaining any form of assistance, such as the use of relief operators, loggers, or spotting nets.

EXCHANGE:

Each 2-way QSO must include an exchange of station callsign and section designator.

SCORING:

The grid-square and range scoring system has been retained, based on proven results obtained from the 1982 ARRL UHF contest. Each section is a geographical area one degree in longitude by one degree in latitude, identified by a 4- or 5-digit number indicating the next lowest degree of longitude and latitude. For example, RMARC club station WA2SNA, located in Oakland NJ at 74° 15′ west and 41° 03′ north, would use a section designator of 7441.

Each QSO has a point value based on the distance between stations as determined by the larger of the differences between the section designators' latitude or longitude plus 1, with a maximum of 10 QSO points. For example, WA2SNA in 7441 works W3XX in 7838. The difference between 74 and 78 is 2. The difference between 41 and 38 is 3. The larger difference is three; adding one to it results in 4 QSO points.

The section multiplier is the total number of different sections worked per band. The following band multipliers are used to determine the final score for each band: 50 MHz = × 2, 144 MHz = × 1, 220 MHz = × 8, 432 MHz = × 4, and 1296 MHz = × 16. The score per band is equal to the total of QSO point values per band times the section multiplier times the band multiplier. The total score is the sum of individual band scores.

ENTRIES:

Prepare a separate log sheet for each band. Heading information must include your station callsign, section designator, and class of entry. Each QSO entry must include the date and time in UTC, callsign, section designator, and QSO point value. Each band summary must include the total of QSO point values and the total of different sections worked.

One entry sheet should be prepared for each band. They should include the band, QSO point total, number of sections, band multiplier, and band score. Also include the total of all band scores, your station callsign, your section designator, ARRL section and division, and mailing address. It must also be signed by the licensee or trustee of the call used.

Until May 1, you may send an SASE to the Ramapo Mountain ARC, PO Box 364, Oakland NJ 07436, to receive logs and entry forms.

HAM HELP

I am looking for original copies of the TME 11-227 and TME 11-227A directories of WWII German and Japanese radio equipment. I also need intelligence equipment from pre- and post-WWII such as the SSTR-1 and the SSTR-5.

Tony Grogan WA4MRR/F0NZ
5 Rollingwood Dr.
Taylors NC 29687

I want to get in touch with people who are experienced in dealing with power companies and who know what can be considered normal or abnormal power line noise.

Gary Mitchell KH8AC
PO Box 164
Cornwall Bridge CT 06754

Could someone please help me find a manual for the Telequipment model D-66 oscilloscope? It was made in England. I will gladly pay for the manual or for a good copy of it.

W. G. Driscoll KC4KE
6060 James Rd.
Austell GA 30001

I would like to locate the manual and schematics for the Hammarlund HFM-40. I will pay for postage and copying costs. I am also interested in hearing from anyone who has put the HFM-40 on 6-meter FM as a repeater.

David Kelly N4HHE
4223-D Myrtlewood Dr.
Huntsville AL 35805

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

which is sought in schools, but merely that the right system be used in getting an answer.

We know that some people have no problem at all in learning the code. These people normally see no reason why everyone else shouldn't have to learn the code, too. I'm fortunate in that I am able to get my code speed anywhere I want it in a jiffy. A few hours and I'm zipping along. It took me maybe a half hour to learn the code in the first place and just a few hours to get to 13 per. The nervousness of the exam put me off the first few times I went down, but finally...after not having practiced more than an hour total since failing the test, I went down...more to help another chap than to take the test myself. I decided that well, heil, as long as I was there, why not? Passed—no strain.

Others are able to rack up hundreds of hours trying for the big 13 and develop quite an inferiority complex over the situation. They try code tapes, copying over the air, classes, and so on. Nothing works. I'm talking about reasonably intelligent people. The army found that a certain percentage of their recruits were just flat unable to learn the code, so they would try them out for a few days and get rid of the people who were difficult learners.

Now, if a person makes a serious effort to learn the code, but is prevented by a lack of the right brain circuits, I assume that this is the kind of stupid person we want to keep out of our hobby, right? And I assume that no matter what this person has achieved outside of this code failure, he should be prevented from getting a ham ticket and bothering us. I have in mind some absolutely brilliant electronics engineers I've known who tried and tried to get the code and just couldn't...who needs that kind of trash on the bands?

No, the majority is probably right in pushing hard for us to keep our present system of encouraging everyone to cheat as much as possible on the technical exam, using the Bash materials so they don't have to know one damned thing about electricity...and sorting it out with the fabled code test...unless, of course, they buy those California tapes...in which case, they will have in their hands the actual FCC code test. Oh, well, we can't win 'em all, right? Will these tapes be available in Dayton again this year? Bet they will.

More than changes in the exams or in the code tests, perhaps it is time for us to consider putting more of the responsibility for the growth of amateur radio onto our clubs. Right now, most of our clubs attract newcomers, who attend a few meetings and then get bored, dropping out. For the most part, I've been finding our ham clubs in the hands of a few old-timers who like to get together and meet each other. Not much more than that happens. I see youngsters very rarely at club meetings and when I do, I often hear grumbling by the grizzled old men who sit toward the back of the room in a separate group.

Perhaps we are happy with a dying hobby and perhaps these old-timers are absolutely right...we shouldn't make any changes. Why should we go out and try to get 12-year-old kids into hamming? They're a bore on the air and create trouble at club meetings. Besides, all this stuff about needing kids so they can become career engineers and technicians is a waste of time...we can buy all we want from Japan and other Asian countries. Heck, even if we did develop technicians, our companies couldn't afford to compete with Japan and Taiwan...wages are too low over there. And besides, their governments are backing their electronics industries while ours is doing its best to screw ours.

Yes, perhaps the old-timers are right and the situation is completely hopeless and there is no use in even trying to do anything about it.

But, Poliyanna me...always the hopeless idealist...I keep thinking that if we could only get our ham clubs to get into the excitement of recruiting youngsters in the 12-15-year age bracket...infect them with the virulent virus of hamming...run classes as part of our club activities... and then have it so our clubs could give the license exams instead of wasting FCC money on this, we just might get some growth started.

We have such an incredible way to go to even catch up with Japan, much less get ahead of them again in electronics, that even if we were to get ham radio growing at 33% per year, it would take over ten years just to catch up...and a few more years to get ahead again. It may take that long before the government (congress) recognizes that business needs help, instead of regulation and taxing, if it is going to compete on a world basis. I really hate to see the US losing one electronics market after another to Asia...because we have so few technicians, so much difficulty getting growth capital, minimum wages driving up costs, so little emphasis on automation and robotics...and so on.

When I looked into building a new plant for our Instant Software division, I found where the bottom line was. Let's say I wanted to set up a plant with $100,000 worth of equipment to produce a product which I would sell largely worldwide. Now, in the US, before I could invest the $100,000, I would have to earn $200,000 and send half of that to the government in taxes. In Ireland, I found that I would have to invest only $50,000 and the government there would match that, giving me the needed $100,000. Further, the government would train workers for me at their expense...and wages would be far below ours to boot. Is it any wonder that Apple, Memorex, and many other firms expanded into Ireland instead of adding facilities here? You get four times the bang for the buck there, so businessmen put down their waving flags and were practical.

Getting back to hamming...one of the reasons I have been pushing so hard for all these years to get the legislation through to allow clubs to give the tests is my faith in the clubs as the best approach we have to getting growth of the hobby. Now that the law has been changed to permit this, I'm anxious for us to get started. I believe that if clubs do the teaching of our newcomers *and* the testing, we won't need any FCC tests or code. The clubs will know who is serious and who isn't. I'm hoping that this sort of entry Into the hobby, where newcomers are taught not only theory, rules, and such, but operating procedures and ham lore as well, will result in much better hams.

In the meantime, I'll be pushing where I can...publishing articles on construction projects...and so on, all trying to keep things moving in the direction that seems most productive for hamming... and our country...in the long run. I'd sure like to have your help and support, but I'm used to being fought and jammed, so I'll do my best with or without help.

BASHED YET?

Yep, my good friend Dick Bash is at it again. You really have to give him a lot of credit. A lesser person would have become discouraged when the FCC changed the test on his blitz-taught students and flunked almost all of them. Well, Dick had their money, so it was no skin off his...er...nose, right?

So Bash is going out again, giving his one-day intensive memorization of the FCC answer courses, all for the low, low price of $150 for the Tech/General or Advanced, or $225 (wow, a bargain!) for both. Dick has a nice guarantee for you, too... if you pass, he keeps the money. If you flunk, he keeps the money. What could be fairer than *that*? Oh, if he runs the class again, you can take it again for free if you can find it. If you don't register ahead of time, it's $25 more at the door for each course.

Will the FCC be waiting for their nemesis again with a new exam and flunk his trusting flock? Heh, heh, only the Shadow knows.

If the FCC doesn't change the questions, Bash will definitely get you ready to pass the exam. And you don't have to worry one little bit about having to learn a thing about electricity or radio. No knowledge or understanding whatever is necessary to pass this test once you have been grilled in the answers for a full day. But better not wait a day or you may start forgetting some of the test answers.

Bash will be going around to Seattle, Los Angeles, San Jose, Chicago, Boston, and Dallas. Let me see...with about thirty students per class, twelve classes in about a one-month period, ole Dick is going to really rake it in. Who says you can't make big money out of amateur radio? Not counting all of his sales of books and code courses ($10), it looks as if Dick could pull in $45,000 in that one big swing. Hey, good work there, Dick!

I don't know if Dick picked up the FCC's actual code exam from the booth near his at Dayton, but if he did, you are really in luck. Why, you would then be able to pass the whole FCC exam without knowing either the code or the theory, rules...or anything! By golly, if we can't get some growth in the hobby this way, what *will* do it?

ANOTHER OGRE

Not all of the falling behind of electronics manufacture in our country can be laid at the feet of the ARRL and their incentive licensing disaster of 1963. The resulting loss of engineers and technicians to the country has been devastating, but there have been other factors involved which have worked to cut American production and put Americans out of work.

One of the more insidious robberies of jobs has been caused by the borrowing of cash by the government to pay the increasingly large government debt. They've done this via short-term, high-interest notes which investors have been buying. According to the most recent figures, the government is now responsible for 29.7% of *all* borrowing. This has doubled in the last decade and has a lot to do with the unemployment situation.

Remember that the more profits companies can make, the more they will expand their operations, creating jobs. And as people make higher salaries they will spend more, again creating jobs. But when the government comes in with super high interest on their borrowing, this takes billions away from the private sector...billions which would otherwise be invested in making more jobs.

The deficit of 1982 is mind-boggling, of course, but one sadder result of this is that the 200 billion will have to be borrowed from investors, further robbing our industries of investment capital and thus preventing them from investing in growth and the badly needed creation of jobs.

This bleeding of investment capital by the government reflects back on us in another insidious way, too. By keeping our industries from getting reasonably-priced money for modernizing plants, they are forced to be ever less competitive with foreign manufacturers. Today, the US has the highest percentage of obsolete plants, the lowest percentage of capital investment, and the lowest growth of productivity of any major country.

This is a difficult situation for those who want to expand welfare and unemployment benefits. In order to get the money to pay people who are not working, we have to borrow it from those who are. And when we use money in that way, the government has to compete against our industries to borrow the money, taking it from them with higher interest rates. Yes, these people spend the money, but make nothing for us to buy in return for it, so the capital thus used up does not end up making more. This unwinds the economy and makes us less productive.

There is no simple answer to everything, but we do at least see a lot of the problems which are sinking our country. The lack of capital for building new and modernizing old businesses is damaging. The lack of trained technicians and engineers puts us at a further disadvantage. If we did have the cash to expand electronics production, we would probably send it to Asia, where we would get more return for the investment because they have more and better technicians there.

If we are able to start getting our kids interested in amateur radio, we could, in a decade, begin to turn the engineer and technician problem around. The cash situation is not going to improve until we make it clear to politicians that we are serious about eliminating deficits. I note that there are a lot of senators and representatives who do not yet have this message...which means that we are not making that clear.

TOO MUCH SCIENCE?

On my birth cerificate, it lists the occupation of my father as "aviator" and my mother as "artist." If you think about that, you'll get some insight into my trains and lapses of thought. There is the mixture of the mechanical and the artistic which resulted in a technical publisher.

This same background has led me to be interested in both the scientific explanations for the world and the occult ques-

tions which science has been unable to answer. Science has done a good job of answering many questions about how the universe works. But it has also failed to successfully tackle a great many observable phenomena. We have come to terms with many of these via religions, which call for belief without scientific proof. Other questions which are not answered either by science or religion tend to be pushed aside with annoyance.

But it is dishonest of a scientist to deny the existence of data just because he is unable to explain it or set up an experiment which repeats it. Science, if it is going to be true to itself, is going to have to admit that there are a lot of things which do not fit into the framework of the universe that they have built up. Scientists are going to have to start seriously trying to understand pesky things such as UFOs, ESP, reincarnation, PK, the spirit body, how memory works and where it is, medium communication with the dead, ghosts, and so on.

The easy path pursued by most scientists has been to unmask a few charlatans and then ignore everything else. Proving that a few of the UFO photos are fake doesn't solve the UFO situation at all.

The more we interest our kids in technical hobbies, the more scientists we'll end up with. You don't develop first-rate scientists by starting people in their 20s any more than you get good ballet dancers from late starters. No, it takes the twist of mind provided by amateur radio or computers (and I think we can all agree that these hobbies definitely do twist the mind) to get a good scientist going.

Dr. Hynek, the outstanding scientist investigating UFO phenomena, got his start as a ham. His credo seems to be much like mine...pointing to a wealth of data and a paucity of provable explanations...and asking if anyone can come up with a theory to explain all of this.

For all of our wonderful progress in science and the high technology gadgets we have derived from it, we still have an enormous number of rather key things which we don't understand and thus have to accept on belief. Once we start getting a handle on some of these mysteries, we will have powerful tools for further progress. Will an understanding of the essence of man lead to time and space travel in some mode barely dreamed of today?

Or will we find out that there really is some benefit to praying to the coffee table to have a nice day?

The questions are there in large numbers. We have to find out more about talking with plants, Kirlian photography, mind photographs, bent spoons, and so on. Can an understanding of human memory lead us to design computer memories in a different way, perhaps ridding ourselves of all size limitations?

Until we understand all of the mysteries of our world, we have plenty of room for science to work...and we need a good supply of new scientists. Hopefully, there will be a few more with the combination of the artistic and the mechanical...the scientific and the metaphysical...so that we will have some scientists able to tackle these things. Just ignoring them and refusing even to think about them is not a scientific answer.

In the past, I have written about such odd phenomena as UFOs, both about my own experiences in this field and those of other readers. I got quite a bit of mail from hams who had had personal UFO experiences. The easiest way to handle things like this is to ignore them. There was a "Nova" program recently which went to rather great lengths to debunk UFOs. And since then, I've read quite a bit about the films they took for the show which were not shown...or even mentioned...films which give strong evidence that something odd really is going on. For some reason, they wanted to do another whitewash on the subject.

The same situation surrounds many of the anomalies which perplex the more thoughtful and open-minded scientists today. One can still find scientists with good reputations in some field who refuse to accept that there is any such thing as mental communication. Yet most of us have experienced this at one time or another, so we know it exists...and wonder at the objectivity of someone who won't even check the evidence. I will never forget some emotional distress I was under one day many years ago. I was distraught...and at that very moment the phone rang. It was my mother asking what was wrong, calling from 135 miles away. She'd never done that before...and never has since. There was no way on Earth that was a coincidence. She knew nothing of any of the situation or its development.

Ask me sometime about the UFO which a bunch of us here at the magazine saw just down the road one evening...and which suddenly sped away over the horizon in seconds when it started moving. We could see it for at least fifteen miles, a distance it covered in about four seconds—after hovering for several minutes.

There are a lot of things to investigate...if we can develop enough scientists...and they are able to break away from orthodox thinking enough to handle these elusive problems. But until we start getting more kids started in high-tech hobbies, our chances of making progress will be slight. Has *your* ham club done anything to spread the ham radio bug in your local schools?

DOWN WITH DXCC

My recent editorial pointing out the harm which DXCC and the Honor Roll has done to our hobby brought in an interesting letter from a well-known DXer. His response was to attack me, not the ideas which I had discussed.

The problem with DXCC is that it puts a premium on making contacts with operators in rare countries. This, in turn, if you stop even for a moment to think about it (which may be too much to ask DXers), means that operators in rare countries are not permitted to get on the air and ragchew. Now, let's think about that for a minute. What is the most popular aspect of amateur radio? No, rag-chewing is by a wide margin the most popular amateur radio activity. We see the bulk of our low bands used for this, as well as virtually all of our VHF operation.

What chance does Paul 9M8PW in Sarawak have to rag-chew? He is no sooner on the air than the pileups start, with ops getting ever more insistent that he stop talking and give them a report and a QSL. They don't want to know about the Sarawak River and the twenty-foot-long croc which has been grabbing children up river. They don't want to know about Paul and what he teaches or that the monsoon rains have flooded half of Kuching that morning. They don't really care that his name is Paul or how long he has lived there or what he is doing...they want a QSL card so they can get a certificate. Many callers have no idea of where 9M8 actually is.

It turns out that Kuching is a fascinating place to live. Just a generation away from head-hunting, the people there are friendly and hard working. Once you get away from the capital city, you find that many of the small towns are built on stilts. Not just the houses, but entire villages are on stilts. They call them long houses—often they contain hundreds of families living together. Each family has a separate set of rooms, but they are together, sort of like a bamboo-made hotel or motel. The ladders down to the ground are made out of single trees, notched to provide the steps. The people zip up and down these narrow stairs just as we do our three-foot-wide staircases.

Having towns on stilts keeps them above the water that runs off on the ground after the monsoon rains, which hit just about every day during half of the year. The temperature is comfortable, even though this is only about a hundred miles from the equator, running about 70° at night and maybe 88° during the hot afternoons. The humidity? Ugh! The rains last a few minutes to maybe an hour at a time, so you can usually outwait them.

Living is easy in a place like this, with hunger unknown. Wild bananas and pineapples are all around, coconuts, and so on. All sorts of fruit and vegetables grow in profusion. You just plant 'em and jump back. And living up off the ground not only keeps you away from the floods after each rainfall, but also keeps you away from most of the small animals and bugs. It's cooler, too. Even in town, many of the houses are built up in the air, with an open parking space for cars on the ground level.

But each remote country of the world has a different story to tell, if you'll listen. However, until we take off the pressure of the awards for getting QSL cards from rare countries, how are we going to share in these things? And how are we going to make hamming fun for ops in these spots?

I enjoy getting on for a few days from some weird place and making thousands of contacts. But remember that I do this for fun. I know that if I were to live in one of these places, I would get pretty tired of the unending pressure for the shortest contact possible, writing down calls month after month so chaps can get QSL cards. The paperwork involved is a drudge.

It's no wonder that every now and then we develop a DXpeditioner who uses this pressure to make money. People on the Honor Roll will eagerly pay $50 each for a contact with a new spot. Indeed, that was the going price ten years or so ago. I'll bet that a mercenary today could ask for and get $250 each for a new country. The charge for those not on the Honor Roll would be down to around $25. If I ever retire from publishing, I just might grab a couple of portable rigs and set out to prove that I can make $100,000 a year via DXing.

Now, for those readers who have not followed my personal enthusiasms, I'd like to assure you that you will have to look hard to find a more energetic contester. And I think I can keep up with anyone in the world when it comes to making fast contacts from rare spots. I've got that down to a science now, if you'll break quickly with the last letter of your call, please. Hold off for a few seconds and give it to me just once phonetically and I'll get you. If you give it twice, you'll go to the end of the list. I don't just work the loud stations that way—I work right down to the weak mobile stations and other rare DX callers.

Can anything be done about DXCC and the Honor Roll? Of course not, but that isn't going to stop me from beefing about what it has done to amateur radio. Who knows, I may come up with something even more pernicious.

ASIAN TOUR

Speaking of Asia, I'm sponsoring a tour of Asia for this coming May, if you're interested in a first-class trip. This will be a short one, running about two weeks, and will visit Tokyo, Taipei, and Hong Kong. This is aimed more at the computer aficionados, so it will coincide with the microcomputer show in Tokyo, plus smaller get-togethers in the other countries (which are not as deeply into micros as Japan).

The tour will use the best of hotels...strictly first-class...and includes breakfasts and even some of those spectacular dinners. Having just returned from one, I can tell you that they are truly first-rate.

In Tokyo, we'll try for a meeting with the TIARA, the Tokyo International Amateur Radio Association. You'll not want to miss Akihabara, the electronics section of Tokyo, with hundreds of stores selling electronic equipment, ham gear, parts, and so on. You'll find most of the ham rigs running about 50% to 75% of the American price...unless you wait for Hong Kong, where they are generally even lower.

You'll get a kick out of Tokyo. The subways are easy to use. There are McDonald's all over the place in case you get a Big Mac attack...plus all the old home features such as Shakey's, Kentucky Fried, and even Wendy's. For the more adventurous, there are all kinds of Japanese meals, from raw fish right on through. This last trip, we had a complete raw-fish meal, with two courses of raw whale included...courtesy of the chaps at TDK.

If we get some hams on the trip...and you're interested...I'm sure we'll get a good reception from Kenwood as well as TDK...and perhaps Yaesu. We'll be too far away for Icom, unfortunately... wonderful people.

In Taipei, you'll enjoy the city...the people...and some of the incredible things you can see there. We can certainly get together to meet Tim Chen and see the radio club...and BV1A. I don't know if we can swing it to let you sit down at the mike of the station or not...but it's worth a try.

The next stop is Hong Kong, where you won't believe the prices on electronic equipment. There are dozens upon dozens of small shops, all trying to outdo each other. The city is big, with hundreds upon hundreds of high-rise apartments and business buildings. Transportation? Anything and everything...from modern subway to trishaws. I like Phil VS6CT's approach to crossing the ever-jammed streets. He just steps into the traffic without looking at the cars and they always stop for him. It takes some guts to get used to his system, but I can assure you that it works. He's lived there for years and is still alive as testimony.

If you bring along an HT, we *can* get ham tickets in Hong Kong. No problem... get 'em in minutes. They have a repeater, of course.

The ferry across the bay between Hong Kong and Kowloon costs 8¢ for first class, as I recall. Wonderful sight—and you'll get great pictures.

The tour starts from Los Angeles on May 20th and will be returning two weeks later, June 3rd. This is immediately after NCC in Anaheim, which runs May 16th-19th. I'll be there for NCC and then go on the tour, so if you go, you might not only have someone interesting to talk to, but you will also have someone who really knows the ropes.

If you have the wanderlust as I have, you may want to delay your trip back for a few days and add some other countries to your trip. This can be done remarkably inexpensively. Travel in that part of the world can be surprisingly low-cost. This last trip, I added a bunch of extra stops to

the tour, going to Singapore, Bangkok, *Kuching (Sarawak), Brunei,* Sabah, *and* Manila. I traveled a day and then visited two days, taking three days more for each country visited. The hams in each country were first-rate. The hotels were fine (except for Brunei...and now I know of a good one there) and the food superb. I gained five pounds on the trip...despite my jogging just about every morning. You'd laugh to see me running three and four miles in the early morning through the streets of Taipei, stopping now and then to snap a picture.

Other than imitation diamond-encrusted $15,000 Tifffany watches for $30, what bargains are there in Taipei? Plenty. You'll be shopping up a storm in the department stores there. You'll also get pretty sharp with chopsticks.

I don't have the exact price of the tour yet, but I'm sure it will run no more than around $2,500 for the air fare, hotels, many meals, all ground transportation, tips, airport taxes, and so on. Also, when you are in a group like this the usual baggage limits are waived, so you can pick up all the souvenirs you want. Drop me a line if you're interested and I'll send your letters on to Commerce Tours in San Francisco, the firm we work with on trips like this.

TAIWAN IN TROUBLE

Taiwan has been growing almost incredibly in exports over the last few years, but they are getting into deep trouble these days...mostly as a result of their success. Most of the products of Taiwan have been labor-intensive, depending for their success on low wages. But now, as their wages have escalated...inevitable with only a little over 1% unemployment...they are becoming uncompetitive with similar goods from other low-wage countries such as the Philippines, where the minimum wage is around $2 a day and many people still have to live in the streets.

The obvious route is to change from labor-intensive goods to higher-priced things such as electronics...but here they are up against an educational problem of enormous proportions. Japan made this change from inexpensive exported goods to high-priced, high-tech manufacturing years ago and has built up the infrastructure of education needed to support such an industry.

As any DXer is well aware, there is exactly one ham in Taiwan. I had the pleasure of having breakfast with Tim Chen BV1A during my recent visit to Taipei and discussing this with him. Tim had some hope because there is a move underway to bring more people into amateur radio in Taiwan which could eventually result in dozens of stations on the air. In the past, the government has discouraged new amateurs or even shortwave listening, with the result that there has been no real incentive for kids to get interested in radio. This, in turn, has made it so that there have been very few electronics engineers or technicians in Taiwan.

I've been getting to the Taiwan Consumer Electronic Shows for several years now, seeing their products and talking with the manufacturers. I've also endeared myself to businessmen of Taiwan by pointing out what they already know... that their electronic equipment is all imitative, with no creativity in evidence. Thus their equipment has had to sell almost entirely on price, with new ideas and quality taking a back seat.

Lacking the scientists to develop new products, or the engineers to put in automation and robots, Taiwan has had to depend mostly on copying the equipment from other countries and on their low wages. Now, with their wages rising faster than those of the rest of the world, they are in trouble, and they haven't the supply of engineers and technicians to turn to for help.

Business has been brisk in recent months in rip-offs of the Apple computer. Again, lacking anything significant in technicians, Taiwan manufacturers have had to turn to copying the most successful of the microcomputers, the Apple. There are over a hundred small firms... and some fair-sized ones, too...making Apple imitations. I saw them everywhere at the electronics show in Taiwan and even had a chance to talk with some of the manufacturers personally.

If Taiwan is able to get kids interested in high-tech hobbies such as amateur radio and computers, the country could, in a few years, be able to get away from trying to make a living from the ideas of others and come up with creative ideas of their own, as has Japan. Within the memory of those of us who were around in WWII is the image of Japanese products as being junk. For many years, most Japanese products were cheap imitations of better products, with shoddy workmanship.

Today, as you know, not only has Japan set the world standard for productivity, but also for quality. They've left most other countries far behind in these regards. And in the last few years, we've also seen the emergence of Japanese creativity.

Though I put a good deal of emphasis on the importance of getting kids into high-tech hobbies as a way for a country to develop technicians and engineers, I am among the first to agree that this is by no means the only problem we have in trying to compete with the Japanese. But without being able to match them...or even come close...in engineering talent, no amount of government help of industries, more favorable tax climates for electronics firms, etc., is going to help us to regain world superiority in technology.

There have been a number of good programs on television lately showing the difference in education between the US and Japan (and even Russia). Our schooling system has disintegrated a good deal since I went to school, with math, sciences, and so forth being almost done away with in many areas. No wonder kids are having a problem even with the Novice ticket, which anyone with a high-school science education should be able to pass. The fact is that few kids *are* getting a high-school science education. Phooey.

Oh, there are a lot of things we need to overhaul...and I will make few friends by bringing these things up. One only has to read the reports in *Reader's Digest* on the activities of unions to terrorize uncooperative manufacturers to realize that America has no monopoly on human rights. While we are indignant over the Israelis making life extremely miserable for the Palestinians, the torture in Argentina, the executions in Guatemala, and so on... things which are going on all over the world...we have not too different things going on right here which we want to cover up.

The worker who works harder than his fellow workers is harassed until he slows down and stops making everyone else look bad. I saw that one myself back when I worked for a company which made transmitters for the Army. The union there was furious that the test people didn't just pass along anything put together by the production people...and never mind that the transmitter would be needed by the Army in working shape. When I got busy and turned out about double what my fellow workers could manage a day, they started sabotaging the units I'd aligned to prove that I was turning out poor work. No, I've been there, so when I read about this happening all over the country, I tend to believe it.

We geared up and won WWII, getting the cooperation of millions of people. I think we can surmount the current depression if we make a decision to do it and stop our own people from fighting each other. Unions can do worlds of good to help people and production...they can also drive you crazy with featherbedding, slowdowns, restrictive work rules, intra-union fighting, and so on. Unions which insist on using every weapon at their command to maintain their members at higher than the normal wage for their work are robbing the rest of us. This comes to roost when they come up against foreign competition, such as with cars. American cars would drive the Japanese cars right out of the country if the car unions would settle for average wages for their workers and put on the pressures for productivity and quality.

When I have to rent an American-made car on a trip, I am invariably amazed at the poor performance and quality of the product I am driving as compared with my Japanese cars. That door doesn't fit right because someone on the production line just didn't care...and the inspector was under union pressure not to make the worker look bad...or was out on coffee break when my car went by.

Well, the world is changing. More and more "workers" are going to be replaced by robots who do not forget a few screws and bolts when assembling a car. Robots will make the windows fit exactly right. Robots will not call in sick when a DXpedition is brewing on 20m or when hung over from too much brew the previous night. Workers are going to have to think in terms of education...perhaps with some science in the mix so they will be able to cope with the type of work we have today...and will have in the next twenty years.

The world of 1999 looks to me as if it is going to be a high-tech world, with telecommunications on the order of 10,000 times more than we have today...with people able to communicate with others anywhere in the world in seconds from small hand-held computer-like communicators. We'll have teleconferencing and so on. But these developments are going to call for an incredible number of technicians, engineers, and scientists. Our present school system is totally inadequate to cope with this need.

Taiwan has the same problem, only it is hitting them hard right now. They need thousands of technicians and engineers and they need them today. In all of Taiwan, I found one firm with an innovative computer product. That was the Micro Professor, which looks like a comer. It will run Apple programs, but does not appear to be an Apple rip-off, even in its electronics.

One is struck by the impact of the lack of copyright enforcement in Taiwan. Not only are there many bookstores full of cheap copies of almost all of our best-selling computer books, but one can also go into stores all over Taipei and buy a $15,000 watch for about $30. Sure, it's a copy, but a good one. I picked up some local copies of Apple manuals...and saw any number of copies of well-known programs, usually selling for about $10. Not bad for VisiCalc. Within days of a new program coming out in the US, it is available all over Taipei for a few dollars.

Taiwan will be able to shift to higher-tech products and thus make more income per sale...and be able to pay higher wages...if they have the technical people to cope with the changes in world technology. To me, this means getting their kids into high tech and providing the schools they need to take this interest and develop it.

HAM HELP

I have a Midland model 13-866 CB radio which I converted to 10 meters, following the modifications outlined in the April, 1981, issue of *73.* However, it does not receive on 10 meters, the transmit signal is garbled, and it will not change frequencies. I need information on how to make it work.

Joe Oden WD0HYM
4129 South Wichita
Wichita KS 67217

I need the following items: horn speakers, spark gear, high impedance headphones with cords, 201A (or equivalent) tubes, old terminals, bus-bar wire, vernier dials made prior to 1930, 2- to 4-inch bakelite 0-100 dials, and telegraph keys.

Alan Shawsmith VK4SS
35 Whynot St.
West End, Brisbane
Q 4101, Australia

I am looking for construction plans or a schematic for a one-tube QRP rig.

MacArthur Moore
5230 Heston
Philadelphia PA 19131

Could someone help me find the schematic for an Eico model 150 signal tracer?

A. B. Wells WA5COM
PO Box 50
Tunica LA 70782

I am looking for CB magazines printed prior to 1967.

John W. Heacock K3YCP
8100 Bass Lake Rd.
Apartment 110
New Hope MN 55428

I am trying to find the manual and replacement capacitors for a Hallicrafters Sky Ranger S-39 receiver. I also need an operational or as-is DX-40 transmitter and a manual. I am willing to cover copying and postage costs

Dave Drinnan VE3MPX
21 Beaverbrook Lane
Kanata, Ontario
Canada K2K 1L4

I am searching for service manuals or schematics for the Jefferson-Travis model 350A-1, vintage unknown. I will pay for postage and copying costs.

Steve Stout KA5CRI/9
1537 Winslowe Dr.
Palatine IL 60067

REVIEW

THE AEA CODE TRAINER

Everybody has his own way of learning the code, and most people think that the way that they learned it was the best. It was with this possible bias in mind that I approached the AEA BT-1 code trainer, a Morse-code training device that uses no tapes but an IC to produce the tones.

AEA, which specializes in keyers and code readers, should know the code better than many manufacturers, and this knowledge has led to a novel approach for learning the code. The BT-1 is designed for use by people who are completely unfamiliar with Morse code. With the trainer, you move step by step through each character, singly and then in groups.

So far, this is pretty standard fare. However, the machine does not teach the code from simplest to more complex, for example from E to Y. The first character learned is F, and from there the student moves on to K, B, Q, and the last letter learned is I.

In addition, the code trainer does not begin sending each character at a slow speed. Every character is at its 20-wpm length, regardless of the spacing between characters. As they explained in the manual, this is to overcome the proverbial plateau many people encounter at about 10 wpm. By learning the sound at a higher speed at the start, your ear will have to adapt less as you increase the code speed.

AEA also suggests a strict adherence to the sequence of characters which they suggest. After learning to recognize each character, both by itself and in groups of increasing length, the student moves to the next character. As he or she moves down the list of new characters, the characters previously learned are thrown into the groups at random. However, the character being learned is weighted at 50 percent—that is, one-half of the characters will be the new character.

Once all of them have been learned (the list includes numbers and common CW ciphers), the student can increase the speed by decreasing the spacing between characters and changing the character length as well. Each training selection may also be called up without weighting the new character, making the characters of each group completely random.

The BT-1 has several accessories which enhance its use, such as a full-sized headphone jack instead of a ¼-inch earphone jack, and a second jack in which a key may be inserted for use as a code practice oscillator. The pitch of the tone is also selectable in discrete steps, adapting the trainer to a variety of ears. Its small size and the included nicad battery pack and charger make it extremely portable, so you can get your daily half-hour of practice in many situations.

A 12-button keypad controls the operations of the BT-1. However, one of the difficulties in using the trainer is learning the commands which control it. All of the commands, except for the stop command (#), are at least 2 keystrokes, and in most cases 4. I found that to use it I had to have the manual close by at all times for quite a while until I learned the proper commands.

Because of the relatively complex controls, the speed at which you are copying is also difficult to determine. One command sets the character speed from 18 to 99 words per minute, and another command sets the delay between groups of characters. The delay range is from 0.1 to 9.9 seconds, with a default value of three seconds. The character speed default, as mentioned above, is 20 words per minute.

AEA's BT-1 code trainer.

For this reason, as well as the somewhat limiting factor of listening to code in purely random groups, I found that the code trainer worked most effectively in conjunction with tapes. For characters with which I have difficulty, such as X and some of the CW ciphers, I drilled myself on the BT-1 to increase my proficiency. But to increase my overall speed, I found that I used tapes. With the known speed for the tapes, it was easier to keep track of my progress, and it alleviated the boredom of listening to and writing random groups.

However, I would recommend the code trainer to Novice classes and individual students. AEA's method, while not the standard procedure, seems to work. The portability of the unit would hopefully lead to more frequent use. And, as we all know, there is no substitute for diligent practice when trying to learn the code.

For additional information, contact *Advanced Electronic Applications, PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.* Reader Service number 486.

Avery L. Jenkins WB8JLG
73 Staff

THE AZDEN PCS-4000

The progress of large-scale integration (LSI) has left hams somewhat in its wake, because this technology is highly dependent upon the economy of scale—the more you make, the cheaper they get. The amateur market is often too small to bring the advantages of LSI to bear in new products. However, Azden has brought amateurs back to the state of the art with the intoduction of its new PCS-4000 2-meter transceiver.

Azden's use of LSI has enabled it to produce a microcomputer-controlled radio that is little larger than the average in-dash AM radio. The PCS-4000 measures 2 inches high by 5½ inches wide by 6¾ inches deep, and much of this miniaturization has been accomplished by replacing mechanical control mechanisms with logical functions performed by the microcomputer.

All of the transceiver's tuning is conducted through the 16-button keyboard, which doubles as a touchtone™ pad. The Azden has an extended range of 142 to 149.995 MHz and frequencies may be selected in 5- or 10-kHz steps or from the two banks of 8 memory locations. The relationship between the memory banks is controlled by a 4-position memory mode switch. This switch allows the operator to choose a frequency from either bank, both banks, or select a receive frequency in one bank and a transmit frequency in the other. By using this switch, non-standard repeater offsets may be programmed into the machine.

Standard offsets and simplex operation are also selected via the keyboard, and the offset may be stored in memory with the chosen frequency. Nine LEDs indicate the memory address and bank currently in use.

Other indicators on the front panel include the green LED frequency display, which indicates the transmit frequency as well as the receive frequency, a digital S-meter, and a channel-busy indicator. Other LEDs show whether the PLL circuit is locked, which offset has been chosen, and whether the frequency is from the memory bank or has been directly keyed in.

Besides the volume, squelch, and memory mode controls, the PCS-4000 sports only 4 mechanical controls. Three switches choose the frequency step, select whether the scanning feature will settle on busy or vacant frequencies, and turn on the optional 1750-Hz tone.

The scanning features may be used in conjunction with the memories, or an entire portion of the band may be scanned to locate either busy or empty channels. These options are also keyboard-selectable. The scanner will also automatically resume after monitoring a busy channel for about 10 seconds, which gives you enough time to decide whether you want to stay on that frequency or not.

The Azden puts out a husky 25 Watts in the high power mode and 5 Watts in low power. Current consumption runs from 0.6 A in receive to 6.0 A while transmitting, and spurious frequency rejection is better than −60 dB.

The receiver has a sensitivity of 0.2 uV and a selectivity of 6 dB down @ ±6 kHz and 60 dB down @ ±15 kHz. The audio output is 2 W into a 2-inch speaker. The receiver is a double heterodyne operating with a first i-f of 16.9 MHz and a second at 455 kHz.

The transceiver is controlled with an MB 8855222M single-chip microcomputer. Circuitry has been sectioned into four boards—the control board, the PLL and transmit circuitry, the receive unit, and a PA board. All of the functions of the PCS-4000 have been packed into 15 ICs, 9 FETs, and 34 transistors.

The flexibility of the microprocessor control system has given the PCS-4000 a variety of special functions which I have found valuable. Besides being able to select a frequency or memory address from the keyboard, a single button will reverse transmit and receive frequencies. I have found this feature useful for quickly finding out whether a station is strong enough to work simplex.

Another very valuable feature not found on many other radios with programmable memories is the nicad backup which Azden built into the transceiver. Although the manual recommends supplying power to the radio directly from the battery, the nicad will preserve the radio's memory when it is removed from the permanent power source. I regularly take my radio inside for safekeeping, so without this feature I would have to reprogram 16 channels every morning. The nicad is automatically recharged whenever the radio is on, and it only supplies enough power to retain the memory; you cannot operate the transceiver from the battery.

The battery comes with the initial charge already completed, unless the unit sat on a dealer's shelf for several months. Azden has included as an accessory the necessary jumper cable and instructions for charging the battery should it be necessary.

There is also one priority channel in each memory bank, in the first memory address. The priority channel in either bank can be instantly accessed, regardless of what bank you are presently operating from. Two buttons on the keyboard are reserved for this function, and the priority channel in the first memory bank may also be called up with the remote control located on the microphone.

The microphone incorporates two other controls as well. The up/down buttons will change the frequency by 5- or 10-kHz steps or will proceed sequentially through the memory if you are operating in the memory mode.

The scanning circuitry has proved to be especially versatile, and with it I have found and immediately been able to access repeaters that I previously did not even know existed. In addition to searching for your choice of busy or vacant channels and scanning the memory or a selected band slice, the scan may be conducted with a repeater offset. For example, if you are scanning the range above 147 MHz, you can instruct the transceiver to automatically add 600 kHz to your transmit frequency.

The 25-W output gives the PCS-4000 a good signal range, and all comments on the transceiver's audio give it a good report card. It picks up little road noise, and the audio lacks the heavy bass component found on some other transceivers.

Although I have had some problems with the transceiver, they have been relatively

minor and can be expected as an operator adapts to a new radio. The microphone button which calls the priority channel is located on the upper tip of the transmit button, and therefore is easily activated when you are pawing for the microphone while keeping one eye on the road. Until I became used to handling the microphone differently, I sometimes would begin a QSO on 146.150 and suddenly find I was talking to the breeze on .52 simplex.

There is also an interesting feature on this radio which could be made more useful. The PCS-4000 will emit a beep whenever a keyboard command is received, enabling the operator to do some extensive radio fiddling while keeping his or her eyes on the road. Unfortunately, the beep is not always loud enough to hear over the road noise.

However, these are minor problems and not integral to the otherwise excellent capabilities exhibited by the PCS-4000. By using the options available on this radio, I have found a versatility in mobile operation previously just imagined and proved to my satisfaction that bells and whistles are not always superfluous, but can become a useful adjunct to my operating. And by bringing state of the art back to hams, Azden has provided an incentive for other manufacturers to try to catch up.

For further information, contact *Amateur-Wholesale Electronics, Inc., 8817 SW 129 Terrace, Miami FL 33176; (303)-233-3631.* Reader Service number 487.

Avery L. Jenkins WB8JLG
***73* Staff**

TEN-TEC MODEL 560 CORSAIR TRANSCEIVER

It was with a great deal of anticipation that I sliced the packing tape on a huge shipping carton whose return address said Sevierville, Tennessee—Ten-Tec's home in the foothills of the Great Smoky Mountains.

For some time, those of us involved with the amateur radio industry had been hearing rumors of a new Ten-Tec transceiver reputed to be even better than, and a replacement for, their respected Omni-C. Very few, if any, of amateur radio's press had yet seen the new rig, and it wasn't until the dealer notices were out and some of the ads in hand that any of us really knew what the rig looked like or what its features were supposed to be. The introduction had been carefully planned to take maximum advantage of the traditional year-end buying season . . . a strategy sharing popularity with Dayton's famous Hamvention as an ideal time for the debut of new amateur radio equipment.

Like its privateering namesake, the Corsair was clearly intended to capture a share of the amateur radio marketplace from other well-known transceiver manufacturers. The ultimate test of that effort will be the reception by John and Joe Ham, but, for now, it was my privilege to have one of these brand-new, solid-state transceivers for evaluation. The *73* staff had requested that a full complement of crystal filters be provided to take care of RTTY and CW needs as well as SSB operation, so it was with considerable excitement that I finished opening the box. Time to see what was inside.

Two other cartons inside the large one appeared: a small and rather heavy one, and a somewhat larger but lighter one. Opening the small one first, I noticed the foam-in-place packing material completely surrounding the contents, conforming to every contour of the equipment to protect it from transit damage. Pulling this aside, I found the deluxe power supply neatly bagged in a heavy transparent plastic envelope. "What a good-looking unit," I thought as I set it on the operating desk. "Ooh, what a pretty radio," said my wife who had been watching the unveiling. "Is that your new rig?"

Next, I opened the larger carton and again found the same secure foam surrounding another plastic-bagged unit. Here was a piece of gear that looked good even before it was unwrapped, and I thought back to all of the earlier Ten-Tec equipment I had seen come from the box: my first PM-1, then the PM-2, the Argonaut, the Century 21, the Models 540 and 544, and the Omni series. All were innovative and unusual, presenting new ideas and approaches in performance and styling for solving age-old problems. It is no wonder then that I keenly anticipated the setup and operation of the new Model 560, Corsair.

The Corsair is slightly wider than it is deep, and one's first impression is of crisp, contemporary styling and no-nonsense, rugged construction. A band of darkened glass along the top of the front panel is set off from the rest of the panel by a trim stripe cleverly painted to look like brushed chrome or aluminum, which nicely sets off the bronze-black finish . . . guaranteed to look attractive on my walnut operating desk.

The six-digit LED frequency display and the meter, next to it on the left, lie behind the glass band, called a "blackout" display because when the rig is off, neither the display nor the meter is visible. When lighted, the display is large and easy to see: five digits in red and the sixth in green, showing 100-Hz steps. The meter is also easy to read and presents four selectable functions.

The speaker/power supply matches the decor of the transceiver, and together they make a handsome pair sitting side-by-side on the desk. Black knobs with bright-metal centers peaceably coexist with aluminum toggle switches for the most frequently used controls, while smaller knobs in a flat black finish serve the set-and-forget functions. A tilt bail under the rig allows the front of the rig to be raised to a comfortable viewing angle. The standard four-in microphone connector and the usual earphone jack immediately above it occupy the lower left corner of the panel.

Dominating the center of the front panel is the tuning dial with its fluted knob and vernier skirt. It is divided into 100 increments, each representing one kHz, to facilitate frequency reset and supplement the LED readout. The accompanying photograph reveals more than a detailed description for the moment, so we will leave that until later. First, let's take a look at the more technical aspects of the rig.


The Corsair transceiver from Ten-Tec.

General Description

The Model 560, Corsair is a medium-powered transceiver employing the latest solid-state technology. As received from the factory, it contains all necessary crystals for operation in the 160-, 80-, 40-, 30-, 20-, 17-, 15-, 12-, and 10-meter bands (full coverage of the latter). Although intended primarily as a fixed station, it may be used mobile or portable because it operates from a 12-14-volt-dc source or from a 115-volt-ac source through an optional external power supply. Broadband circuitry eliminates the need for tune-up, and the normal sideband for the band in use is automatically selected when bandswitching. LED indicators are provided so the operator can tell at a glance which particular functions are in use. Nominal input power is 200 Watts, and full output power at a 100% duty cycle (RTTY and SSTV buffs take note) is available on all modes and bands. Further, the Corsair is capable of operating into an infinite swr without damage to its finals.

Frequency coverage on the various bands includes a generous 40-kHz overrun at the top and bottom edges of each band, whose limits are: 1.8-2.3, 3.5-4.0, 7.0-7.5, 10.0-10.5, 14.0-14.5, 18.0-18.5, 21.0-21.5, 24.0-24.5, and 28-30 MHz. The heart of the frequency-determining circuit is a permeability-tuned oscillator operating in the 5.0-5.5-MHz range. Note that phase-locked-loop circuits were purposely not used in order to provide better receiver performance.

Stability of the vfo (PTO) is less than 15-Hz change per degree F over a 40-degree change from 70-110° F after 30 minutes warm-up, and less than 10-Hz change between 105 and 125 volts ac using the Ten-Tec 18-Amp supply. The tuning is vernier and gives approximately 100 kHz per full revolution of the dial skirt and about 18 kHz for one full revolution of the knob. Readout is direct with +/− 100-Hz accuracy in 0.3"-tall numerals. The last numeral is green while the first five are red.

The transceiver contains one LSI, 20 ICs, 94 transistors, 107 diodes, and six LED readouts on 22 PC assemblies with plug-in cables. Its construction is a rigid steel chassis with dark-painted, textured aluminum panels and a snap-up steel tilt bail. Dimensions are: 5¼" H × 15" W × 14" D (including the massive heat sink). Weight is 14 pounds. The rig requires 12-14 volts dc for operation, at 850 mA in the receive mode and 18.5 A maximum in the transmit mode.

Receiver

The receiver is a triple-conversion superhet having a sensitivity of 0.25 microvolts for a 10-dB signal-plus-noise-to-noise ratio on all bands and 0.8 microvolts typical with the rf preamplifier switched off. It is interesteing to note that the preamplifier circuit attenuates incoming signals by being switched out of the circuit (giving 10 dB of attenuation) and by inserting 10 dB of resistive attenuation in series with the antenna lead and input, for a total of 20 dB of signal attenuation. The dynamic range is better than 90 dB with a third-order intercept point of +15 dBm. Selectivity is obtained through 12-pole crystal filtering in the i-f circuits (consisting of 8-pole and 4-pole filters in series) instead of the more usual 8-pole filters, resulting in a nominal SSB bandwidth of 2.4 kHz and a 1.7:1 shape factor between the 6-dB and 60-dB down points on the selectivity curve. Optional 250-Hz, 500-Hz, and 1.8-kHz filters were installed in the unit sent for test by *73*'s staff. If desired, an optional 8-pole filter may be substituted for the standard 4-pole filter (giving 16 poles, cascaded) to provide nearly ideal steep-sided skirts on the selectivity curve and an even better shape factor. A notch filter is also provided for attenuating interfering signals by a *minimum* of 50 dB and is tunable between 200 Hz and 3.5 kHz, which means that you can notch out annoying heterodynes within the audible range and obtain vastly improved reception. This is particularly useful on SSB, but is very successful on CW as well. A CW "spotting" tone of 750 Hz is also provided for zero-beating a received signal. This is done by tone-matching instead of zero-beating; that is, when the "spot" tone matches the received tone, you are exactly zero-beat with the desired signal. Incidentally, this system is much more accurate than the null, or zero-beat, method, because the latter method could introduce an error of at least 200 Hz since the audio response of the circuits cuts off at about 200 Hz.

I-f frequencies are 9 MHz and 6.3 MHz, and the PTO covers 5.0-5.5 MHz. Audio output up to 1 Watt with less than 2% distortion (reference to 8 Ohms) can be selected. Spurious responses are all below the equivalent 10-dB S+N/N ratio except at 1.838 MHz (where the equivalent 15-dB S+N/N ratio applies), at 21.300 MHz (where the equivalent 20-dB S+N/N ratio applies), and at 28.980 MHz, where the "birdie" can be eliminated by tuning to the next higher band segment (29.0-29.5 MHz) and tuning 20 kHz below the lower band edge. Although the birdies are detectable, they were not objectionable in our evaluation and could be heard only under quiet band conditions. There is an adjustable noise blanker whose threshold may be varied by rotating a small knob on the front panel. I-f rejection is greater than 60 dB.

The S-meter is factory set to provide an S-9 indication at a signal input level to the antenna terminal of 50 microvolts. Each transceiver is supplied with its own performance specifications as measured in the laboratory before shipment. In the case of the one tested by *73*, S-9 was obtained with an input signal of 47 microvolts at the antenna terminals.

The antenna input is low impedance (nominal 50 Ohms), unbalanced to ground. The dynamic range is given as 90 dB nominal, and the *73* test transceiver was measured in the laboratory before shipment (see box). Offset tuning is provided in two ranges: a low range of +/−500 Hz and a high range of +/−4

Corsair #560-00056
as tasted by 73

Sensitivity/RX Performance

	Sens.	Image	I-f Rej.	Bird or RX Spur
160m	−119 dBm	>90 dB	>90 dB	-
80m	−120 dBm	−67 dB	−77 dB	-
40m	−120 dBm	−64 dB	−75 dB	6.999
30m	−120 dBm	−66 dB	−64 dB	-
20m	−121 dBm	−84 dB	−84 dB	14.0
18m	−121 dBm	>80 dB	>90 dB	18.00, 18.165
15m	−121 dBm	−64 dB	>90 dB	21.000, 21.300, 21.320, 21.365
12m	−109 dBm	−53 dB	>80 dB	-
10A	−121 dBm	−51 dB	>80 dB	-
10D	−122 dBm	−52 dB	>80 dB	28.98

Note: Sensitivity reference point is 10 dB Signal-Plus-Noise/Noise

S-Meter:
Threshold −121 dBm
S−9 = 45 μV
IP_3 = +5 dBm (rf amplifier on) and +15 dBm (rf amplifier off)

	TX: Output	Harmonics		
160m	98 W	−50 dBc	3rd order two-tone: −28 dB	
80m	97 W	−45 dBc	-	Carrier −55 dB
40m	95 W	−48 dBc	-	
30m	97 W	−50 dBc	-	
20m	95 W	−52 dBc	Opp. Sideband ≥ −45 dB	
18m	95 W	−45 dBc	ALC range: to 30 W	
15m	93 W	−55 dBc	-	
12m	93 W	−52 dBc	-	
10m	93 W	−65 dBc	-	

Measured performance of the Ten-Tec Corsair transceiver tested by 73.

kHz. This feature is particularly useful for netting (low range) or for DXing where the foreign station listens up or down by several kHz.

Transmitter

The transmitter dc power input is 200 Watts maximum at 14 volts dc (CW and SSB) and a 100% duty cycle of up to 20 minutes is permitted without exceeding the temperature limitation as measured on the final amplifier heat sink. Operation in excess of this limitation should only be undertaken by force-cooling the heat sink with a small fan (not supplied). Rf power output is 85-100 Watts typical into a resistive load, and each transmitter is measured on all bands prior to shipment (see box). Output impedance is nominally 50 Ohms, unbalanced to ground, through a UHF-type connector. The microphone input, although nominally high impedance, will accept either Hi-Z or Lo-Z microphones with 5-millivolt output. An optional electret microphone may be obtained from Ten-Tec. Polarizing voltage is available on pin 4 of the connector for microphones such as the electret sent with the unit for *73*'s evaluation.

T/R switching is by VOX or PTT on SSB and instant or semi-break-in on CW. The CW sidetone is internally generated, and its pitch and volume (which is independent of the receiver's audio control) may be adjusted to suit the operator by means of two thumbwheel controls inside the rig and reachable through a hole in the bottom of the metal cover near the tilt bail. The CW sidetone operates only in the CW mode.

SSB generation is by means of a four-pole crystal-lattice filter at 9 MHz, using the balanced modulator system of carrier suppression which is typically 60 dB (see box). Unwanted sideband suppression exceeds 45 dB with a 1.5-kHz tone input (see box). Spurious output is better than −45 dB relative to full output of the transmitter.

The panel meter is switchable to read several functions: forward (output) power, collector current (Ic), vswr, and speech processor level. These functions are selected by a front-panel switch near the meter.

CW offset is 750 Hz, automatically provided, and ALC is front-panel adjustable between 30 and 100 Watts output. An LED indicator flashes at the ALC threshold as drive is increased or as modulation peaks reach a preset level.

Observations on Use of the Operating Controls and Accessory Features

OFFSET tuning is similar in function to the receiver incremental tuning offered on most modern transceivers, except that this one has a dual range selectable by a toggle switch on the front panel plus the fact that the receiver, the transmitter, or both at once may be varied by this control through switch selection. . . particularly useful for net operation and for working DX.

Passband tuning adjusts the position of the second i-f crystal filter in relation to the fixed first i-f filter. When the filter selected by the XTAL switch is wide (2.4 or 1.8 kHz), the PBT control becomes essentially a variable bandwidth control whereby counterclockwise rotation reduces the bandwidth on the low side of the selectivity curve, and clockwise rotation reduces the bandwidth of the high side of the selectivity curve. When the XTAL switch selects a narrow filter (500 or 250 Hz), the PBT control is used in the normal passband tuning sense. The Ten-Tec PBT circuit produces the effect of varying the bfo, changing the pitch of signals passing through the narrow filter to separate signals that are very close together. For example, on RTTY, the passband tuning can be adjusted to pass only the 2295- and 2125-Hz tones for superior rejection of adjacent signals.

VOX/OSK depends upon the mode of operation selected (SSB or CW) and the position of a front-panel switch. For example, in the SSB mode, if you select the VOX position, normal VOX operation is achieved and VOX gain, VOX delay, and anti-VOX controls are effective to tailor it to your own preferred style. If you select the FAST position, you have PTT operation with fast recovery. If you select the SLOW position, you also have PTT operation but with slow recovery from the microphone switch. In the CW mode, however, the VOX is inoperative and T/R switching is accomplished by the break-in keying circuits. In this mode, FAST gives you full break-in keying, while SLOW permits semi-break-in keying.

AGC switching is provided so that the hang time, i.e., receiver recovery time, may be selected to suit the operator. In the OFF position, there is no auto gain control, and i-f gain is controlled by the rf gain control.

Noise blanker level is adjustable and sets the blanking threshold. In the fully counterclockwise position, the blanker is off. Clockwise rotation of the control increases blanker sensitivity, permits fine adjustment, and prevents overloading, ensuring the best possible fidelity of the received signal.

The DRIVE control adjusts both the microphone gain and CW level.

The ALC control sets the threshold level at which automatic level control starts. When rotated fully clockwise, the input power is factory-adjusted for 200 Watts on the least efficient band when the ALC LED indicator just starts to blink. Power can be reduced below this level to approximately 30 Watts by rotating the control fully counterclockwise. A change in the ALC control adjustment requires a change in the DRIVE setting.

You can use either high- or low-impedance earphones with the Ten-Tec Corsair, and the equalizing audio circuit is such that the audio amplifier operates at its best signal-to-noise ratio at all times.

WWV is received at 10 MHz. Set the LED frequency readout at 10.000 with the bandswitch and tuning knob. Set the switch for selectivity at position 3 (2.4 kHz) and zero-beat WWV's carrier. If the LED frequency display does not read exactly 10.000/0, you may adjust the timebase oscillator internally to read the exact frequency at zero beat.

The rear panel of the Corsair contains some interesting features that will make operation of the rig and accessories more convenient and will permit great versatility. Before looking at the back-panel features, we should have a look at some interesting front-panel provisions that may at first seem a bit confusing.

The RF-POWER dual-function control contains a push-pull switch which turns the rig on and off (in = on; out = off). Rotation of the control varies the gain by changing the bias to the i-f amplifiers. This is the rf-gain control and on-off switch.

As you might expect, the input level to the audio amplifier of the receiver is controlled by the AF-RF AMP knob, but it also has a push-pull switch connected to the control which activates the rf amplifier of the Corsair. The LED lights when the control is pushed in, telling you that the rf amplifier is operative. When the switch is pulled out, a 10-dB attenuator is switched into the circuit and the 10-dB-gain rf amplifier is disconnected entirely. The effect is a 20-dB reduction in signal applied to the rf mixer stage, which results in improved dynamic range and better sensitivity than would be possible if only an attenuator were used. Superior operation in the QSK or VOX modes can be obtained by temporarily setting the rf control fully clockwise, and then adjusting the setting (while receiving a strong station at about S7 or better) to a level slightly higher than desired. Then reduce the level of that signal by means of the rf control to a comfortable level. In this way, only one setting of the AF-RF power control need be made, and agc pumping and intercharacter signal blasting when QRM is present may be avoided when operating CW.

Rear-Panel Features

The EXT T/R jack is intended to actuate a high-power linear amplifier and is derived from a set of normally-open contacts on the auxiliary relay located on the control board. When operating CW, a thumb potentiometer located on the control board controls the drop-out delay of the relay, but in SSB, the drop-out delay function is switched out of the circuit. Adjustment should be made to suit the individual station requirements only *after* external equipment is installed and must be controlled by this relay.

Obviously, the key or keyer plug is inserted in the KEY jack. Keyers designed for negative-line keying, i.e., grid-block keying, will not work. The key line is positive and is a high-impedance circuit requiring very little current for actuation.

Two AUX 12 VDC jacks are provided, either of which may be used to power external equipment such as an external vfo or keyer. The jacks are connected to the +12-V-dc line *after* the protective fuse, which is rated at 20 Amperes.

A nine-pin female connector (ACCESSORIES) is available for interfacing an external vfo. When the vfo is not used, an external jumper must be used and the rig is shipped with the jumper in place.

The LINEAR socket consists of a 12-pin female connector which enables front-panel bandswitching of a linear amplifier or antenna relays. Nine band positions correspond to nine switch terminals, while three additional terminals are intended for a common, a ground, and a T terminal.

AUDIO IN-OUT jacks provide connections to the microphone and speaker for attachment of a phone patch or a RTTY unit. AUDIO OUT may also be used for connecting an external speaker *without* disabling the internal speaker.

A RECEIVE ANTENNA jack is provided for connection of a receiving antenna to the receiver input at all times by placing the small switch nearby in the *receive* position. In the *transceive* position, the receiver input is connected to the antenna socket for normal transceiver operation.

VFO IN-OUT jacks make it possible to switch off the transceiver's internal PTO such as when using an external vfo. The Corsair is shipped with an external U-shaped jumper in these jacks, enabling the internal PTO.

The PTT jack is in parallel with the microphone switch for activating the push-to-talk line and is operable in the SSB mode *only*. This permits an external switch such as a foot switch to be used for transmit/receive control.

The EXT SPKR jack is for an external station speaker and disables the speaker of the Corsair when an external station speaker is plugged in.

Operating the Corsair Transceiver

The bottom line, of course, is how the Corsair operates. Is it smooth and easy? Is it convenient? What are the disadvantages and drawbacks, if any? What is the "feel" of the rig, an indeterminate quality that is very subjective and depends upon the operator. . . but nevertheless important.

When I first spoke with Dan Tomcik at Ten-Tec about this rig, I stressed the importance of CW in my own operating and allowed as how I expected this Ten-Tec rig to excel in that department. Dan quickly corrected my impression. . . but he didn't

tell me I was wrong. What he said was, "yes, indeed, Ten-Tec has the reputation of building CW rigs that delight the operator with their QSK features and their rock-solid signals . . . but Ten-Tec rigs also have fine SSB performance which has often been overlooked." He wanted to make sure that I knew the Corsair was a no-holds-barred, fine SSB *and* CW rig. Consequently, I was on the lookout for something above average in audio quality on both transmitting and receiving.

Now we can return to the setup in my own shack, and I have to tell a little story at this point. In their effort to send the rig to us as quickly as possible, Ten-Tec omitted the instruction manual (which, by the way, is very complete and clear with good diagrams and descriptions). I used this opportunity as an advantage to see if it would be possible to set up the rig and operate it *without* the manual. Now I realize that this is the time-honored, traditional American way to do things . . . after all else fails, read the instructions. So here I was in exactly that position, but I reasoned that the rig was designed to operate into an infinite swr without damage to the transistors and the heat sink looked big enough to cool the Hercules kilowatt, so I wasn't too worried. Therefore, I proceeded with care and carefully connected the proper plugs to their mating receptacles. Each was labeled clearly. Ground strap first, antenna connector, speaker, keyer power supply interconnection (yep, switch was off), and finally, I plugged it into the ac outlet in my shack wall. The moment of truth was about to arrive; switch on and what do you know—signals, loud and clear, coming fom the neat compression-loaded speaker!

I first checked the band edges on receive and checked the calibration against WWV . . . perfect. Then I adjusted the controls for CW reception and checked the filters—very nice! Next, I tried the various other controls, including notch filter, offset tuning, passband tuning, and the various gain controls. Do you detect a bit of delay here, sort of a putting off of the ultimate test? Well, you're right. The manual was missing, and I didn't want to blow the rig by inadvertently doing a no-no. I needn't have worried.

From previous Ten-Tec rigs I knew that the LOCK position of the control is the tune-up position, so I selected LOCK and slowly advanced the DRIVE control with the meter reading FWD, or forward power. The needle obediently came up and my antenna seemed to be taking the load nicely. As received from the factory, the ALC control had been set fully clockwise. Not realizing that this was the normal full-output position, I backed it off to minimum, or maximum counterclockwise position, wondering why I could not obtain full-rated output (and input). By bringing the ALC up slowly, I found the reason that it had been set fully clockwise in the first place. It provides a limited variable adjustment of output power.

From that point on, contacts were quick and simple. Everyone commented on the keying quality and the solid signals, and I particularly enjoyed full QSK, in spite of some QRM close to the frequency. By appropriate adjustment of the rf gain, I was able to minimize its effect, and a tweak of the NOTCH and PBT knobs solved the problem. Many contacts later I decided that the Corsair was some nice rig. I had used it on 160, 80, 40, 30, 20, 15, and 10 meters . . . all with good signal strength and quality reports.

"But what about SSB," you ask? Wait a minute; I am coming to that! I hadn't requested a microphone with the rig so one wasn't sent. A stupid oversight on my part, so I scrounged around the shack and workshop for a mike that would work. Aha! Found one. Oh, oh . . . no four-pin connector anywhere. SSB would have to wait until another day.

For the next three days (and nights), I burned up the bands with this Corsair, getting to know it better and better. I found the more I used it, the better I liked it.

Finally, the manual and microphone arrived, and I was relieved to see that I had done everything right according to the book. In fact, I guess I had been a bit conservative. Now to check it out on SSB.

Evening operation with a vertical antenna on 40-meter SSB is not conducive to your average quiet QSO. The band was alive with foreign broadcasts, but I managed one or two QSOs using the processor to keep average voice power up. Incidentally, if you use the processor according to the manual, you will get *very* complimentary reports! I got some unsolicited praise for "excellent and natural voice quality," "lots of punch," "nice, narrow signal," "didn't know you were using a processor," and the like.

Next, I ran some DX on 15 meters with essentially the same reports. Much praise and no objections of any kind. Well, why not try it on 20? Isn't that the ultimate test for low power and modest antennas? So, I did . . . and results were the same. "Your audio is smooth," "Broadcast quality," "unusual for a sideband rig," etc. I got the same kind of reports on 160: "Mellow . . . nice, easy listening."

What more can be said? I like the Corsair and, for once, I felt completely comfortable (well . . . almost) on SSB; for me, that's quite an admission. Naturally, I expected to be happy with CW, and I was. The reports have been uniformly complimentary, and just this evening I worked a Colorado station on 15 meters who told me (in an *unsolicited* report, mind you) that he had looked at the keying waveform on his scope and it was *perfect!*

Here's another thing, too, that may be of importance to you: The Corsair is roomy inside. Things are well laid out and spaced for service. You don't feel crowded, and you have the confidence in your own ability to remove and replace a PC board, for example, if it is ever needed. Here is another Ten-Tec plus: SERVICE. That is intentionally capitalized, too. I had a problem with a Century 21 a few years ago and called Ten-Tec's service department. They helped me troubleshoot the cause over the phone, asked me to mail the board with its defective component back to them, and put a new board in the mail on the day of my call! You can't beat that—anywhere. With Ten-Tec you have a feeling that you would *like* to do your own servicing, and that's a new feeling for most of us with other rigs. Sure, they could have made it smaller, but why should they? This way, it's very neat and open and still of a reasonable size for desk or den. The rig is fully warrantied for one year, and the transistor finals are warrantied for five years on a *pro rata* basis!

Okay, you've heard the favorable impressions. What about the *bad* things, you ask? Well, there are a couple of things that aren't bad, but could be improved upon . . . and probably will be. They aren't serious, and might not even bother someone else—you, for example. But for the record, here they are.

There is no frequency memory. That is, there is no extra on-board selectable frequency that can be stored until needed. Frankly, I admit being lazy and have become used to some of the newer rigs with their keypad memory entry and recovery. I also missed the dual on-board vfo's provided by some of the rigs. This is convenient, and although not a requirement, sure is handy. Ten-Tec provides an optional external vfo for connection to the Corsair, and up until a few years ago, that would have been the epitome of luxury. Today, it's okay, but not state-of-the-art. Nevertheless, the DX operator will want his external vfo for split-band operation.

Next, I do a fair amount of shortwave listening and really appreciate general coverage in a receiver. It's true that this is a communications transceiver and is not intended to have all the bells and whistles, but when you have a basic rig this good, you'd like to have it cover some of the SWL bands, too. I also missed having an AM reception position on the mode switch. Frankly, I don't give a hoot for transmitting AM anymore, but I do like to listen to BBC or Deutsche Welle occasionally without having to zero-beat their carriers to recover audio. Nit-picking, sure; I know.

Finally and most bothersome to me was an essential feature that did not meet my expectations: the tuning vernier. It felt rubbery and I think it has a teeny bit of backlash. It left me with the impression that it might creep after being set on a frequency. It turns a tad easier clockwise than it does counterclockwise, so I checked with the boys at Ten-Tec and they tell me this is easily corrected by a dial adjustment . . . it's purely mechanical and the function of alignment during assembly. Great! I'm happy to hear that this isn't the way all Corsairs behave. Yours will probably be perfect in this respect. The only reason I noticed it is that some of the comtemporary rigs have such silky-smooth tuning that one quickly comes to expect it in *all* rigs. In possible defense of dial friction is the undeniable fact that it isn't as easily knocked off frequency or inadvertently shifted. However, a dial lock is the solution to that problem.

In summary, while the Corsair lacks a few bells and whistles, it sure has *performance* aplenty.

The suggested retail price at $1169 is ballpark for a rig that has all these good points; the external power supply is available at $199 for the deluxe model with a front-radiating speaker and $169 for the utility supply without speaker. If you want more than the nominal 2.4-kHz selectivity, you will have to specify extra crystal filters when ordering your Corsair. These are available for 1.8 kHz (SSB) and 500 and 250 Hz (CW and RTTY). They all fit into the rig and can be selected when needed. This is an improvement over some of the newer rigs where you have to choose only one of the three for use in addition to the standard one supplied. Many hams don't need and wouldn't want the narrow filters anyway, so it's logical to offer them as options.

All in all, I like the Corsair and would probably be happy with it in my shack as an only transceiver. When it comes to sheer operating ability, the Corsair will probably hold its own against anything available today. It's rugged, honest, easy to use, and nice to look at . . . besides which it sounds great on the air. Its sensitivity, selectivity, dynamic range, and resistance to front-end overload are superior . . . and it stays put on the frequency of your choice.

Whether or not the Corsair is your cup of tea depends on what you rate as desirable features and what you like in a rig . . . but after all, that's what makes horse races and amateur radio fascinating.

For more information, contact *Ten-Tec, Inc., Sevierville TN 37862.*

Jim Gray W1XU
73 Staff

DOVETRON'S WIDGET

In this era of expensive, state-of-the-art rigs and microprocessor-controlled transceivers, there is still room for useful gadgets. Dovetron has recognized this largely unsatisfied need with the introduction of a new, simple gadget, appropriately named the Widget.

The Widget is designed to alleviate one problem which has accompanied the increasing miniaturization of 2-meter transceivers—that of low-quality audio reproduction. When so much is compressed into a small space, there is little room left for the speaker, and it is usually placed in a position better suited for the heater fan to hear than the driver. However, with the Widget, you can listen to your 2-meter radio through the in-dash AM radio and benefit from the higher fidelity as well as the larger speaker size and better placement.

The Widget takes the receive audio output of your transceiver and retransmits it at the low end of the broadcast band. You then tune your radio to the appropriate frequency and capture the low-power signal.

Connection of the Widget is simple—you just plug it into the external speaker jack of your mobile rig and unwind the enclosed wire antenna to ensure good pickup. The cable included with the Widget has a subminiature plug on one end, which is standard for most mobile radios. The antenna is not always necessary, and it can be unplugged from the back of the device. I found that with my mobile installation, the transceiver and the radio were close enough that I did not need the antenna. No power connection is necessary; the Widget rectifies part of the incoming audio to power the circuit.

The circuit is housed in a small (about 2 by 1 by ½ inches) sturdy black box with an LED on one end. The LED signifies that the Widget is receiving a signal and indicates the relative signal level. The box is made of high-temperature plastic designed for year-round exposure in an automobile, and the PC board is made of epoxy-glass FR4. It includes an audio high-pass filter to limit the bass characteristics; the tone may also be controlled by the AM radio.

But why let the uses of the Widget stop with that? The circuitry can be powered by miniscule audio output, so use with a handie-talkie is feasible. If your handie-talkie also doubles as a mobile rig, the Widget will make marginal contacts much easier.

With the antenna fully extended, I found that the Widget has a range of 40 or 50 feet, which gives it some usefulness around the home. You could hook it up to the HF rig and use a cheap portable radio to monitor the frequency, or connect it to the television set for remote listening. By hooking up the Widget to a high-fidelity AM receiver, it could also be used to improve the audio quality of small tape recorders or other portable radios.

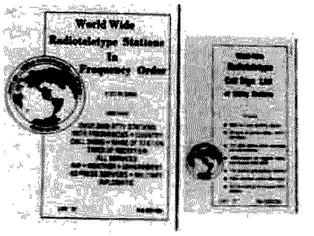
Unfortunately, the Widget is crystal-controlled, which gives it good stability but prevents the transmitter frequency from being moved to avoid interference from the commercial broadcast stations. I encountered this problem in the Boston area, where there is a station located near 530 kHz. This is the Widget's transmit frequency. Although the station was not directly on 530 kHz, my radio, like many other car radios, lacked the selectivity to reject the nearby station. Thus, the relatively low signal of the Widget was overrun by the station, making it unusable on that frequency.

However, the second and third harmonics, at 1060 and 1590 kHz, respectively, are also available at a slightly lower power level. In my case, the signal was strong enough to use one of the harmonics.

According to the specifications, the unit has a life expectancy of about 10 years. In addition, the nature of the Widget prevents it from becoming outdated—unlike a transceiver, small gadgets do not have to be state of the art. It comes with a 30-day warranty and may be repaired for a nominal fee within 90 days.

For further information, contact *Dovetron, Box 267, South Pasadena CA 91030; (213)-682-3705.* Reader Service number 488.

Avery L. Jenkins WB8JLG
73 Staff



RTTY CALLBOOKS

For anyone interested in RTTY, here are two books which are indispensable—*The World Wide Radioteletype Call Sign List* and *World Wide Radioteletype Stations in Frequency Order.* These books provide a vast amount of RTTY information in a minimum of space, and they have been designed for easy access and cross-referencing.

The RTTY station frequency list has 2,198 listings, a number which is continuously growing, according to the book's publisher Thomas Harrington W8OMV. Harrington collects his information from a variety of sources, including the ITU, the RTTY services themselves, and two dozen listeners he has stationed worldwide.

The book lists stations from 3 to 30 MHz in ascending frequency order. In addition to the frequency and callsign of the station, Harrington has included the station's location, the service it represents (if known), and any other information he has been able to collect. If the baud rate differs from the standard 50 baud, the different rate is noted.

The type of traffic each station handles is also noted. This will range from test slips such as "ry" or "the quick brown fox jumps over the lazy dog" to military traffic and weather bulletins.

Harmonic emissions of identified stations are listed as such, and their fundamental frequencies are also given. Harrington has included unofficial stations, those with callsigns not approved by the ITU, and other apparently underground transmissions. With each of these listings, the date a transmission from the station was last heard is given, as well as any other information obtained.

The language each station is transmitting is also identified, including Serbo-Croation. Similarly, stations transmitting in the Cyrillic alphabet or third-shift Cyrillic alphabet are also identified.

The back of the book contains a list of press service frequencies by country, service, and frequency. Another appendix lists stations transmitting meteorological data, and a third gives utility stations abbreviations and mnemonics.

The callsign list, although smaller than the frequency list, contains about 4,000 entries. In addition to the callsign, each entry includes the location and service of the station. Appendices offer further information, from a partial reproduction of ITU rules relating to station identification to a list of service and country abbreviations.

Not only does this book cover RTTY stations, but also it includes CW, weather, and satellite stations as well.

The callsign book provides a useful conjunct to the frequency list, in addition to carrying information not contained in the other book. It is especially useful because stations do not always remain on their posted frequencies, and the call letter book provides a rapid means of identifying them.

To facilitate merging these lists with additional information garnered by the user, neither book has been bound. Both lists are held together with staples, so the pages may be easily separated and placed into a loose-leaf binder or other notebook.

The amount of information contained in these books, as well as the amount of information transfer which they represent, is nothing short of fantastic. I did not realize until I began to peruse the lists how much information is accessible to the ham or SWL equipped with RTTY and a general-coverage receiver.

Imagine listening to weather bulletins from Kuwait, or military messages from El Salvadoran forces. Although the transmissions may be encoded or otherwise untranslatable, the material is available for your study.

The press frequencies listed would also appear to be an extremely valuable tool. A vast amount of filtering occurs in the world's newsgathering forces as the day's events are distilled into a half-hour newscast or a few columns of print. By tuning in the press frequencies, you can catch much of the news before it has become victim to the filtering process.

You need not worry about the information becoming very far out of date, either. Harrington updates his material three times a year in supplements to the main list. All of the entries have been positively verified before they can be listed in the books. Harrington's stringent requirements include verification of the station's existence by the station itself, by the ITU, or by three reports of the station from different sources or at different times.

My surprise upon seeing these lists may be likened to the feeling I had when I turned on a ham-band radio for the first time. There's a whole new world out there waiting to be explored, and these books are the key to it.

For further information, contact *Universal Electronics, Inc., 1280 Aida Drive, Reynoldsburg OH 43068; (614)-866-4605.* Reader Service number 484.

Avery L. Jenkins WB8JLG
73 Staff

AWARDS

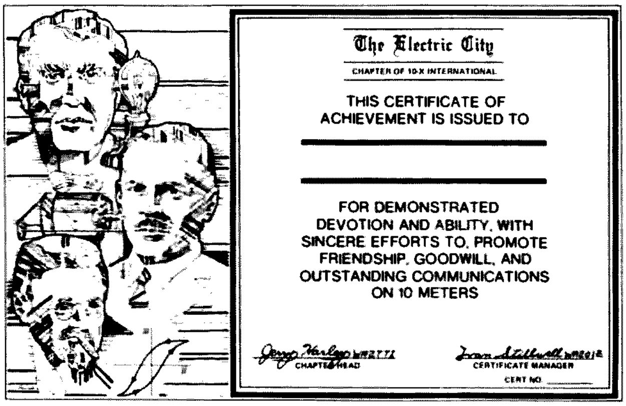
Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

THE ELECTRIC CITY CHAPTER OF 10-X INTERNATIONAL

Electric City is the nickname given to Schenectady, New York, because of the numerous electrical developments generated by the Edison General Electric Company, now the General Electric Company (GE). GE was founded in 1982 by the merger of the Edison General Electric Company and the Thomas Houston Company.

The design of this award certificate is based on three of the most famous people associated with the Electric City. As you have probably already recognized, Thomas A. Edison is the top picture and Charles P. Steinmetz is the bottom picture. The center picture is of Ernst F. W. Alexanderson, who is responsible for the design of the Fessenden alternator used at Brant Rock, Massachusetts.

To go back a little, Reginald Fessenden (physicist, inventor, and radio pioneer) of the National Electric Signaling Company believed in the possibility of developing smooth and continuous flow of high-frequency vibrations, which, at the time, was impossible with the intermittent spark-gap system then in use. He envisioned the idea of superimposing the human voice on the continuous flow of high-frequency vibrations in much the same manner as



Alexander G. Bell had done on the direct current with the telephone. How to produce the high-frequency-vibration flow was the great problem. Believing that a generator might be built with this capability and being familiar with the high-frequency dynamo built by Elihu Thomson of GE, he contacted GE. In 1903 Steinmetz built a 10,000-Hertz alternator for Fessenden. The output of this alternator was a whopping 1000 Watts.

In 1904 Fessenden ordered an alternator capable of 100,000 Hertz. The order was assigned to a brilliant young engineer at GE—Ernst Alexanderson. The machine was completed and tested at 50,000 Hertz in the summer of 1906 and was delivered to Fessenden at Brant Rock. Its first demonstration deserves to go down in history as one of the great events in scientific annals. The demonstration, performed on Christmas Eve, 1906, is described as follows: Early in the evening, wireless operators on ships within a radius of several hundred miles sprang to attention as they caught the call "CQ CQ" in Morse code. Was it a ship in distress? They listened eagerly and, to their amazement, heard a human voice coming from their equipment—someone was speaking! Then, they heard a woman's voice in song. It was uncanny! Many of the operators called their officers to come and listen. Soon, the wireless rooms were crowded. Next, someone was heard reading a poem, then there was a violin solo. Then, a man made a speech, and they could understand most of the words. Finally, everyone who had heard the broadcast was asked to write to R. A. Fessenden at Brant Rock. This was how the first voice radio broadcast in history was transmitted.

Now you can understand why the Electric City chapter of 10-X International chose for their center picture a man whose picture is probably not recognized, but whose achievements in voice communications made possible the hobby and the way of life we now all enjoy.

To obtain the distinguished Electric City award, stations must accumulate a total of 50 points as well as work a minimum of three 10-X International chapters. Five points are scored for CH plus CM. C equals four points, HC plus L is three points, FS plus DX is two points, and all others are one point.

Forward a list of your contacts and be sure to include the 10-10 number for each station worked. Enclose $1.00 plus two US first-class stamps; DX stations enclose $2.00 in US funds.

For further information about this awards program or to submit an award application, address your correspondence to: Ivan Stillwell WA2OIZ, 18 Englehart Drive, Scotia NY 12302

TWO-LETTER CALL WAS

Representing the Heart of America Radio Club, Inc., out of Kansas City, Missouri, comes this Worked All States award announcement from our good friend, A. Hoogenraad WB0RAF.

To qualify for the Two-Letter Call Worked All States award, the applicant must work one two-letter callsign in each of the fifty US states. Two-letter calls would be, for example, W0RR, AK0A, KB0VL, etc. In short, any call with two or less characters in the suffix qualifies as a good contact.

To apply for this award, prepare a list of contacts in alphabetical order by state, giving the callsign, date worked, band, mode, and state. Have your list of contacts verified by two amateurs or any club secretary. Send a $2.00 (US funds only) award fee to: Adrianus Hoogenraad, 7204 E 28th Street, Kansas MO 64129.

WORKED LAEN P AWARD

The Boras Amateur Radio Society of Sweden is proud to announce the Worked All Laen P award. This award is available to licensed amateurs and SWL stations worldwide.

To be valid, all contacts must be made

on or after January 1, 1980. Applicants may utilize any band or mode; however, repeater contacts such as those made on 10-meter FM are invalid.

Scandinavian countries must work and confirm 25 different stations in Laen P Sweden. Other Europeans must work 15 different stations, while stations outside the European continent must work a minimum of five different stations in Laen P Sweden.

GCR applies. Forward your verified list of contacts to: Lars Lind SM6NT, Ekesund S-520 11, Vegby, Sweden. Enclose $2.00 (US) or ten IRCs.

THE DX LONG CHAT HAM

This award is sponsored by the Long Chat Ham Club in celebration of its sensational start. All the club members prefer a long QSO with DX stations rather than a short contact. The DX-LCHA is issued for confirming contacts with five foreign ham stations for more than fifteen minutes each.

For the award, send your application, GCR, or log, certified by a local radio club or two other amateurs, with four IRCs to: Award Manager Aki Kogure JG1UNE, Charme #303, 5-37-5 Denenchofu, Ohtaku, Tokyo 145, Japan. Be sure your application clearly indicates the beginning and ending time of each contact made.

ISLE OF EIGHT FLAGS AWARD

Representing the only location in the United States governed under eight flags, Vance LePierre W5IJU writes to share with us the Isle of Eight Flags award. As they appear on the certificate, they include France (1562-1597), Spain (1597-1735, 1748-1763, and 1783-1821), Great Britain (1736-1748 and 1763-1783), the Patriot's Flag of 1812, the Green Cross of Florida (1817), Mexico (1817), the Confederate Flag (1861-1862), and the US Flag (1821).

To qualify, the applicant must work any two stations on Amelea Island Florida on or after January 1, 1975. You may use any band or mode. Submit log data and $2.00 or eight IRCs to: Vance LePierre, 2618 McGregor Blvd., Fernandina Beach FL 32034.

JUMBUNNA AWARD

Chris Levingston VK3AOR, from Kilsyth, Australia, writes to tell us about an award dedicated to the Australian Novice.

The award requires the applicant to work and confirm a minimum of 15 VK3 Novice stations. Prepare a list of qualifying contacts in order by their callsign, giving the date, time, band, and mode of communications. Have this list verified by at least two amateurs or a radio club official. The cost of this award is $3.00 or 12 IRCs. Send your application to: Chris Levingston VK3AOR, 2 Acacia Avenue, Kilsyth, Victoria, Australia 3137.

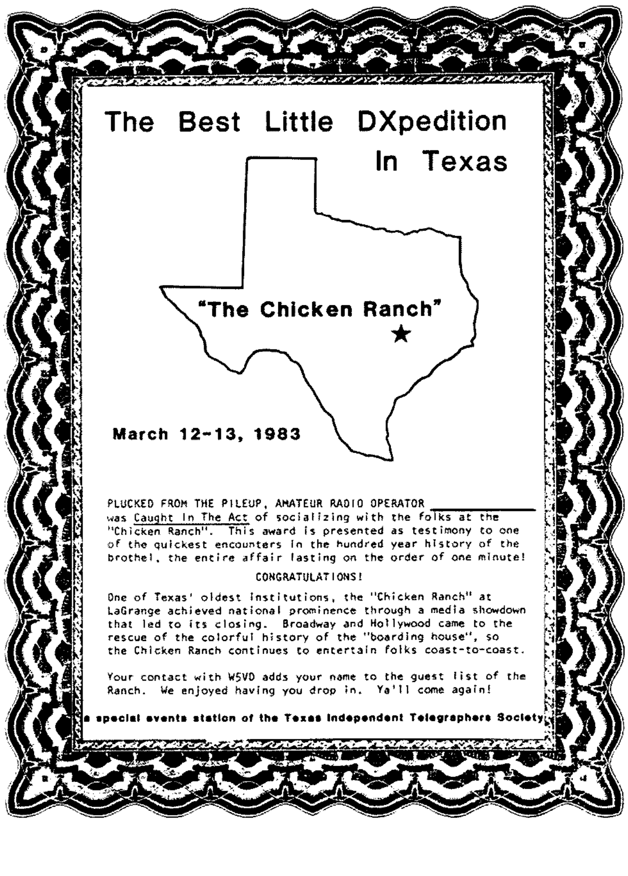
By the way, VK Novice stations are identified by the suffix N, V, P, or K. The K suffix denotes a combined Novice and limited license holder. These stations are permitted CW on 3.525-3.625 MHz, 21.125-21.200 MHz, and 28.100-28.600 MHz. They are limited to ten Watts dc of power. On SSB, Australian Novices may operate thirty Watts PEP on 3.500-3.625 MHz, 21.150-21.100 MHz, and 28.300-28.600 MHz.

THE BEST LITTLE DXPEDITION IN TEXAS

Chartered under the laws of amateur radio camaraderie and brotherhood, the Texas Independent Telegraphers Society is proud to announce the Best Little DXpedition in Texas on the weekend of March 12-13, 1983. Members and friends of the society will be operating from LaGrange, Texas, the location of the famous Chicken Ranch.

For those hams who need a peck of Texas history, the Chicken Ranch represents the oldest institution in Texas. It became a part of Texas folklore when it was exploited by a Houston newscaster who projected it into the living rooms and political backrooms of Texas. It became nationally famous when used as the setting for a Broadway musical and a Hollywood movie.

Now, radio amateurs of the world will have an opportunity to work the home of the Chicken Ranch. Using the callsign, W5VD (very distinctive), the station will operate from 1200Z March 12th until 1800Z March 13th. Depending on the band conditions and the time of day, prime frequencies will be 7.280, 14.280, and 21.380 MHz. CW frequencies will be 7.100, 14.050, and 21.100 MHz with period excursions into the Novice band. Special certificates and QSL cards will be available to those who work the Chicken Ranch special-event station. QSL to W5VD, PO Box 3225, Bryan TX 77801. Hope to pluck you from the pileup.



The Best Little DXpedition In Texas

"The Chicken Ranch"

March 12-13, 1983

PLUCKED FROM THE PILEUP, AMATEUR RADIO OPERATOR ____________
was Caught In The Act of socializing with the folks at the "Chicken Ranch". This award is presented as testimony to one of the quickest encounters in the hundred year history of the brothel, the entire affair lasting on the order of one minute!

CONGRATULATIONS!

One of Texas' oldest institutions, the "Chicken Ranch" at LaGrange achieved national prominence through a media showdown that led to its closing. Broadway and Hollywood came to the rescue of the colorful history of the "boarding house", so the Chicken Ranch continues to entertain folks coast-to-coast.

Your contact with W5VD adds your name to the guest list of the Ranch. We enjoyed having you drop in. Ya'll come again!

a special events station of the Texas Independent Telegraphers Society

SOUTHWIRE COMPANY

The Southwire Employees Amateur Radio Society (SWEARS), based in Carrollton, Georgia, announces that the second annual SWEARS anniversary special-event station will be activated on March 26, 1983, to honor the 33rd anniversary of the parent company's (Southwire Co.) first production of wire. Specially-designed QSL cards will be awarded.

Plans call for operation on 14.270 (± 10 kHz), 21.345 MHz (± 10 kHz), and 28.600 (± 10 kHz). Novices should check the first 10 kHz of the 15- and 10-meter bands. Operation will likely not be continuous on all bands, so check all frequencies. For further information, contact: Terry Martin WD4AON at (404)-832-5375.

ELMER OF THE YEAR

Francis C. Leonard W2NPT was chosen as QCWA's Northern New Jersey Chapter's "Elmer of the Year" by a committee which included such prominent local amateurs as George Diehl W2IHA, newly elected director of the Hudson Division of the ARRL, Curtis Williams W5DTR/2, section communications manager of the Northern New Jersey Section, and Joseph Painter W2BHM, head of the W2 QSL Bureau.

W2NPT, a founder and past president of the Fairlawn, New Jersey, Radio Club, has devoted most of his time for the past 20 years to helping new and would-be hams—old and young, boys and girls—obtain their tickets and get on the air. His basement ham shack continues to be a haven for hatching new ham ops.

HAM HELP

I need the service manual and schematic for a Hammarlund HQ-145 and a Galaxy V transceiver. I would prefer the original, but a copy is OK.

Henry Galbraith W9RDJ
1214 S. Alvord Blvd.
Evansville IN 47714

I am looking for RTTY software to use in conjunction with my TRS-80 model I and the Micro Modem, which I built from plans which appeared in the September, 1982, issue of *73*. Any assistance would be greatly appreciated.

William Eyter, Jr.
454 Kent Ave.
Catonsville MD 21228

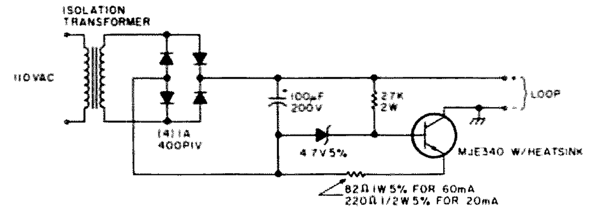
I would like to purchase a copy of the *CQ Surplus Conversion Manual* and the manual for a Hammarlund HQ-110A receiver.

Richard McCubbin WD8RQH
Box 65
Mulliken MI 48861-0065

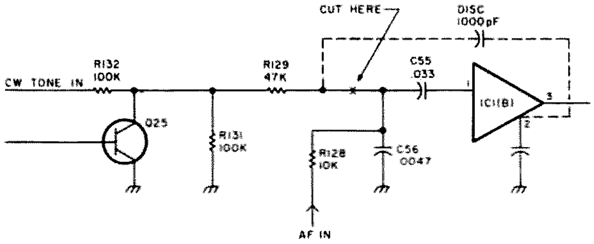
CIRCUITS

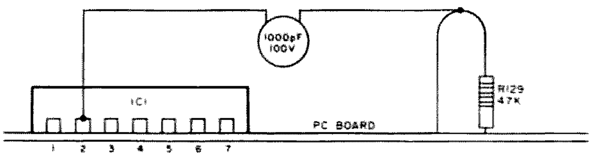
Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73 Magazine, Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



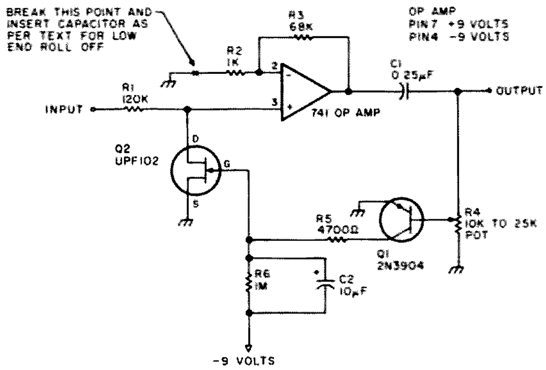
RTTY CONSTANT-CURRENT LOOP SUPPLY: This supply provides a constant 60 mA or 20 mA, regardless of the resistance in the loop. The supply's current is determined by the value of the resistor coming out of the MJE340 transistor.—Al McKenna WB6BSP, Healdsburg CA.



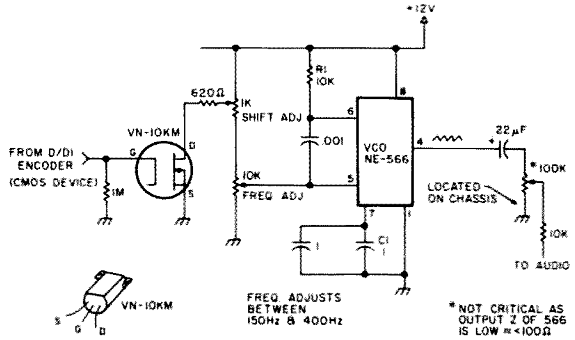


ICOM 720A CONVERSION: This simple change makes the CW sidetone volume independent of the af gain control. All you have to do is cut the top loop on R129 and solder a 1000-pF disc capacitor from R129 to pin 2 of IC1. You can reach the parts through the access cover.—Peter Wiggin ZS6ARW, Alberton, South Africa.

LOW-POWER AND RETRIGGERABLE TIMERS FROM NAND GATES: Fig. 1 shows a simple one-shot timer which is not retriggerable and, unlike some timers, is not affected by a steady signal on the trigger. This timer costs less than those using a 555, and it also has complementary inputs and outputs. The quiescent current drain is less than 100 nanoamperes, and the circuit can sink or source about 0.5 mA while operating from 3 to 15 volts. Although this circuit cannot directly drive a relay, it is useful for driving more logic. The upper limit on the time period is limited by the quality of capacitor used, with about 10 minutes being the limit for most junk-box electrolytics. Fig. 2 shows a simple retriggerable timer. The output of this one is normally a low, going high upon a low trigger. The output time will be extended each time the input is triggered low. Don't forget to tie the inputs of all unused gates to + Vcc. The values of R1 and C1 will determine the timing on both circuits. The formula 0.8RC will give an approximation of the time in seconds.—Craig Crichton K7UKW, The Dalles OR.



GENERAL-PURPOSE LIMITER: The FET is used as a variable resistor forming part of a voltage divider across the input of the 741 op amp. Q1, which is fed through the pot hanging on the output of the 741, does not begin to conduct until the negative cycles of the output reach about .6 V. The rectified voltage is applied to the FET, causing its resistance to vary with the voltage. When the circuit reaches its limit, the gain is greatly reduced. To set the circuit up, apply 20 mV of tone to the input while measuring the output. Adjust R4 until the gain just starts to drop. And to roll off the low end, put a .25-mF capacitor between R2 and ground.—Allan Joffe W3KBM, Dresher PA.



VCO-DECODER INTERFACE: This circuit matches a garage-door-opener encoder/decoder chip to an NE566 vco. It provides proper matching between the CMOS device and the vco as well as a shift adjustment. The 10k pot adjusts the frequency between 15 and 400 Hz.—William Desnoes W2HBC, Oneida NY.

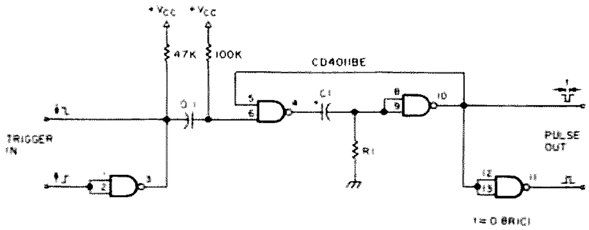


Fig. 1.

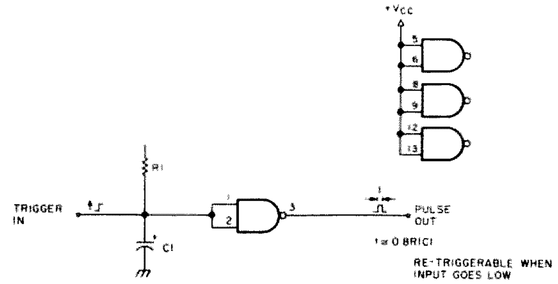


Fig. 2.

SATELLITES

Amateur Satellite Reference Orbits

Date		OSCAR 8 UTC	OSCAR 8 EQX	RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
Mar	1	0024	87	0124	140	0049	134	0135	143	0154	145	1
	2	0028	88	0119	140	0034	132	0125	142	0151	145	2
	3	0033	89	0114	140	0019	130	0115	141	0148	146	3
	4	0037	90	0108	140	0003	127	0106	140	0145	147	4
	5	0041	91	0103	140	0147	155	0056	139	0142	148	5
	6	0046	92	0058	140	0131	153	0046	138	0139	149	6
	7	0050	93	0052	141	0116	150	0037	138	0137	149	7
	8	0054	95	0047	141	0100	148	0027	137	0134	150	8
	9	0059	96	0042	141	0045	146	0017	136	0131	151	9
	10	0103	97	0036	141	0030	143	0008	135	0128	152	10
	11	0108	98	0031	141	0014	141	0157	164	0125	153	11
	12	0112	99	0026	142	0158	168	0148	163	0122	154	12
	13	0116	100	0020	142	0142	166	0138	162	0120	154	13
	14	0121	101	0015	142	0127	164	0128	161	0117	155	14
	15	0125	103	0009	142	0111	161	0119	160	0114	156	15
	16	0130	104	0004	142	0056	159	0109	160	0111	157	16
	17	0134	105	0158	173	0041	157	0059	159	0108	158	17
	18	0138	106	0153	173	0025	154	0050	158	0105	158	18
	19	0000	81	0148	173	0010	152	0040	157	0103	159	19
	20	0004	82	0142	173	0153	180	0030	156	0100	160	20
	21	0008	83	0137	173	0138	177	0021	155	0057	161	21
	22	0013	85	0132	173	0122	175	0011	154	0054	162	22
	23	0017	86	0126	174	0107	173	0001	153	0051	163	23
	24	0022	87	0121	174	0052	170	0151	182	0048	163	24
	25	0026	88	0115	174	0036	168	0141	181	0046	164	25
	26	0030	89	0110	174	0021	166	0132	181	0043	165	26
	27	0035	90	0105	174	0005	163	0122	180	0040	166	27
	28	0039	91	0059	175	0149	191	0112	179	0037	167	28
	29	0043	93	0054	175	0133	188	0103	178	0034	167	29
	30	0048	94	0049	175	0118	186	0053	177	0031	168	30
	31	0052	95	0043	175	0103	184	0043	176	0029	169	31
Apr	1	0057	96	0038	175	0047	181	0034	175	0026	170	1
	2	0101	97	0033	175	0032	179	0024	174	0023	171	2
	3	0105	98	0027	176	0016	177	0014	173	0020	172	3
	4	0110	99	0022	176	0001	175	0005	173	0017	172	4
	5	0114	100	0017	176	0144	202	0154	202	0014	173	5
	6	0119	102	0011	176	0129	200	0145	201	0012	174	6
	7	0123	103	0006	176	0113	197	0135	200	0009	175	7
	8	0127	104	0001	177	0058	195	0125	199	0006	176	8
	9	0132	105	0155	207	0043	193	0116	198	0003	176	9
	10	0136	106	0149	207	0027	190	0106	197	0000	177	10
	11	0141	107	0144	207	0012	188	0056	196	0157	208	11
	12	0002	83	0139	207	0155	216	0047	195	0154	209	12
	13	0006	84	0133	208	0140	213	0037	194	0152	210	13
	14	0011	85	0128	208	0124	211	0028	194	0149	211	14

AMATEUR SATELLITE NEWS

Soviet Telemetry Update

Russia's RS (Radio Sputnik) amateur satellites continue to transmit a steady stream of telemetry data. Since I last discussed RS telemetry in this column (*73*, Sept., 1982, p. 140), new interpretations of some data items have come to light. Table 1 is a revised list of the 35 RS telemetry items and the equations for decoding the raw numbers into interesting information about the spacecraft.

All RS telemetry is transmitted in Morse code at speeds from 15 to 25 words per minute. When the satellites are in range, virtually any 10-meter receiving installation should be capable of hearing the transmissions. Table 2 gives the telemetry beacon frequencies for all six of the RS satellites. It's easy—give it a try!

Thanks to *Amateur Satellite Report* for the updates.

The Home Stretch

The second half of April—probably the 21st—is now the scheduled date for the launch of the AMSAT Phase IIIB amateur satellite. If the launch takes place as planned, it will occur a little less than three years after the ill-fated attempt that sent the Phase IIIA satellite to the bottom of the Atlantic.—Jeff DeTray WB8BTH, Assistant Publisher, *73*.

Prefix	Interpretation
K	0.2 × N = output power of transponder in mW
D	N × 0.2 = voltage of main power source
O	20 × (100 − N) = charge current in mA
G	Service parameter; usually = zero (00)
U	Gas pressure of sealed system; equation unknown
S	N = temp. of voltage regulator (Celsius)
W	N = temp. of transmitter cooling fins (Celsius)
IK or SK	Same as K
ID or SD	Telemetry baseline; usually = zero (00)
IO or SO	0.2 × N = output power of beacon in mW
IG or SG	When N = 10 ± 1, a 10-dB attenuator is in line with main receiver front end
IU or SU	0.1 × (N − 10) = relative S-units, main receiver
IS or SS	0.1 × (N − 10) = relative S-units, robot receiver
IW or SW	0.1 × (N − 10) = relative S-units, command receiver
NK or RK	Same as K
ND or RD	50 × N = solar panel current in mA
NO or RO	2.7 × (N − 26) = temp. of 1st solar panel (Celsius)
NG or RG	2.7 × (N − 26) = temp. of 2nd solar panel (Celsius)
NU or RU	2.7 × (N − 26) = temp. of 3rd solar panel (Celsius)
NS or RS	0.8 × (N − 5) = temp. of structure (Celsius)
NW or RW	0.8 × (N − 5) = temp. of hermetically-sealed casing
AK or UK	Same as K
AD or UD	0.1 × N = voltage of transponder 9-volt line
AO or UO	0.1 × N = voltage of transponder 7.5-volt line
AG or UG	0.1 × N = voltage at first 9-volt stabilizer
AU or UU	0.1 × N = voltage at first 7.5-volt stabilizer
AS or US	0.1 × N = voltage at second 9-volt stabilizer
AW or UW	0.1 × N = voltage at second 7.5-volt stabilizer
MK or WK	Same as K
MD or WD	N = # of QSOs made by robot (occasionally reset to zero by ground controllers)
MO or WO	N × 0.1 = power consumption of heating system in Watts
MG or WG	N × 20 = input power of robot transmitter in mW
MU or WU	N × 20 = input power of service channel in mW
MS or WS	When N = 10 ± 1, a 10-dB attenuator is in line with the robot receiver front end
MW or WW	When N = 10 ± 1, a 10-dB attenuator is in line with the service receiver front end

Table 1. RS telemetry channel prefixes and their meanings. N is the two-digit number sent after the prefix. Where two prefixes are given, the first is used when the service (or command) channel aboard the satellite is not active. The second is used when the service channel is active, indicating the satellite is under command by ground controllers.

Satellite	Frequencies (MHz)	Satellite	Frequencies (MHz)
RS3	29.321, 29.401	RS6	29.411, 29.435
RS4	29.360, 29.403	RS7	29.341, 29.501
RS5	29.331, 29.452	RS8	29.461, 29.502

Table 2. RS beacon frequencies.

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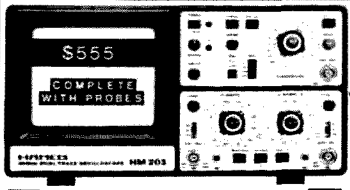

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✓See List of Advertisers on page 114

FUN!

John Edwards KI2U
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POTPOURRI

Potpourri! As our readers in F-, VY-, HH-, FS-, FR-, FM-, and FG-lands undoubtedly know, the word signifies a medley of various items. And that's what this month's Fun! is, a grab bag of questions on topics spanning the entire spectrum of amateur-radio activity. Think you're an amateur-radio renaissance man? Give this month's puzzlers a try.

ELEMENT 1—MULTIPLE CHOICE

1) From 1978 to 1979, a person claiming to be a lawyer threatened to take away all of our bands and give them to CB. Can you remember this generous chap's name and the organization he purported to represent?
  1) Richard Cooper and the Communications Attorney Service
  2) Harry Dannals and the American Radio Relay League
  3) Jon Ingram and the Citizen's Radio Coalition
  4) David Simpson and the Committee for Fair Communication

2) Remember that Jack Anderson column a few years back? You know, the one that claimed hams were controlling just about everything in Washington from the FCC to the Pentagon. Well, can you name the US Representative who gave Scoop Anderson his story?
  1) Claude Pepper of Florida
  2) Tip O'Neill of Massachusetts
  3) Elliott Levitas of Georgia
  4) Fred Richmond of New York

3) Roy Neal K6DUE hosted the films "The World of Amateur Radio" and "Moving Up to Amateur Radio." Can you name the narrator of "Ham's Wide World"?
  1) Walter Cronkite K2IBE
  2) Arthur Godfrey K4LIB
  3) Dick Van Dyke WJ6L
  4) Phil Donahue KE9UF

4) Which of the following amateurs is not a Westlink anchorman?
  1) Jim Davis KU8R
  2) Alan Kaul W6RCL
  3) Burt Hicks WB6MQV
  4) Stan Martin WA2DCS

5) A number of years ago, there was an amateur-radio column written in broken English supposedly by an oriental writer. Name the "author" and the magazine.
  1) Scratchi, in *CQ*
  2) Itchy, in *QST*
  4) Ching Chow in *Ham Radio Horizons*
  5) Hong Wouff in *73*

ELEMENT 2—TRUE-FALSE

	True	False
1) A ham was involved in the production of the movie "E.T.—The Extra Terrestrial."TM	___	___
2) The first ham to operate from orbit was Neil Armstrong aboard *Gemini 6*.	___	___
3) In 1982, the Soviet Union launched two amateur Iskra satellites from the Solyut 7 space station. The word Iskra means "peace."	___	___
4) Ken Sessions K6MVH wrote the very first book dealing with ham repeaters.	___	___
5) A famous DXer is known by the name of Dr. DX.	___	___
6) At the relatively tender age of 22, James Hendershot WA6VQP was the youngest person ever to serve as the head of a repeater coordination council.	___	___
7) Joseph Merdler N6AHU is the current president of the Personal Communications Foundation.	___	___
8) A few years back, a novel that included ham radio as an integral part of its plot not only hit the best sellers list, but also was turned into a TV movie.	___	___
9) King Juan Carlos of Spain is a ham.	___	___
10) Queen Elizabeth of England is a ham.	___	___

ELEMENT 3—SCRAMBLED WORDS

Unscramble these terms and slangs relating to ham radio.

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NCTOLREEA	EKY	DNAB
KIME	CORK	GLSU
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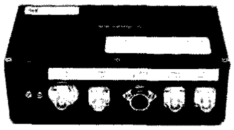

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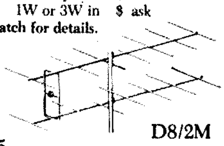

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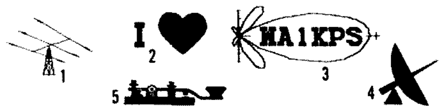

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ELEMENT 4—ALPHABET GUESS

Complete the words below by placing letters of the alphabet on every dash. Use each letter only once. The letter "Z" isn't used.

A	B	C	D	E	F	G	H	I	J	K	L	
M	N	O	P	Q	R	S	T	U	V	W	X	Y

1) _ I _ D E
2) _ O T _ _ T _ O M E _ E _
3) _ O U L E
4) _ _ _ _ G U I D E
5) Y O _ E
6) O U P _ E _
7) _ T U _
8) _ A R R I E R
9) _ R E _ _ E N C _
10) _ A _

THE ANSWERS

Element 1:
1—1 He's now believed to be living south of the border.
2—3 Still in Congress, but probably has found other ways to fish for votes.
3—2 Seems like old times just thinking about that film.
4—4 Stan's probably the missing "link."
5—5 Think ol' Scratchi ever got paid?

Element 2:
1—True Indirectly, anyway. Henry Feinberg K2SSQ designed the little alien's space communicator.
2—False As of yet, no ham has ever operated "spaceship mobile." That may change later this year, though, when Dr. Owen Garriott W5LFL is scheduled to take an HT aboard the shuttle.
3—False Spark.
4—True Not an easy question.
5—True A name given to him by Westlink's Alan Kaul.
6—True You read it here first.
7—True A much-needed and under-appreciated organization.
8—True "The French Atlantic Affair," by Ernest Lehman K6DXK.
9—True I've yet to work him, though.
10—False Not yet.

Element 3:
Stub, tolerance, mike, ether, modulate, key, rock, meter, band, slug.

Element 4:
1—DIODE, 2—POTENTIOMETER, 3—JOULE, 4—WAVEGUIDE, 5—YOKE, 8—DUPLEX, 7—STUB, 6—CARRIER, 9—FREQUENCY, 10—HAM.

SCORING

Element 1:
Five points for each correct answer.

Element 2:
Two and one-half points for each correct answer.

Element 3:
Two and one-half points for each word unscrambled.

Element 4:
Two and one-half points for each word completed.

Potpourri literally translates to "rotten pot." How rotten are you?

1-20 points—Rancid
21-40 points—Green around the gills
41-80 points—Slightly sour
61-80 points—Fresh as a daisy
81-100 points—Prime condition

Special thanks for this month's column go to Bill Pasternak WA6ITF (of *73*'s "Looking West" fame), who provided many of the trickier questions.

CORRECTIONS

Builders of the "Keyer on a Shoestring" (*73*, November, 1982, page 104) should note that the Radio Shack 276-2008 transistor specified for Q1 is no longer available. An appropriate substitute is the Radio Shack 276-2061 or Motorola MPSA42. When using these transistors, the resistor connected to the base of Q1 should be changed from 2.2k to 1k.

Jeff DeTray WB8BTH
***73* Staff**

Radio Shack recently introduced a new style of 10-uH choke which affects all of the coils in *73*'s series of Fun-Gear articles. Those articles were "The Fun-Mitter—A Goof-Proof Rf Project," Feb., 1981; "The Fun-Ceiver," July, 1981; "The Fun-Oscillator," Feb., 1982; "The Fun-Amp," May, 1982; and "Fun-Equipment Revisited," Jan., 1983.

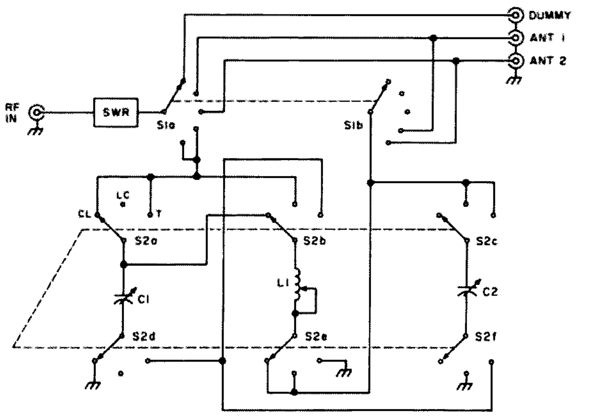
The new Radio Shack choke can be identified by a smaller body, fewer turns (a total of 22), and the part number 273-101A. These new chokes will operate fine, provided the correct number of turns are removed. Table 1 shows the number of turns that must be removed from the full choke.

Mark Oman WA0RBR
Ft. Collins CO

	Fun-Mitter	
	L1	L4
80m	5 (8.4 uH)	14 (2.4 uH)
40m	0 (10 uH)	17 (1.2 uH)
20m	13 (2.8 uH)	18 (.6 uH)
15m	17 (1.2 uH)	19 (.4 uH)
	Fun-Amp	
	L2	L3
80m	10 (4.7 uH)	7 (6.2 uH)
40m	13 (2.9 uH)	10 (4.3 uH)
20m	18 (1.0 uH)	17 (1.4 uH)
15m	20 (0.5 uH)	18 (1.0 uH)
	Fun-Ceiver	
	L2, L3	L4
80m	5 (8.4 uH)	0 and 7 (16.2 uH)
40m	0 (10.0 uH)	7 (6.2 uH)
	Fun-Oscillator	
	L1	
80m	0 and 7 (16.2 uH)	
40m	7 (6.2 uH)	

Table 1. Correct dimensions for Fun-Gear coils.

"A Tuner for Antenna Fanatics," which appeared in the November, 1982, issue, contained an incorrectly-drawn schematic. The switching system in Fig. 1 on page 42 should be wired as shown here. The only component change necessary is the substitution of a 6-pole switch for the 5-pole switch suggested in the article. Thanks to Jeff Steinkamp KA5MYF for pointing out the error.



Revised Fig. 1, "A Tuner for Antenna Fanatics."

Avery L. Jenkins
***73* Staff**

A diagram error appeared in Fig. 3 (page 33) and Fig. 5 (page 36) of "What? Another Audio Filter Project?" in the November, 1982, issue. Both diagrams show the cathode of diode D7 connected to a 100k resistor and pin 6 of U3. However, the cathode of D7 should be connected to the junction of D6 and the 1-uF capacitor. The 100k resistor should go directly to pin 6 of U3.

Avery L. Jenkins WB8JLG
***73* Staff**

The addresses of Ameco Equipment Company and Amidon Associates were accidentally reversed in "Beating the Untraceable Buzz" on page 58 of the January, 1983, issue. Amidon Associates is located at 12033 Otsego St., North Hollywood CA 91607; Ameco's offices are located at 275 Hillside Ave., Williston Park NY 11596.

Avery L. Jenkins WB8JLG
***73* Staff**

HAM HELP

I would like to hear from anyone who has successfully used a hidden antenna.

Michael H. Landwehr KE7T
PO Box 4502
Huachuca City AZ 85616

Wanted: the schematic for an Electrodata model AG-1 audio generator.

R. H. Klapheke
4113 Sunflower Dr.
Louisville KY 40216

I am looking for a way to modify a Motorola HT battery-pack recharger so that an Icom HT can be inserted in it.

Don Setliff WB8IMA
4729 Darnell Rd. #17
Huntington WV 25705

Can anyone supply me with the schematic needed to interface a modulator with a Pet 4032? I also need CW and RTTY programs.

Nazzaro Limongelli
Milano 1, 09100
Cagliari, Italy

I am searching for a CRT for a Tektronix 422 oscilloscope, or any information on repairing the old tube.

Robert L. Rowles KC5GT
701 NW 24th St.
Guymon OK 73942

I would like to locate someone in the Marion IL area who could help me learn the code. I am working toward my Novice license.

Ron Banfield
RR 4, Box 174, Lake Estates
Marion IL 62959

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

Random ruminations at the end of winter. "What do I need to do to get an article published describing my new LSI circuit that not only multiplies Q, but divides, adds, and subtracts it as well?" Boy, how many times I get that one! First of all, look critically at what you want to write about. Is it interesting to others? Bounce the idea off a few close friends; if they are friends, they won't (shouldn't) pirate your idea. If it's not technical, ask your wife (husband/mother/father/significant other) for an opinion.

If all is still okay, write up an outline for the article. Now, I don't necessarily mean the formal (I-A-1-a, etc.) outline that you learned back in the fifth grade, but rather an informal sketch of the points you want to cover. Try to organize the article with, as radical as it sounds, a beginning, a middle, and an end.

For technical articles, the first segment normally introduces what the device is, perhaps why it is needed, and general specifications. The central part of the article deals with the nuts and bolts (design and construction) phase. At the end, alignment and testing, applications, and potential other uses or pathways may be explored.

Non-technical articles follow the same train of thought, but on a parallel track. Open your idea, develop it, and close, trying to keep some sense of order. Diagrams, drawings, or photographs might occur to you as being appropriate at certain places. Note these now for later development and inclusion.

Now it's time to, as they say, flesh it out; write the words that make the whole world read, or whatever. If you have not written before or are unsure of your ability to set down words that make sense, I have a tip for you. Get a tape recorder and say what you want to write. Describe the gizmo, investigate the concept, or expand the theme *vocally*, then listen to it and write down what you said. Alternatively, type it into a word processor (my favorite technique) or write it down in longhand on a yellow pad (my second favorite technique); just get those first ideas down onto paper. You will need it in this rough form so that it can be polished into a finished gem.

Once you get the first draft down, read it. Yes, look for misspelled words and the like, but also *read it* (out loud is a good idea). Does it make sense? Are there areas which could be explained better or places where the explanation is so long-winded that it chokes the meaning to death? Clean it up, revise it (this is where a word processor makes life easy!), and when you are happy, go back to the friend you approached before and see what he or she thinks. Does your opening try to "grab" the reader? Is your last sentence a conclusion or close, or does it just end in space?

Finished? Now type up a good copy. I know we aren't all typists, but there are some standards which should be followed. Your submission copy should be typed, not handwritten, on standard 8.5" by 11" white bond paper. It should be in upper- and lowercase, be double spaced, and have generous margins on all four sides. It should *not* be uppercase-only printer output (this is a human readable article, not a program) on newsprint-weight roll paper or pasted-up sheets from a narrow thermal printer. If you have a dot-matrix printer which produces good quality upper- and lowercase print, check with the publisher before you use it; most editors would still prefer typewriter-style characters for their weary eyes.

Diagrams should be neatly drawn, with black ink on 8.5" by 11" paper. They don't have to be super-artsy; most magazines will have them redrawn by a draftsman if your article is published. Just make sure they are clear and correct. Photographs should be sharp and clear, with 8" by 10" black and whites preferred. Little Instamatic™ or Polaroid™ snaps just won't reproduce well. Color should not be used unless it is essential to the picture; most magazines cannot or will not print color photos, anyway.

Now that you've worked on this labor of love to a state of perfection, where do you send it? Here are some items to help you make up your mind. For amateur radio articles, the ARRL's journal *QST*, pays you nothing for your contribution, allowing you to bask in the glory given to those few authors whose work is published each month. On the other hand, *73* pays its authors upon acceptance of the article, with the average being perhaps $100 or more. I need not go into the number of articles published here every month.

For computer-related articles, the choice is more difficult. With the great number of specialty and general-interest magazines being published, you may well choose to direct your work to a specific audience. Payment practices vary widely, though, from reasonable amounts of cash to extending your subscription for a couple of months to a letter of thanks. To the best of my knowledge, unlike *73*, those computer magazines that pay for articles pay on *publication*, not when they accept your article. Therefore, they can, and do, hold your article for many months or years on the promise of payment. Check it out before you submit your masterpiece.

When you have decided where to send your article, wrap it in a sturdy envelope, enclose a cover letter introducing both you and your work, and mail it off first class to the magazine. You should enclose sufficient first class postage for the article's return if it is (sob) rejected; otherwise it might find its way into the editor's circular file. Then sit back and wait a couple of weeks and, who knows, your article might lead the next issue of 73!

Membrane keyboards—feh! I mentioned here a few months back that I purchased an Atari 400 computer for both the kids and some looks into the more "popular" (as opposed to my 6800) side of computers. After poking around a bit, I have reached my First Conclusion of Home Computers: Membranes may be good for a lot of things, but keyboards ain't one of them. I shall elaborate. Many of the "new breed" computers sport flat membrane keyboards rather than the more traditional typewriter-style keys. These flat panels are kidproof and less expensive to produce; they are also practically impossible to type on. Not much better are the little calculator-style button keys found on another raft of personal computers. Others' widespread frustration with this trend is evidenced by magazine articles and independent manufacturers' production of full-sized keyboards for the Atari 400, Sinclair ZX-81, Pet, and others. But if you add a $100 keyboard to an Atari 400, do you know what you get? An Atari 400 with an external keyboard. It reminds me of the time in high school when I tried to put expensive speakers on a cheap hi-fi compact. Couldn't understand why it sounded only marginally better. For the ham contemplating using a computer on RTTY or to write with, anything short of a standard (also called full-sized) keyboard is asking for trouble. No, membrane pads are fine for DTMF entry buttons, control switches on microwave ovens, or other occasional use terminals. But as keyboards designed for data entry? Feh!

Around the world with RTTY Loop brings a note here from Steve Pepler VE3KHU in Ottawa, Ontario. Steve is using a Mite teleprinter for computer output and is in need of a part. Steve, the sources I had for Mite parts dried up several years ago, and I have had no new leads since. If anyone knows of a source, drop me a line and I will let Steve and other Mite owners know about it.

Hans Granberg SM2DHG, a RTTY/computer buff from Sweden, relates his interest in the 6800 and its use on RTTY. I am sending Hans copies of old issues of RTTY Loop which may be of help in his endeavors.

This and many other letters raise another question for you all out there. Would you like to see a compilation of old RTTY Loops in book form? If so, are there any sections you would specifically like to see expanded or condensed? Please drop me a line (a postcard or QSL would be fine) with some sense of what you, the readers of this column, would like. I have been trying to work on such a tome, but I keep getting bogged down in the material. Let me know what you would like to see.

Next month, a tip of the hat to Al Jolson. Don't follow? You'll just have to wait for next month's RTTY Loop!

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

AMATEUR RADIO IN SOUTHERN AFRICA

What's the only country in the world which is completely surrounded by one other country and has no land below 1500 meters high? If you're up on your geographic trivia, you might be able to identify this mystery country as Lesotho, in southern Africa.

Not many people know where Lesotho is; fewer still know much about the tiny "mountain kingdom." Even the official Lesotho tourist brochures seem to be talking about a different place. These brochures are filled with photographs of the country's railroad and hotels; they mention the local TV station, the happy Basotho natives, and the rain-free climate.

What the tourist brochures do *not* mention is that Lesotho is one of the 20 least developed nations in the world. It is totally surrounded by South Africa, on which it depends for electricity, employment of the Basotho people, money from gambling at the Holiday Inn in Maseru, and food. That highly touted national railroad is less than a mile long, and half the hotels in the brochures don't really exist. It rains so seldom in Lesotho that the country must import almost all of its foodstuffs. In fact, the motto of the tiny kingdom is "Peace, Rain, Prosperity." And just because it has little rain doesn't mean the climate is perfect; Lesotho boasts the highest incidence of lightning in the world, and frequent high winds sweep dust storms across the treeless country. And that prized television broadcast with a power of only 400 mW! Can you imagine how easy it must be to cause television interference?

What the kingdom *does* have includes one of the longest reigning monarchs in the world, King Moshoeshoe II. It has majestic mountains, lots of them. The country is all mountains; even the "lowlands" are more than a mile high. And it has foreign aid. As a "non-aligned" nation, Lesotho enjoys frequent donations from other countries, including the US, France, Germany, and England. Lesotho recently received a grant of nearly 40 million dollars to fix up the nation's telephone system. There are only 4,000 phones in all of Lesotho; that's 10,000 dollars per phone!

With the highest incidence of lightning in the world, no trees to hang antennas from, a milliwatt TV station, and frequent high winds, you wouldn't think Lesotho would be an amateur-radio paradise, would you? But Rich Kingston 7P8BX (see photo) consistently receives signal reports 2 S-units louder than he gives out.

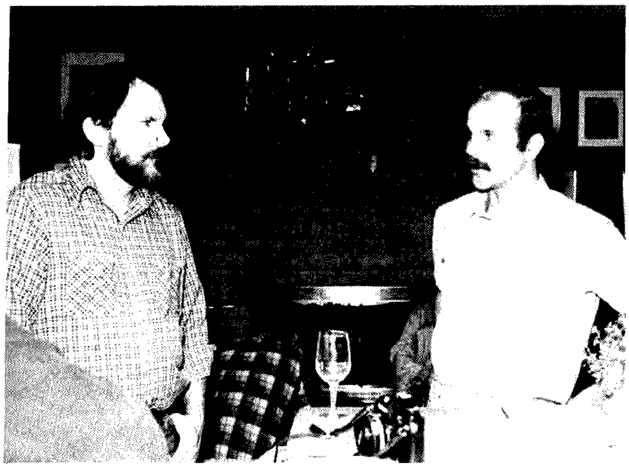
About half way along his round-the-world tour, Rich spent a few days in northern California with your DX editor. Rich offered to share his experiences as an amateur in southern Africa with *73* readers.

Rich finds amateur radio in Lesotho very successful. Using only a mobile whip, Rich and fellow Lesotho amateur Ed 7P8CG have worked stations around the world from a four-wheel-drive truck. And Rich finds no problems with his modest antenna farm of dipoles. "The other day I got on 40 SSB and worked VS6, VK, and a bunch of JAs. They couldn't believe I was barefoot into a dipole," Rich said. Rich claims the good signal reports he receives are due to strange propagation in Lesotho, but I think the 7P8 callsign is worth at least 2 S-units.

While Lesotho is not exactly rare on the amateur bands, there are many DXers still looking for their first 7P8 contact. Perhaps this information will help.

Among the more active Lesotho amateurs are 7P8s BX, CG, CL, CM, and CR. Ed 7P8CG is Vice Consul at the American Embassy in Maseru, the capital of Lesotho. Ed hopes to work DXCC on CW while in Lesotho and also can be caught working mobile. Martin 7P8CM uses a 40-meter dipole on 40 and 15 meters. A new Lesotho amateur, 7P8CR, hails from Italy and often can be heard on phone speaking Italian and Spanish. Rich himself puts his TR-44C and Swan radios on the air from his home station (7P8BX) and mobile (7P8CG). Rich hopes to supplement his existing dipole antennas with some new aerials soon, including a 15-meter beam.

Rich suggests the best time to look for 7P8 stations is early evening, Lesotho time. 1730 UTC is 7:30 pm, local time. Beginning



Rich Kingston 7P8BX, president of the Lesotho Amateur Radio Society (right), discusses schedules with Paul Hansen AE6H, president of the Redwood Empire DX Association.

about 1700 UTC, 10 meters is often open to the States. You can listen for ZS stations or the ZS 10-meter beacon to check propagation to Lesotho. 10 meters tends to fade away completely during the stateside summer, Rich explains, so try lower-frequency bands between June and August. 15 meters often opens to the States about an hour later, around 1800 UTC.

Rich says 2 IRCs or a green stamp will provide return airmail postage for your 7P8 QSL card. Rich's own QSL card (see photo) features a map of the continent, with Lesotho marked, and a colorful one-cent stamp. Lesotho, like many small countries, produces beautiful postage stamps; they add a nice touch to Rich's custom card. Rich has included on his QSL the logos from two international organizations to which he belongs: the Radio Society of Great Britain and Mensa, the high-IQ society.

Rich is also president of the newly formed Lesotho Amateur Radio Society (LARS). LARS recently held its first meeting at the home of the German ambassador to Lesotho, 7P8CI. Of the approximately 18 amateurs in Lesotho, 12 joined LARS. Only about 6 of these amateurs are active on HF, however.

At the first meeting, Rich presented the International Amateur Radio Union (IARU) films on amateur radio. Several Basotho (lifelong residents of the tiny mountain kingdom of Lesotho) attended the first meeting, but none has an amateur radio license to date.

Rich has helped bring some formal structure to amateur radio in Lesotho and has patterned the license examinations after the British model. The theory portion of the amateur examination is taken directly from the British test. The code requirement of 12 wpm is also similar to the British system. Unlike the US test, Lesotho amateurs must copy the 12-wpm code without error! No multiple choice to make it easier!

The Lesotho Amateur Radio Society has exciting plans for encouraging amateur radio activity within the country and with hams in other countries. A club station, 7P8RS, is under construction and looking for donated or loaned gear. LARS plans a Field-Day-type operation, perhaps in connection with the king's birthday. And an award for working 7P8 amateurs is in the works. About the latter, Rich says, "It won't be an easy award. Perhaps work 7P8RS and 7P8 stations on 4 bands. You'll have to try hard to earn this one."

One of the duties of a young national amateur radio society such as LARS is to set up an incoming QSL bureau for its members. The Lesotho Amateur Radio Society has started such a QSL bureau for local 7P8 amateurs. You can send your cards direct, to individual QSL managers, or to the bureau at Box 949, Maseru, Lesotho, Africa.

Any cards for 7P8 amateurs sent to the Lesotho Amateur Radio Society will arrive at LARS's PO box. The secretary or QSL manager of LARS will sort the incoming cards by callsign and hand them to appropriate LARS members at the next club meeting.

The incoming QSL bureau in the States works in much the same way, but on a much larger scale. Let's follow a card back from Rich 7P8BX to a stateside ham, KK6X.

At a club meeting, the members of LARS bundle up their stateside QSL cards without SASEs and mail them to the USA's official IARU incoming QSL bureau at ARRL headquarters. The cards are then sorted by call areas and mailed to the QSL bureaus in each amateur radio call district. The card we are following is sent to the sixth district QSL bureau in Sun Valley, California.

Here, local volunteer amateurs enter the picture, donating hundreds of hours of time to sort the many thousands of QSLs by the first letter of the suffix. KY6A, K6ANP, KB6AG, and WB6ANT would all go to the "A" letter sorter. At the next radio club meeting, the individual letter sorters pick up their shopping bags full of QSLs. Our card is sent to the "X" sorter in northern California.

Every month, the individual letter sorter gets 10-100 lbs. of QSLs to sort by individual callsign. The "X" sorter gets a break because there are no three letter suffixes beginning with X, as these callsigns are reserved for experimental licenses. With only one- and two-letter suffixes, the "X" sorter gets only a fifth of the cards the sorters of other letters receive.

At the same time as he gets our card, the "X" sorter gets any return envelopes for stations with X as the first letter of their suffix. He puts these into callsign order and adds them to the file of envelopes on hand. After he sorts the incoming QSLs, he puts each amateur's QSLs into the SASE provided by that ham. If there are enough cards in the envelope, our sorter will seal and mail the envelope, and a few days later a happy KK6X will pull his 7P8BX card out of the envelope from the bureau.

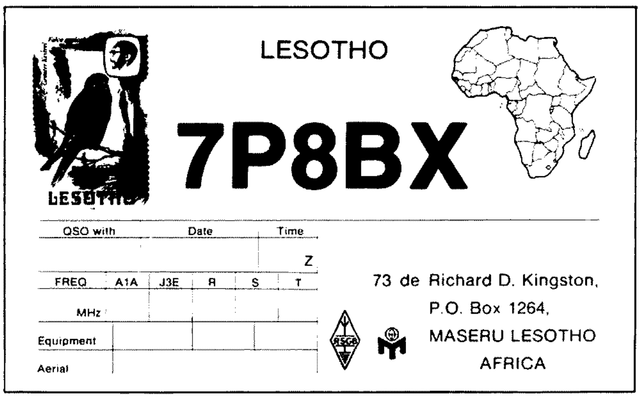
There are many potential pitfalls for the QSL card along this extended journey from Lesotho to a mailbox in California, any of which can delay delivery. The card might sit around for a while before being shipped to the sixth district bureau. It might just miss a sorting session there and not be sent off to the letter sorter for another month. That letter sorter might be forced to skip a month for various reasons. So the card could easily take six months to get across the country. If you think that's slow, think about how much you are paying for this service.

Jay W6GO (left) and Jan K6HHD O'Brien are in charge of the program at the International DX Convention at the Holiday Inn, Visalia, California, April 22-24, 1983.

The cards move through the QSL bureaus entirely by volunteer hands. The sixth district QSL bureau handled more than 600,000 cards last year! That's almost 2,000 a day, 365 days a year! The QSL bureau volunteers contribute thousands of hours of rather tedious work to make a lot of DXers happy. And you'll never guess their biggest problem: unclaimed QSLs!

Thousands of cards pile up each year for amateurs who do not have an envelope on file at the correct QSL bureau. Sometimes there are thousands for a big contest station; sometimes only one or two for a ham who "doesn't work DX." One Technician who was helping sort cards came across three for himself! One was a callsign error, but two were from South American stations worked on 6 meters, years before.

What can *you* do to speed the process and get your QSLs back as fast as you can? I suggest three things: 1) get the proper



Rich Kingston's QSL card features logos, a map of Africa, and a postage stamp for color.

envelopes or money to the bureau, 2) be patient, and 3) be patient.

You will seldom get your QSLs if you don't have an envelope or postage credits on file at your district QSL bureau. Your bureau is based on the number in your callsign, not where you live. WB2CHO/6 keeps postage credits on file at the 2nd district bureau.

Most district bureaus sell postage credits, a route often preferred by both bureau and DXer. You can find out the details of your own bureau's envelope credit system by sending an SASE to the bureau address, listed in the front pages of the *Callbook* or in *QST*. Generally, you send some money and your address, and they'll deduct postage as needed to mail your cards. When you run low, they'll note it on your return envelope.

Many bureaus prefer this method to receiving prepared envelopes, as they can buy standard envelopes in quantity, simplifying storage and reducing costs. Also, postage credits aren't outdated by a postage rate increase, and the QSL bureau finds it easier to keep the addresses and callsigns up to date with postage credits.

If you choose the envelope route, be sure to follow the bureau's suggestions for preparation of your return envelope. Get some 5" × 7½" envelopes and print your callsign *neatly* in the upper left corner. Put a single $0.20 stamp in the upper right corner and print your name and address neatly in the center of the envelope. Send a few envelopes prepared this way to your correct bureau, and wait.

Don't hold your breath. Cards can take many months or a year just to work their way through the bureau system to you. And this doesn't include the time it took *your* card to get to the DX amateur or the time it took the DX station to get around to answering your card.

In the case of the Russian stations, through Box 88, Moscow, a delay of several years is commonplace. It is not unusual to find Russian QSLs for contacts made 3-7 years ago in the bureau.

After you work a station who promises to QSL "via the bureau," you might wait six months or a year for the card. While a new DXer eagerly awaits his first bureau shipment, he can reflect on why most Honor Roll DXers are old: It takes *years* to finally get some cards. Longevity is one of the most important DX skills.

What if you have sent off envelopes or money to the bureau, worked a bunch of DX, waited a very long time, and still have nothing? Don't be afraid to drop a note to the bureau asking if you have any cards or asking them to mail any cards for you, no matter how few. Be sure to include an SASE for any reply, and be prepared to wait a few months while your envelope works its way through the system. And be nice; these are volunteers handling your cards, remember, and screaming that you have worked hundreds of DX stations and must have cards waiting won't help.

Ask politely if you have any cards waiting, and if so, would the sorter please mail them? On rare occasions, the sorter or bureau has a temporary problem, and your query might point it out. But more likely, the reason you haven't gotten anything back from the bureau is that the bureau has not received any cards for you!

Sorting the cards, putting them into the correct envelope, and mailing them takes even the "X" letter sorter a full day every month. Improper postage on envelopes costs the sorter about $4.00 of his own money every month. Why does someone contribute so much time and effort to this nearly thankless task? Well, one reason is that the letter sorter gets first peek at the incoming cards and gets to pull his own out. "That's why I volunteered to sort the 'X' cards," our sorter says. "I get mine first!"

But this is not the *only* motivation of these hard-working volunteers. Some amateurs in the Washington DC area sort cards from a different call district. They'll never see one of their own cards first. These amateurs are more motivated by the thrill they help provide. The thrill when the ham eagerly rips open the envelope from the bureau to see what treasures might lie inside.

Receiving an envelope from your QSL bureau is like receiving an invitation to a treasure hunt. For the active DXer, each envelope from the bureau will contain at least one prize, and sometimes a whole handful of new ones arrives at once. Inside that little envelope could be those long-awaited Asiatic Russians, or that South American who *swore* he would QSL via the bureau. Or it might be returns of one's own OSLs, marked "callsign unknown," or SWL cards from countries most DXers would love to work.

So some volunteers work in the QSL bureaus because they know just how eager you are for your cards and just how happy you are going to be when you open that envelope. So think of the hard-working volunteers at the QSL bureau the next time you wait for your 7P8 QSL "via buro."

NEW PRODUCTS

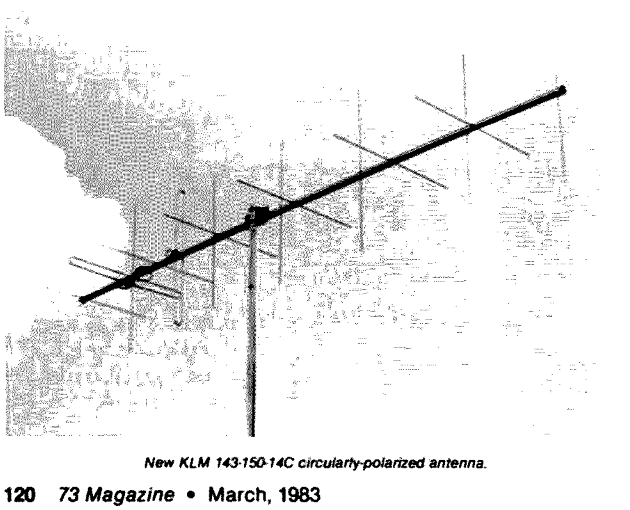
CIRCULAR SATELLITE TECHNOLOGY FROM KLM

The new KLM 143-150-14C circularly-polarized antenna not only provides optimum reception of OSCAR satellite signals, but also can dramatically improve 2-meter terrestrial communication. Linearly polarized signals (any mode, fixed or mobile) are frequently affected by buildings, mountains, and movement and, as a result, circular wavefronts develop. Reception with the 14C reduces flutter fading and multipath distortion and often improves S/N ratios. Benefits of circular polarity on transmit are similar, regardless of the polarization of the receiving antenna.

Since circularity may have a right-hand or left-hand "twist," the 14C antenna kit includes a feedpoint-mounted switcher keyed by +9 to +15 V dc right from the shack. For single feedline convenience, a special matching harness is included. If desired, the 14C can also function as two separately fed antennas, one vertical and one horizontal. Each set of feedpoints is equipped with a 2-kW balun ready for direct coax feed.

The 143-150-14C is built to provide years of reliable service. All aluminum is 6061-T6 and 6063-T832 alloys. All hardware is stainless steel except the U-bolts. The matching harness and balun coax features weather-impervious Teflon™ insulation and silver-plated conductors.

With seven elements in each plane, the 14C produces 11-dB-dc gain at better than 1.5:1 vswr. Circularity is maintained within 3 dB. Virtually unbreakable 3/16"-rod parastic elements, anchored through the 1½" boom, help reduce weight to 7½ pounds, windload to 1.2 square feet. For more information, contact *KLM Electronics, Inc., PO Box 816, Morgan Hill CA 95037; (408)-779-7363.*



New KLM 143-150-14C circularly-polarized antenna.

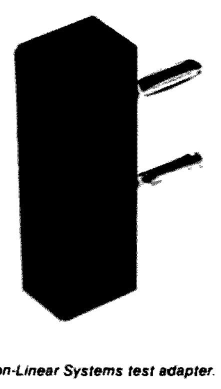
TEST ADAPTER

The new NLS Touch Test 20 test adapter for axial- and wire-lead electronic components has found a home with test engineers in test labs across the United States. Its popularity has caused Non-Linear Systems, Inc., to add this last test product to its accessory line of digital panel meter and digital test equipment line.

Measuring 1/2" by 2" by 5/8", the adapter has two slots on the side opposite the banana plus terminals, into which the leads of individual components may be inserted for component testing. The adapter eliminates the tedious task of applying prods and/or using test lead clips to make contact with the terminals of small components. Once the component leads are inserted, the testing becomes a hands-free operation, allowing for easier adjustment and control of the testing instrument. This method also eliminates the ambiguity introduced by lead or cable resistance. With banana-plug terminals 3/4" on center, the adapter can be used with any measuring instrument utilizing standard banana-plug receptacles with like separation.

This product is now available nationwide from local electronics distributors handling the NLS digital panel meter and digital equipments line of products.

For additional information, write *Non-Linear Systems, Inc., PO Box N, Del Mar CA 92014.* Reader Service number 483.



Non-Linear Systems test adapter.

NEW HAMTRONICS® CATALOG

Hamtronics, Inc., announces publication of their new 1983 catalog crammed full of goodies for the VHF/UHF/OSCAR enthusiast and two-way shops. The 36-page two-color catalog features many new products, including FM repeaters, new VHF and UHF FM receivers, helical resonator preamps and filters, low-noise receiver preamps, and a UHF receiver to listen to the space shuttle. Also included are the popular FM transmitters and power amplifiers, VHF and UHF receiving and transmitting converters, VHF transceivers, and other products Hamtronics has long been noted for.

For your free copy of this attractive new catalog (for overseas mailing, please send $2.00 or 4 IRCs), call (716)-392-9430 or write to *Hamtronics, Inc., 65F Moul Rd., Hilton NY 14468.* Reader Service number 476.

THE NEW MFJ-1440 VIDEO CONTROL CENTER

The new MFJ-1440 video control center combines enhancer, stabilizer, fader, switcher, distribution amplifier, and rf modulator to make professional-quality dubs and to give improved viewing quality of videotapes. You can make copies as good as the original, stop copyguard, improve sharpness, separate scenes, select from 4 inputs, and make 4 copies simultaneously. An rf modulator lets you monitor what you are taping or playing back on your TV set.

An Enhance control dramatically improves picture clarity, detail, sharpness, and increases contrast. You can actually see individual strands of hair and blades of grass.

An exclusive Logarithmic mode enhances light areas only for improving dark scenes.

A Noise Cancel control reduces picture noise exaggerated by enhancement.

Enhance before recording to cancel VCR and tape loss. Enhance during viewing to bring out detail and sharpness and to improve viewing of older tapes.

Enhancement can make viewing quality of 6-hour mode recordings comparable to 2-hour mode.

A bypass switch compares the enhanced with the unenhanced picture.

A Stabilizer control removes copyguard and stops picture roll and jitter. Play copy-

guarded tapes on any TV set. Duplicate any prerecorded tapes. Has stabilizer bypass switch.

The new Fader Design separates scenes, dubs out commercials, and cleans up edits and glitches for professional results. It has automatic and manual modes, simultaneous video and audio fade, continuously adjustable fade-out times, and audio dub jack for bypassing audio fade. The picture is in sync during fade.

The Video/Audio switcher adds convenience and eliminates messy cables. Select from 4 sources. (Connect VCRs, video disk, computers, games, video camera, etc.)

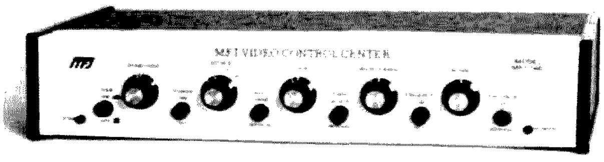
The Distribution Amplifier gives 4 video and 4 audio outputs for multiple recordings or monitoring.

The FCC-approved rf modulator converts video and audio signals to channel 3 or 4 for monitoring on your TV set.

The cabinet is eggshell white with walnut grain sides and measures 12 × 2 × 6 inches. The MFJ-1440 operates on 110 V ac or 12 V dc for portable use.

MFJ provides a 30-day money-back trial period. If you are not satisfied, you may return it for a full refund (less shipping). MFJ also provides a one-year unconditional guarantee.

For further information, contact *MFJ Enterprises, Inc., 921A Louisville Road, Starkville MS 39759.* Reader Service number 480.



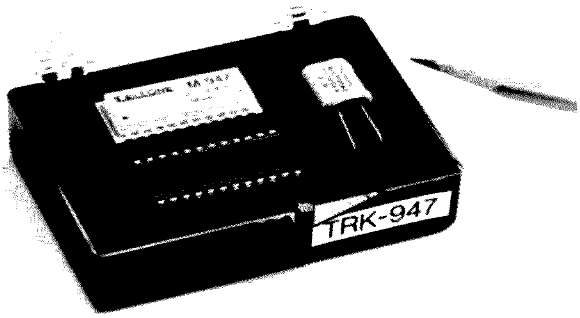
The MFJ-1440 video control center.

DTMF RECEIVER KITS FROM TELTONE

Teltone announces the addition of two new DTMF receiver kits. These receivers will allow you to turn your telephone into a control device.

The TRK-927 contains the Teltone M-927 DTMF receiver and rotary dial pulse counter, a 3.58-MHz crystal, and a 40-pin DIP socket. The TRK-947 contains the M-947 DTMF receiver, a 3.58 crystal, and a 22-pin DIP socket. These units are packaged to simplify breadboarding by engineers, scientists, and hobbyists alike. Typical applications of these receivers include computer data entry, equipment monitoring and remote control, and central-office-quality DTMF-to-rotary conversion. Both kits are currently available.

For additional information, contact *Teltone Corp., PO Box 657, 10801 120th Avenue Northeast, Kirkland WA 98033; (206)-827-9626.* Reader Service number 478.



New receiver kit from Teltone.

R-2000 COMMUNICATIONS RECEIVER

Trio-Kenwood has just announced the new R-2000, a highly sophisticated, all-mode communication receiver that covers 150 kHz-30 MHz in 30 bands. Designed to answer the needs of the shortwave listener as well as the radio amateur, this new radio is capable of receiving signals on AM, USB, LSB, CW, and FM. Among the more interesting features to be found on this model are digital vfo's, 10 memories that store frequency, band, and mode data, memory scan, programmable band scan, and dual 24-hour quartz clocks, with a timer that can be programmed to turn the radio on and off on a pre-selected schedule. Additional features include a built-in lithium battery memory backup (estimated 5-year life), flourescent tube digital display, 3 built-in i-f filters with switch, manual "UP/DOWN" band scan, squelch, S-meter, noise blanker, and rf step attenuator. The R-2000 operates on 100/120/220/240 V ac or may be operated on 13.8 V dc using an optional DCK-1 cable kit.

For additional information, contact your local Kenwood amateur radio dealer or write *Trio-Kenwood Communications, 1111 West Walnut Street, Compton CA 90220.*

R-2000 communications receiver from Kenwood.

CONTACT-80/MARK II SYSTEM FROM ROYAL

Royal has announced the release of the Contact-80/Mark II RTTY and Morse system for the TRS-80. The system consists of an interface unit which will link the computer to the station equipment and the necessary software on either disk or cassette.

The interface will mate with any standalone terminal unit for use as a RTTY terminal, and the interface contains its own decoder and keying circuits when used on CW. The program will send and receive RTTY at 60, 66, 75, and 100 wpm, ASCII at 110 baud, and Morse at any speed. The Morse receive mode will automatically synchronize its speed with that of the received code. The user may also change the decoding parameters to compensate for closely-spaced characters and machine-gun dots.

Contact-80 features a tri-split screen which shows received data, stored message numbers and text, and the transmitted message. The screen format may be easily changed for different uses.

The system also has MSO capability, a line printing spooler, automatic frequency monitoring, and a special mode to send and receive Basic programs.

For additional information, contact *Royal, 407 Conkle Rd., Hampton GA 30228; (404)-946-9314.* Reader Service number 477.

SOFTWARE POLLUTION CONTROL

Electrical pollution drives micro programs bananas! Power-line electrical noise, hash, and spikes often cause erratic computer operation. In addition, severe spikes from lightning or heavy machinery may damage expensive hardware.

Many systems create their own pollution! Disks and printers often create enough electrical interface to disrupt an entire program. Nearby electronic equipment is affected as well.

Electronic Specialists' recently announced Magnum Isolator is designed to control severe electrical pollution. Incorporating heavy-duty spike/surge suppression, the Magnum Isolator features four individually quad-pi filtered ac sockets. Equipment interactions are eliminated and disruptive/damaging power-line pollution is controlled. The Magnum Isolator will control pollution for an 1875-Watt load. Each socket can handle a 1000-Watt load.

The model ISO-17 Magnum Isolator eliminates severe ac power-line pollution for smooth program operation.

For additional information, contact *Electronic Specialists, Inc., 171 South Main Street, PO Box 389, Natick MA 01760; (617)-655-1532.* Reader Service number 481.

HAL'S MPT3100 SOFTWARE EXPANSION FOR THE DS3100 ASR VIDEO TERMINAL

Hal Communications Corporation has announced the MPT3100 software expansion of the popular DS3100 ASR video terminal. The MPT3100 expands the features of the mailbox option and adds a separate mode for collection, editing, and relay of multiple message texts.

The MPT3100 package will store any length of message up to 32,000 characters in any format. Each file receives a sequential serial number ID, and a directory of stored files may be accessed. The messages may be edited after they have been stored by using the MPT3100's edit mode, which includes custom identifier codes for user designs.

The relay mode allows repetitive transmission of text, and transmission order is user-set, rather than in the order the text was received. Different texts may also be grouped for retransmisson to specific geographic areas or stations.

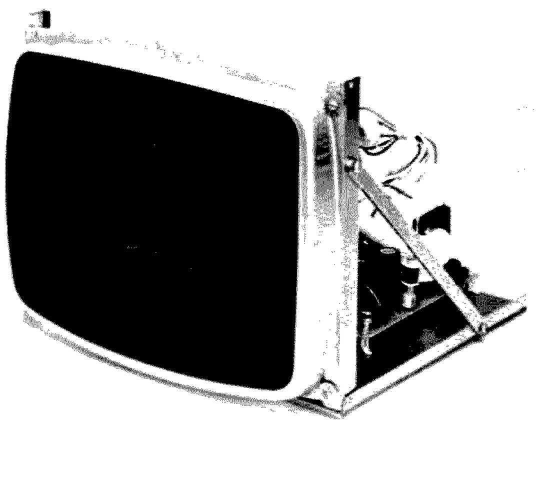
The mailbox enhancements allow the user to edit while receiving or transmitting or during a mailbox access by an outside station. Added comments have also made the directory search and SDIR listing more useful tools for the mailbox user.

For more information, contact *Hal Communications Corporation, Box 365, Urbana IL 61801; (217)-367-7373.* Reader Service number 485.

DTU-12 AMATEUR DATA DISPLAY FROM DOTRONIX

Dotronix, Inc., manufacturer of CRT displays, offers commercial-grade US-manufactured CRT displays for Morse-code translators, SSTV, ATV, or personal computer applications.

Get a clean, crisp computer-quality data display for your next ham project with a DTU-12 from Dotronix, available in kit, chassis, or chassis/ac power versions, and either P4 (white) or P31 (green) phosphor. The DTU-12 requires only 12 V at 1.5 Amps, standard TTL horizontal and vertical con-



DTU-12 display from Dotronix, Inc.

trol signals, and 2.5-V video drive. Scan rate is 15,750 Hz. Interface is through a 10-pin edge card connector.

These are brand new commercial-grade displays, factory adjusted for proper geometry and supplied with written specifications.

Dotronix, Inc., produces a complete line of compact and economical CRT displays, including 5-, 7-, 9-, 12-, 13-, 15-, and 17-inch sizes, in both chassis and kit configurations. Dotronix displays are used in the computer terminal industry, medical instrumentation, automated phototypesetting, airline flight information, and closed-circuit television applications. The company maintains sales and service operations in Minnesota, Texas, and Illinois.

For additional information, contact *Dotronix, Inc., 160 First Street SE, New Brighton MN 55112; (612)-633-1742 or (612)-633-8236.* Reader Service number 479.

CES MD22 chip.

NEW LOW-POWER DTMF MEMORY DIALER CHIP FROM CES

Communications Electronics Specialties, Inc., introduces the MD22 memory dialer chip, the only memory dialer in a single chip.

"We foresee a very broad range of applications for the MD22," CES President Ron Hankins remarks. "Its low power requirements and impressive capabilities lend it to quite a few types of communications systems." Component sales are available on the copyrighted chip, Hankins says.

No external RAM or tone generator is required with the MD22's unique design. This new proprietary chip actually operates off telephone line power due to its CMOS technology. The MD22 features a ten-year memory backup with a single lithium cell.

Other features of the MD22 include: 10- or 22-number capacity, programmable pause, manual or automatic dialing, automatic redial of the last manually dialed number, and program inhibit input to avoid memory loss.

The MD22 is programmed and operated from a standard twelve-button keypad.

CES is offering qualified users a complete dialer for installation in any standard telephone for product evaluation. For complete information, contact Ron Hankins, *CES, Inc., PO Box 507, Winter Park FL 32790; (305)-645-0474.* Reader Service number 482.

LETTERS

DISTORTED NEWS

We are Americans who have made our home in Latin America for seven years. Lately, we are seeing much distorted news about the Americas coming out of the US and would like to set the record straight for *73* readers.

When we first moved to Costa Rica—bag, baggage, grandmother, teenagers, and pets—we spoke no Spanish and knew little about the country. But, soon, our rural neighbors accepted us and graciously taught us their language, their culture, and how a city-bred family could enjoy ranch life in a foreign land. Truly, our delightful adventures there merit a book, at least!

My husband's love for the sea (Pearl Harbor survivor, retired Navy) prompted a further move, two years ago, to Colombia's Caribbean coast. We found a lovely old coconut plantation on the Pan American Highway near Santa Marta, the oldest (457 years), most fascinating city in all of the Americas.

Imagine, green palms waving in gentle ocean breezes, blue sea and sky, pounding surf and golden sand, and, towering 19,000 feet over all and snow-capped the year 'round, majestic Mount Columbus. We feel we have much . . . incomparable beauty, fine neighbors, perfect climate, a stable democratic government, and a satisfyingly-low cost of living.

Like Columbus, we have discovered a new frontier with a vast potential and, being human, are driven to tell others about our dream-come-true. If you are interested in the future of the Americas . . . and the Birds . . . write us by international airmail (35¢ a half-ounce) at PO Box 5222, Santa Marta, Colombia. It may take a while, but we promise to answer.

Now, from beautiful Santa Marta, we wish you salud (health), pesetas (wealth), amor (love), and the time to enjoy them all!

Juanita Bird
Santa Marta, Colombia

ICOM FOLLOW-UP

You may possibly recall that last June 19th I wrote to *73* to tell of my problem in trying to get some kind of response from Icom regarding a part I needed to repair a pair of Icom headphones that I have. You were kind enough to forward my letter to Icom's customer service manager, Tom Snellings. He, in turn, promised to get the part to me even if it was necessary to go to the factory for it.

As it turned out, this particular part was not available separately and Icom offered to exchange my set of phones for a new one. I naturally accepted their offer, which was more than I expected. If Icom had told me that the part was not available, I would have "jury rigged" something and would have settled for that.

What disturbed me was the complete lack of response. What I suspect happened was that some employee discarded my letters when they found that the item was not available. Of course, this is conjecture on my part, but I have that feeling.

The main purpose of this letter is to thank you and to let you know the way Icom followed up. Once again, thanks very much for your help.

Sam Zolick KB2UH
Howard Beach NY

FIST OR PHONE

Before all the stuffed shirts bury amateur radio and drive off all the young talent, how about developing a license that has either code or phone privileges or both? In other words, one can work CW on that portion of the band if one has the necessary license endorsement. You may work someone on the phone portion of the band if you have the phone endorsement. An amateur may work both modes if he or she has passed the tests for both endorsements. This is a simple solution which should satisfy everyone.

I foresee that if the "code establishment" continues to thwart some type of compromise like the one I have mentioned, then you can say "good-bye" to the recruitment of many bright young men and women into amateur radio.

Robert Baker KA1JDD
S. Yarmouth MA

THANKS TO BASH

I feel I must take exception to the editorial regarding Dick Bash and *The Final Exam* in your November, 1982, issue.

About four years ago I decided to get my General license after dutifully working my fingers to the bone for two years in the Novice bands. On advice from our local electronics store, I selected the Ameco Amateur Radio Theory Course and proceeded to study like hell for the next three months while working with the ARRL code tapes to bring my speed up to a solid 13 wpm.

In the Ameco book I took and passed every single test and when I went down to the dear old FCC, I got the surprise of my life. Although I passed the code with ease, the whole damn written test was on UHF; ergo, three months wasted. To hell with it—I quit ham radio!

I packed my TS-820 away and found another hobby (this *is* a hobby).

Per chance, about two months ago, I wandered into our local electronics store and there on the shelf was Bash—B.S., I figured, but what the hell—I bought it anyway. I dug up the ARRL code tape (why don't you pick on them?) and got my code back up and passed both with ease. I am now working on the Advanced, thanks to Dick Bash.

Since you chose to come down hard on Dick and *CQ*, I feel it is only fair for me to advise that this is the first and last *73* I will purchase. By the way, you may be interested in knowing that my former call from the 1950s was K6DDC (General class) so I am not exactly unfamiliar with amateur theory.

Scott Smith KH6JKX/HL
Kaneohe HI

P. S. Print this in your rag sheet if you want to.

Scott, lacking much in the way of letters protesting the Bash approach to licensing . . . which you endorse . . . perhaps that is the way to go. But I honestly think it is stupid to even ask anyone to bother with a written test at all under these conditions. There seems to be strong sentiment for letting in any dummy who can copy the code. So, how about it, shall we go this route and

just do away with anything but the ability to sign a name and copy code? Or is that signing the name too much to ask? Oh, about your ability to cope with the theory... the 50s?... have you opened a radio recently?—Wayne.

CW IS FUN

You keep insisting that SSB can get through every bit as well as CW. Well, this summer during a sked with AA9P, conditions deteriorated on 20m SSB, due to QRM and QSB, until I could not copy AA9P anymore. However, when we resorted to CW... Q5 copy! CW has a place.

Yes, RTTY is faster and more efficient. Yes, CW is slow. Yes, ASCII is the way to go. But I don't operate CW because I think CW is efficient or easy to receive or because of the "tradition." I like CW because it's fun. Isn't that why a lot of us got into this?

Bob Reynolds KB9MU
McHenry IL

P. S. I'm not an old-time CW op either. I'm 29 and I also enjoy SSTV and RTTY.

Yep, Bob, there are times when CW can get through... and there are times when SSB can't be beat. No emission is best all the time... as yet. I suspect that when we put our minds to it, we will be able to come up with some sort of machine-readable transmissions which will be virtually jam-proof and which will go right on through interference, static, fading, and so on. That's a good challenge. Meanwhile, I agree that CW can be fun and should be accepted because it is fun—not because there are people who want to force it on you.—Wayne.

RICH HERITAGE

Come on now, Wayne. Let's be realistic about this second language thing (*73*, November, 1982). You and I are savvy enough folks to know that the language of the ruling tribe is the language of the common little folks who live outside the castle gates. And the last thing the little guy wants is trouble with the rulers.

The language you and I speak would be a lot closer to Frisian or Dutch, were it not for the victory of some francophone Vikings at Hastings in 1066. And those same francophone Vikings might have ended up speaking a form of Gaelic, had not the Romans overrun Gaul some centuries earlier. (And had not the Gauls been chased into western Europe by the Slavs and Germanic tribes, our language would be closer to Basque—well, maybe.)

The fact remains that languages change, as do politics and economics. America is not so much a melting pot as it is a mulligan stew. By and large, we are the cultural descendants of herds of people, from Athabascan and Algonquin, through Spaniard and Anglosaxon, to Oriental and African. We are the cultural descendants of any group which has dragged or been dragged up on these shores.

These people—our cultural and linguistic forebears—deserve their rich heritage. Keeping this heritage alive in non-English-language press and media is not some heinous crime against "us." Rather, it would be far more heinous to ban these non-English media forces. The thought of banning such publications and media forces conjures up visions of some multimedia Kristallnacht. It won't hurt us at all to reach out to our fellow man, even if he doesn't speak our language as nicely as we think he should.

But this of course is a two-way street. We should indeed have a populace which speaks one language. To do that, we need to give the non-English speakers a reason to join the rest of us "anglos."

I can think of no better reason for the rest of us, who presumably speak English, to exorcise our prejudices, whether racial, sexual, religious, political, or linguistic.

Nils R. B. Young WB8IJN
New Carlisle OH

CB OR HAM?

A letter to you has been in limbo for some time now, but I just came across something which is really disgusting and an absolute insult to amateur radio.

While sitting here working on my antenna tuner and listening to the last few fading signals of 15 meters, I had an idea to drop my R4C down on 11 meters to hear what was going on. Brother, was that a mistake. Man, did I get hot!

On 27.395, at least the frequency was legal. I found a couple of CBers discussing their rigs. Let me see, Woody, in Trenton, has a Tempo transceiver, a ground-mounted vertical, and a set of "moon rakers." Harold has a ham rig that has great ears and a keyer that does great at 25 wpm! Wow, a CBer who can send and copy 25 wpm... a prime candidate for a ham ticket, right? Wrong. Come to find out, these turkeys were amateurs, I think, down on 11 with their ham rigs. Oh, yes, they did ID, naturally with their "callsigns" Mercury 5119 and Mercury 927, I believe. Come to think about it, these guys may have been doing this for a couple of years; I believe I have heard them before.

It is really sickening to hear these guys. Man, are they doing a great job of public relations for all of us amateurs in this area. To them, all we are is glorified CBers. That's the pits!

As you can probably tell, I am a new amateur. My ticket is just 6 months old and my pride has really gone to my head. It really gets my goat when I hear some of the stuff so-called amateurs are putting out on the air. They seemingly have no remorse for their behavior.

Turkeys or not, I am proud of amateur radio and of being an amateur radio operator. I will defend its principles and ideals until I am blue in the face. Just believe me though, this enthusiasm will be turned loose on these two if they keep it up!

On a lighter note, I have worked all states and 41 countries. Not bad for a mobile antenna on a balcony, is it? Thanks for listening.

Jerry Rogers KA8PTL
Monroe OH

Jerry, it is unlikely that those chaps were actually amateurs. Zillions of CBers bought ham rigs a few years ago and had them converted for 11 meters. As a matter of fact, a couple of our very large ham dealers made quite a business of making those conversions because CBers paid full list price for rigs with no questions asked while hams would do virtually anything to save $10 on the purchase... so they sold CBers first and we got what was left over. With the fading interest in HF operating, as the frequencies above the 40 CB channels were called, hams have been able to buy ham rigs again. There is still activity on the HF band, but it is a shadow of what we were hearing ten years ago. The FCC has never shown any serious interest in trying to shut down this illegal activity, so it has indeed been going for many years relatively unimpeded. There was a time when hams were screaming that these hordes of CBers were going to invade the ten-meter band, but it never really happened. I didn't think it would and said so at the time, but that was not a popular way to think then. Come to think about it, I always seem to be out of step like that.—Wayne.

EDUCATION

Here I go again, penning my second letter. Many of your ideas are echoes of my feelings, and further discussion would be redundant. Some of your ideas go contrary to my feelings, but thank goodness we are all different, and I am sure you get plenty of feedback. One topic which you hit on in your Never Say Die (Never Spend a Dollar?) column that I must respond to is education.

Your September NSD column stated, among other things, that the school system is set up so as to virtually guarantee failure as far as making any real money is concerned. How you reach this conclusion is questionable, but I have a more important querry: What can be done to change this?

My wife and I are both teachers (as well as hams). Karen works with learning-disabled children and I have a sixth-grade classroom. What are your thoughts on how to instill that desire of success with students who do not care? Any ideas would be welcomed.

The Whiteside Amateur Radio Club, which I sponsor, recently purchased your code series cassettes and the kids seem to be learning the code better than when I send it on an oscillator.

Thanks for any suggestions a teacher could use, and keep on plunking away at what you feel is right concerning amateur radio, politics, or whatever.

Carl J. Buehler WB9ZAJ
Belleville IL

Sure, Carl, whenever I discuss a problem I try to offer a solution to it. In the case of education, I noted that our colleges are geared towards training kids to work in the three proven areas for non-wealth... large corporations, government, and teaching. Once we recognize that the easiest way to make money is to be an entrepreneur, we can see the need for schools which teach kids how to be entrepreneurs. My aim is to set up a pilot-program college which will teach the fundamentals of electronics and computers, and then all of the business courses which are needed if one is going to successfully run one's own business or manage a business. In order to keep the cost down and also to provide the best possible teaching in the shortest time, the college will work hand-in-hand with a group of on-campus businesses with which the kids can get practical professional experience in advertising, sales, accounting, marketing, legal problems, production lines, technical developmental work, and so on. Between practical college courses and actually working at business, the students will be ready to go to work and be of value the day they graduate.—Wayne.

DX JUNKIES

I am calling for help as a battered, insulted, and reviled ham who has the misfortune to be "nearby DX" to hundreds of thousands of frantic thoughtless hams. At present, I seem to be the only active ham in the US Virgin Islands on CW.

It's almost impossible to keep a schedule with some old friends with dozens of hams cramming the frequency calling me. For what? The stupid endless waste of time known as 5-band DXCC. These misguided souls are frantic, like a bunch of starving junkies with their fix being my QSL card.

I have been an active ham since 1928 (W2AIS—'28-'51, KH6ARA—'51-'59, and KV4CI—'60 until the present). I am now retired and own my home, 6/10 of an acre, and a big active Labrador retreiver. I have barely enough time to keep up with domestic chores let alone reply to a flood of QSL cards.

When we were young, it took a QSL card to convince people that we really talked to the Far East or Iowa. Now, if you can't work DXCC in a few weeks, your antenna is no good.

For the past few weeks, I have endured insults, jamming, and vicious gossip. One morning, I heard a ham chide another working me by asking, "Why do you QSO that bastard? He doesn't QSL." My God! This is supposed to be a hobby, not a dogfight.

Though I had notices published in RSGB's *Radio Communication*, the JA magazine, and *CQ* telling of my intention to cease QSLing, the cards still pour in. When a ham asks me if I QSL and I tell him I don't, he will send me begging letters and homemade QSLs especially designed for my signature. Add to that dollar bills and countless IRCs. I could make a good side income on the dollar per QSL route, but that is not ham radio. Yesterday, I had to stand in line for a registered letter, and the Christmas lines are long. It was a registered, return letter from a JA ham. I added up the stamps plus the IRCs, and it exceeded $5! The worst aspect of this whole mess is what I call the "bang-bang thank you ma'am" type which is "ur 599 pse ur QSL info."

Wayne, you have clout and your editorials are read widely. Though I detest the whole QSL mess, I would cooperate by answering a "yes/no" printout for QSO claims. Why don't these crazed fanatics get together and have a master computer to handle it? God knows they spend multithousands of dollars on ham gear. Why not set up a "DX info center," hire help, buy software, and charge the applicants a yearly fee for the service? It could be done now.

If they did, the overloaded post office would be thankful and innocent victims would be relieved of the foul filth being spewed out by a deranged minority of DXaholics.

It is a timely topic for a "good Green tirade" to help these misguided souls regain some perspective as to what ham radio is meant to be—fun, not misery.

H. Miller KV4CI
St. Thomas, Virgin Islands

Sorry, OM, there is no escape from DXCC and its 5BDXCC extravaganza... plus the (dis)Honor Roll. This is an ARRL-made nightmare which makes life miserable for all hams in relatively rare DX countries. Of course, being within contact range of the entire US all of the time, you get the very worst of it. One of the reasons so many countries are rare is that the DXers drive any new ham off the bands as quickly as they can with demands that no contacts be over a few seconds long... and that the ham in the rare country devote his life to the unending pile of DXers. Even if a ham in one of these countries could work every single DXer just to get it over with, within two days he would be piled up again with chaps just piling on the heaps to prove they can get through. I'm sure we all really love the guy with the multi-kilowatt and big beam who gets a rare one and thanks him for the instant contact a few days ago... 73, OM, there is no answer to your problem that I know of. The ARRL certainly is not going to cancel DXCC just because it ruins the hobby for ops in 250 countries... and even if they did, there would be a replacement award within seconds to keep the pileups shrieking. Say, have you thought of moving to Florida?—Wayne.

DEALER DIRECTORY

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Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	7A	7	7	7	7	7	7	14	14A	21	21A
ARGENTINA	21	14	14	14	7A	7	14	21A	21A	21A	21A	21A
AUSTRALIA	21A	14A	14	14	7B	7B	7B	14B	14	14	21A	21A
CANAL ZONE	21	14	14	7	7	7	14	21A	21A	21A	21A	21
ENGLAND	7	7	7	7	7	7A	14A	21A	21A	21	14A	14
HAWAII	21A	21	14	7	7	7	7	14B	14	21A	21A	21A
INDIA	14B	14	7B	7B	7B	7B	14	21	21	14	14	14
JAPAN	21	14	7B	7B	7B	7B	7	7	7B	7B	14	21A
MEXICO	21	14	7	7	7	7	7	14A	21A	21A	21A	21A
PHILIPPINES	21	14	7B	7B	7B	7B	7B	14B	14	14	14	21
PUERTO RICO	14	7	7	7	7	7	14	21	21A	21A	21A	21
SOUTH AFRICA	14	14	7	7	7B	14	21	21A	21A	21A	21A	21
U.S.S.R.	7B	7	7	7	7B	7B	14	21A	21A	14	14B	7B
WEST COAST	21A	14A	7	7	7	7	7	14	21A	21A	21A	21A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7A	7	7	7	7	7	14	14A	21A	21A
ARGENTINA	21A	14	14	14	7A	7	14	21A	21A	21A	21A	21A
AUSTRALIA	21A	21	14	14	7B	7B	7B	14B	14	14	21A	21A
CANAL ZONE	21A	14	14	7	7	7	14	21A	21A	21A	21A	21A
ENGLAND	7	7	7	7	7	7	14	21	21A	21	14A	14
HAWAII	21A	21A	14	7	7	7	7	7	14	21A	21A	21A
INDIA	14	14	7B	7B	7B	7B	7B	14	14A	14	14	14
JAPAN	21A	21	14	7B	7B	7B	7	7	7B	7B	14	21A
MEXICO	14A	14	7	7	7	7	7	14	21	21	21A	21A
PHILIPPINES	21A	14A	14	7B	7B	7B	7B	7B	14	14	14	21A
PUERTO RICO	21	14	14	7	7	7	14	21A	21A	21A	21A	21A
SOUTH AFRICA	21	14	7	7	7B	7B	14	21A	21A	21A	21A	21
U.S.S.R.	7B	7	7	7	7B	7B	7B	14A	21A	14	14B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7A	7	7	7	7	7	7A	1*	21A	21A
ARGENTINA	21A	21	14	14	7A	7	7B	21	21A	21A	21A	21A
AUSTRALIA	21A	21A	21	14	14	14B	7B	7B	14	14	21A	21A
CANAL ZONE	21A	14A	14	7	7	7	7A	21	21A	21A	21A	21A
ENGLAND	7B	7	7	7	7	7B	7B	14	21A	21	14	14
HAWAII	21A	21A	21	14	14	7A	7	7	14	21A	21A	21A
INDIA	14	14	14	14B	7B	7B	7B	7B	14	14	14	14
JAPAN	21A	21A	14A	14	7B	7B	7	7	7	7B	14	21A
MEXICO	21A	14A	7A	7	7	7	7	14	21A	21A	21A	21A
PHILIPPINES	21A	21A	14A	14	7B	7B	7B	7B	14	14	14	21A
PUERTO RICO	21A	14A	14	7	7	7	7A	21	21A	21A	21A	21A
SOUTH AFRICA	21	14	7	7	7B	7B	7B	14	21A	21A	21A	21
U.S.S.R.	7B	7B	7	7	7B	7B	7B	7B	14	14	14B	7B
EAST COAST	21A	14A	7	7	7	7	7	14	21A	21A	21A	21A

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

MARCH

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G/G	2 G/G	3 F/G	4 F/F	5 F/G
6 F/G	7 G/G	8 G/G*	9 F/F	10 F/G	11 G/G	12 G/G
13 F/F	14 G/G	15 G/G	16 F/F*	17 P/F*	18 P/F*	19 P/F
20 F/G	21 F/G	22 F/F	23 F/G	24 F/G	25 F/G	26 F/F*
27 F/F	28 G/G	29 G/G	30 G/G	31 F/G		

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Issue #271

73 Amateur Radio's Technical Journal

International Edition

A Wayne Green Publication

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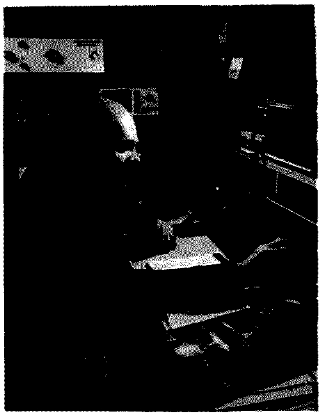
W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



MY WISH BOOK

Just in case the equipment manufacturers are having any problem in figuring out what developments are needed for future rigs, I'd like to throw a few more ideas into the pot. Not that they have been very responsive to my past suggestions... which are still unfulfilled.

For instance, now that voice synthesizer chips are low in cost, isn't it about time that mobile rigs had them built in so we would know what channel we are tuned to when we change? Drivers should not have to look at the rig to see what channel has been selected. In the daytime, it is dangerous enough to have to look down at the rig as you change channels; at night, few of the rigs can be seen even if you want to.

With the increasingly lower cost of microprocessors, isn't it about time that we had some automatically self-diagnosing rigs? With today's chips, it is simple to have an extra one built in whose job is to check on the others, letting the user know if something goes out of specifications. The LCD readout on the set could then indicate the circuit out of parameter so you would know what has gone wrong.

It might be worthwhile on low-band rigs to have the screen alert the operator every now and then when the speech compressor is on. Many operators turn it on and then forget it, putting out a crummy broad signal which isn't any help on short-haul contacts. Something like that might help to clean up the DX bands noticeably.

Now that memory chips are getting so much less expensive, perhaps it's time to put in a log function which would keep track of stations contacted, times, handles, etc., and have them cross-indexed automatically. If any manufacturer is really interested in this concept, I have a surprisingly simple way for the data to be entered that would cost a good deal less than the usual alphanumeric keyboard ...and take up little space. Wouldn't you like to have a rig which would give you instantly the name of the station you are calling and when you last contacted it.

This would also be great for two-meter rigs, including HTs, so that you'd have a cross-index of calls vs. names at hand. It wouldn't take a lot of memory to keep track of a couple hundred repeater users and call their names up on demand.

That ought to keep technicians busy for awhile.

If the manufacturers are slow on the uptake on this, perhaps some readers can design the needed circuits and send 'em in for us to publish, thus doing the work for the manufacturers.

IMPORTING MILITARY TECHNOLOGY

When I wrote about a year ago suggesting that the loss of high technology to Japan could eventually result in America having new weapons designed and built for us in Japan, I got some har-de-har-har letters informing me that I was crazy. It is now revealed that US officials are interested in advanced electronics, fiber optics, laser techniques, and so on, and are looking to Japan for these.

It seems to me that until the US mounts a major program to get kids interested in science and scientific hobbies such as amateur radio, computers, and so on, we are going to continue to fall further and further behind

NO-CODE LICENSE ARRIVES

The no-code license, long a subject of hot debate in amateur circles, took a step closer to reality recently when the FCC proposed two changes in the amateur regulations. One of the Commission's proposals would allow volunteer examiners to conduct amateur tests, a change that was made possible by last fall's legislation.

The Commission suggested two possible alternatives for the no-code license. One would establish a new class of license similar to that of the Canadian Digital class, and the other would eliminate the code requirement from the Technician license.

Neither alternative would allow operation below 30 MHz, and the FCC has requested comments on which frequencies above 30 MHz the new licensees could work. It suggested conferring all amateur privileges above 144 MHz to the Experimenter class or, if the Technician class change is implemented, leaving all privileges above 50 MHz intact.

The Experimenter class test may require more extensive technical knowledge than Technicians need at present; the FCC proposed adding a fifth element to the written test which could be drawn from present test material or written specifically for the new test.

In its proposal, the Commission noted that code is seldom used in the VHF and higher bands, adding that the codeless license might serve as a springboard to higher licenses.

The FCC's proposal for volunteer examiners followed the outline of the ARRL's petition to the Commission, which calls for a three-member team to give the Technician, General, and Advanced tests. The team would be composed of a chief examiner who holds an Extra-class license and two members holding either Advanced- or Extra-class licenses.

Amateurs employed by a publisher or distributor of license study guides, as well as amateurs working for manufacturers or distributors of ham gear, would be prohibited from administering the exams.

The FCC also suggested that "umbrella" agencies be formed to coordinate the volunteer examiner program.

The deadline for comment on the volunteer examiner program falls on April 8, and those wishing to submit comments on the no-code license must do so by April 29.—Avery L. Jenkins WB8JLG.

FCC NEWS

The FCC has paved the way for increased use of experimental digital codes on VHF and relaxed restrictions on ASCII and Baudot transmissions.

In the recent decision, the Commission authorized ASCII up to 56 kilobaud with a bandwidth to 100 kHz on all frequencies above 220 MHz. Between 50 and 220 MHz, the maximum speed is 19.6 kilobaud, and there is no bandwidth restriction.

In addition, experimental codes with a bandwidth of up to 20 kHz are now permitted on the frequencies between 50 and 220 MHz. Previous to this decision, the only permissible codes were ASCII and Baudot. Although the FCC originally wanted to limit the use of experimental codes to domestic transmissions, the final ruling permits their use across the borders of consenting countries such as Canada.

The decision also permits amateurs to use the method of their choosing in determining whether their transmissions fall within the bandwidth limits, and the new regulations do not require continuous monitoring.

Other amendments to Part 97 allow Baudot transmission speed to vary more than 5 words per minute from the standard speeds. The Commission cited the common use of microcomputers rather than electromechanical equipment as the basis of this decision. Frequencies previously limited to F1 have also been opened up to A1 ASCII-coded signals.

The final decision contains several changes from the original proposal. The FCC previously wanted to give its Engineers-in-Charge the power to require amateurs using experimental codes to maintain a record of their communications. However, several public comments noted that the vast amount of material which may be sent by digital methods could be "prohibitively costly to file" and the FFC agreed.

However, hams will still be expected to keep on hand a description of the code which they are using if it is other than ASCII or Baudot.

The Commission also noted that its ability to enforce these new regulations will be hampered by the regulations themselves. "Our ability to verify that the content of messages complies with our rule requirements will be hindered by the broad relaxation of regulatory constraints that we are ordering in these proceedings." However, the FCC added that the "special provisions we are including in the final rules, as well as existing provisions that identification be made in plain English or the international Morse code, should ...provide adequate protection."—Avery L. Jenkins WB8JLG.

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Japan in technology. Sure, we're outproducing them in lawyers by about the same numbers as they are outdoing us in engineers and technicians. Perhaps we're going to sue for technology.

CRAPPY AMERICAN PRODUCTS?

I received a letter from a major ham dealer in New Zealand in response to my editorial suggesting that there is need for more engineers and technicians if we are ever going to regain our amateur radio equipment (and other consumer electronic equipment) sales. Of course I didn't suggest this is the *only* problem slowing the sales of American equipment. No, there are several factors which need fixing, such as a tax situation which will allow American firms to spend more on R&D and on growth (which means more jobs).

The letter from New Zealand makes some very pertinent points. There are some exceptions, but in general the quality of products from Japan puts American products to shame. Compare the American equipment side by side with the Japa-

Continued on page 126

QSL OF THE MONTH

This month's QSL contest winner is Dave Shiplett WL7ACY in the frozen north country of Alaska. His card depicts a grizzled 49er panning for gold while listening to an HT propped against a nearby rock. The scene may not be exactly typical of modern Alaskan life, but it quickly identifies the location of David's station. The callsign is made from birch logs, which is a common wood in the Fairbanks area, and the card is drawn by a local artist.

If you would like to enter *73*'s QSL of the Month Contest, put your card in an envelope with your choice of books from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not sent in an envelope or without a book choice will not be considered.

Well . . . I Can Dream, Can't I? by Bandel Linn K4PP

"We're glad you're interested in the apartment! There's one small problem, though . . . a 100-foot tower in the backyard!"

Charles W. Lobb KN6H
1843 W. 244th Street
Lomita CA 90717

Pedal Power: A Perfect Field-Day Generator

This bicycle-driven power source is easy to build and guaranteed to get you in shape. No heavy breathing into the mike, please.

Five QSOs by "natural power." That's all you need for 100 Field-Day bonus points. Did you or your club lose out on those "give-away" points last year? Probably figured it was way beyond your means, right? I mean, how many clubs can sport solar panels, wind generators, Pelton water wheels, or some other exotic power scheme?

Well, phooey. You missed a real giveaway if you skimmed that lightly over this one. You can easily scrounge enough stuff for a real fun-powered machine, even run a contest-within-a-contest if you wish. Let's take a closer look.

Rules

Field-Day rules state that the 100 natural-power bonus points can be earned by completing a minimum of five QSOs without using power from commercial mains or petroleum derivatives. This intuitively means alternate energy sources such as solar, wind, methane, grain alcohol, etc.

How about muscles? Don't they qualify? Especially grain-alcohol-powered muscles. There are usually plenty of 'em around a typical Field-Day site, most standing around getting flabby while their owners fuel themselves with some of those non-petroleum derivatives. Think you're *too* flabby? Heck, it's only five QSOs, and surely there's enough activity on 2 meters or 220 in your area for that. Besides, with a little imagination you can set up a simple contest within your group for the highest number of muscle-powered QSOs (with a suitable handicap for those more heavily fueled).

Muscle Power

In your club or group someone undoubtedly has a small, mobile VHF rig or converted CB. (Single-sideband QRP rigs are ideal, since power demands come in bursts and average power is quite low.) In our club, there are about 40 Midland 13-509s available thanks to a group buy a couple of years ago. On low power (one Watt output), this 220-MHz

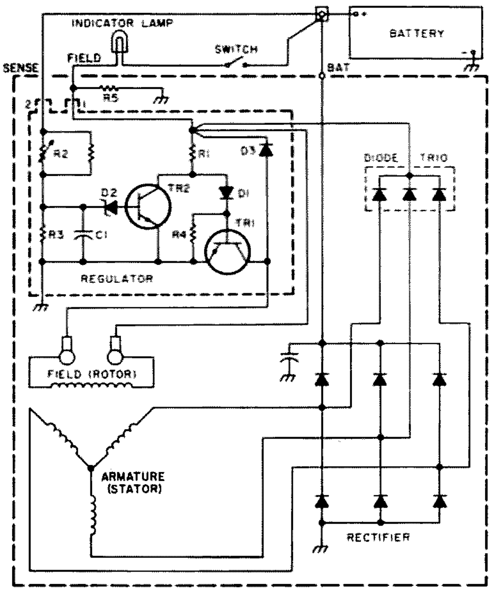


Fig. 1. Alternator schematic diagram.

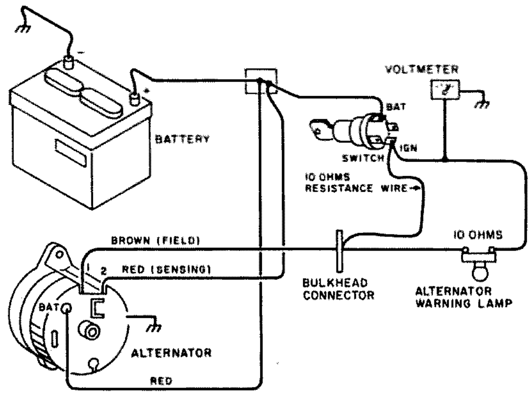


Fig. 2. Typical automobile charging circuit.

rig requires only 1.1 Amps at 13.8 V dc, panel lamps and all. That's 15.2 Watts, or about 0.02 horsepower. On high power (ten Watts), the current zooms to 3.1 Amps, about 0.06 horsepower. Unfortunately, FM means a continuous carrier, but gad, even the flabbiest beer stomach can produce 0.02 horsepower in just one hefty belch! For five QSOs, however, it may take a bit more. Besides, you ought to be listening more than you're transmitting. So how do we turn beer-power into five QSOs? All it takes is a little imagination and some scrounging.

Design

At lunch one day a bunch of club members began to kick around a few ideas, and soon the ingredients for a beer-powered machine began to evolve. An old Delco-Remy alternator was volunteered from one junk box, a little-used exercise bike came from another, and a spare V-belt materialized from the trunk of a car right there in the parking lot. Even a loaner 13-509 was arm-twisted away from its owner in the enthusiasm of the moment.

The pieces began to fall into place. It was decided that it should be rigged so the guy pedaling also had to make the QSOs, all by himself. That way we could run a contest for the greatest number of self-powered contacts. But more about that later. Let's get on with building this contraption.

The Bike

The bike selected should have some means of solidly driving a V-belt. The key word here is "solidly." You'll want to cut all the power losses you can between legs and rig, so no slippage. A multi-speed bike with the rear rim used as a pulley would be ideal, since the gear ratio can be adjusted for the load. The hardest part will be improvising a stand to hold the rear wheel clear of the ground while providing a solid and stationary support for a pedaling rider.

An exercise cycle neatly solves the stationary stand problem, but usually does not provide a gearing adjustment for comfortable pedaling. Nonetheless, since it was free, we opted for the exercycle. The pedaling speed needed to be largely constant to hold the alternator at a constant rpm and could therefore be adjusted by selecting a proper drive-sprocket diameter. A local bike shop proved very happy to help—at no cost—when they understood what we were doing.

If you plan to use an exercise bike, the first step is to disable the friction, weight, or loading mechanism used to increase pedal load. It's going to be hard enough keeping the alternator going. The next step is to decide how best to drive the V-belt. The easiest method is probably to remove the tire and use the rim as a drive pulley. Belt slippage should be no problem even without side contact if the belt is kept reasonably taut. The area of bottom surface contact is large enough to provide sufficient friction.

In our case, however, the semi-pneumatic tire of the exercise bike proved impossible to remove without destroying it. The belt could be driven by grooving the tire, but again that meant destruction. The solution was found in another scrounging trip to the bike shop junk box. A 12" spokeless rim from a kid's bike was unearthed, a rim slightly smaller than the 15" wheel on the exercycle. All that had to be devised was a method of clamping it to the side of the exercise bike wheel. This was done by carefully centering the 12" rim on the 15" wheel and marking points where holes should be drilled for screws, washers, and nuts to be installed as

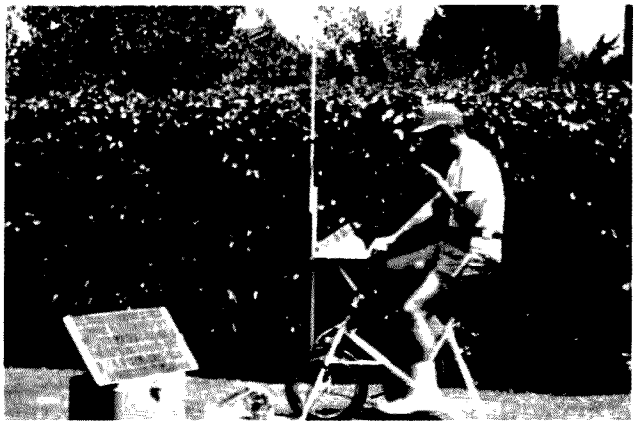


Photo A. The author piling up natural-power QSOs. Note the fuel supply located beneath the solar panel.

clamps to the 15" spokes. Ten such points were marked and drilled and the rim mounted with #8 screws, flat washers, and nuts.

Exact centering of this side-mounted rim is not too important since the speed will be low (about 400 rpm) and some wobble can be tolerated. Be sure, however, that (a) there is clearance for the add-on rim inside the fork, and (b) the V-belt can subsequently be brought forward clear of the tire. Locate the clamping screws alongside the spokes such that the pull on the belt will tend to pull the screws into the spokes, not away from them, or the whole works may slip off the first time the belt is loaded.

Old-timers may recall the popular "Whizzer" bicycle motor of the late 40s and early 50s. The Whizzer motor was mounted on the frame and drove the rear wheel through a V-belt pulley clamped to the spokes. Award yourself a "Scrounge First Class" medal if you can locate one of these old Whizzer pulleys. The enormous V-belt from the Whizzer would be great, too.

The Alternator

Deciphering the innards of an alternator takes just a bit of head-scratching. Our scrounged Delco-Remy was a type with an internal voltage regulator. A schematic diagram and circuit description located in a GM truck maintenance manual proved to be a valuable reference for devising external circuitry for this alternator. The discussion below should apply to whatever type you can scrounge. If you must buy, look for a rebuilt alternator with internal regulator frequently on sale at automobile parts houses in the \$20–\$25 price range.

Our Delco-Remy produced 3-phase ac in the stator that is rectified by six diodes to produce clean, low-ripple, no-whine dc. Regulation is accomplished by sensing the output dc and adjusting the field (rotor) current to hold the output constant over a wide range of speeds and loads. By fixing the high-current stator and spinning the low-current field winding, brushes and slip rings can be kept small, lasting almost indefinitely. Fig. 1 shows the internal alternator schematic, and Fig. 2 its normal hookup in an automobile.

There are three external terminals, a post labeled "BAT," the positive high-current stator output, and two push-on spade lugs labeled "1" and "2", the field and regulator sense inputs, respectively. All US-made alternators are designed for clockwise rotation, looking in at the pulley end of the shaft.

After studying the automobile hookup of Fig. 2, a

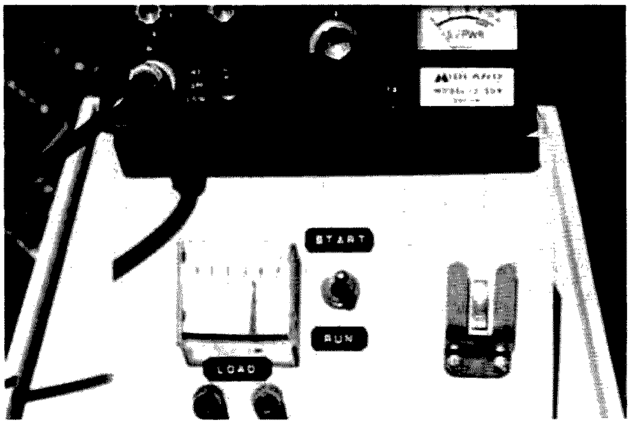


Photo B. The operator's control panel. The transceiver is running directly off the solar panel (see text).

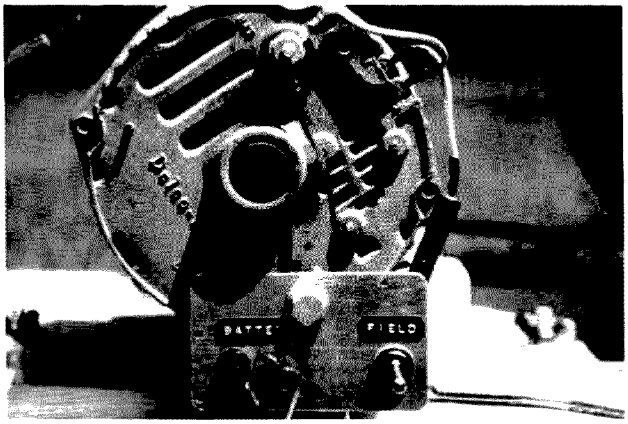


Photo C. The alternator control panel. The field-current source is connected to the BATTERY terminals. The FIELD switch opens the field circuit (see text).

circuit was devised for the bike-powered version as shown in Fig. 3. Start-up field current proved to be the biggest problem, since this is normally supplied from the automobile battery. A close examination of Fig. 1, however, indicates that three internal diodes (labeled "Diode Trio") provided field current when running. These will only work, however, once the alternator stator is producing an output. From a dead stop, no field current is available, so a source of 12 volts must be temporarily connected to terminal 1, then removed after the alternator is up to speed. A switch was therefore included with a START position to initially connect the 12-volt source to the field and a RUN position to open the field line once up to speed. (The extra load on the legs was very noticeable if left in the START position.) To limit field current during start, a 10-Ohm, 10-Watt resistor was included in the place of the automobile alternator warning lamp normally used for the purpose.

The necessity for this external 12-volt source of field current took us back to a careful reading of the Field-Day rules. If we used a battery here, even if only momentarily, would we no longer be natural power? And what if the battery was connected permanently? Happily, the problem disappeared when a small solar panel built of scrap spacecraft solar cells was scrounged from another trip to the junk box. This panel provided more than ample field current, and in fact worked so well that an alternate circuit was improvised to allow running the 13-509 directly off the panel without the alternator. For this mode, another series switch labeled FIELD was added to open the field circuit with the START switch closed, so the alternator field winding would not load down the solar panel. See Fig. 3 and Photo C. (Incidentally, the 15" by 30" solar panel proved adequate to run a 13-509 on high power most of the day, continuing on low power through dusk.)

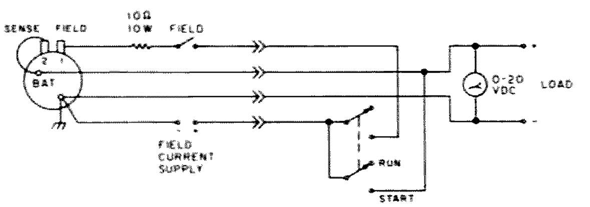


Fig. 3. Schematic/pictorial diagram (the 4-pin connector provides for disassembly).

Mechanical Design

Once the electrical design had been completed, attention turned toward mounting and assembly. A small 10" by 12" tray was fabricated and secured between the handlebars, as shown in Photos A and B. A 7" by 8" stand, angled upward at 40°, was placed on the tray to provide a more convenient viewing angle for the 13-509 front panel and a surface to mount the START-RUN switch, a 0-20-V-dc voltmeter, and the microphone bracket (see Photo B).

The alternator was bolted to a 14" by 20" piece of ¾" plywood which, in turn, was attached with U-bolts to the front foot of the exercise bike (Photo A). By leaving some slack in the U-bolts, the weight of the alternator provided sufficient tension on the V-belt to maintain positive drive, even with some wobble in the bike drive pulley.

Final Adjustments

A final tweaking was required, as mentioned earlier, in pedal speed. The original 7" exercycle pedal sprocket required an uncomfortably high pedal speed for satisfactory operation. Simple proportions between sprocket and pulley diameters can be used to determine the relation between pedal rpm and alternator rpm. (You can also count sprocket teeth and ratio them, if you wish, but diameters are easier.)

Example: Pedal sprocket diameter = 7"; wheel sprocket diameter = 2¾"; wheel pulley diameter = 12"; alternator pulley diameter = 2".

For an alternator speed of 2500 rpm, the wheel pulley speed would be 2500 × (2"/12") = 417 rpm. Since the wheel sprocket and wheel pulley must rotate at the same speed (they are on the same hub), the pedal sprocket speed would be 417 × (2¾"/7") = 164 rpm, about 3 revolutions per second.

Three rps proved to be uncomfortably fast and riders were hard pressed to keep it up very long even with no load. The bike shop once again supplied the answer from its junk box. An enormous 10½" pedal sprocket, installed in place of the original 7" one, brought the pedal speed down to a very comfortable 109 rpm, or less than 2 revolutions per second. This proved so comfortable, in fact, that there was virtually no noticeable increase in load on the legs when the 13-509 was switched on at low power and a barely perceptible leg load on high power. One flabby beer-drinker, microphone in one hand and 807 in the other, completed the required five QSOs before half finishing his 807!

Antenna

The antenna can be almost anything suitable for your Field-Day location. Since we were at a 1500-foot elevation overlooking the Los Angeles basin, a simple home-brew quarter-wave spike with ground plane proved more than adequate to reach all corners of the basin, full quieting. Number 12 solid copper house wire was used for the spike and radials on an upside-down SO-239 connector, as shown in Photo D. A simple angle-bracket and wood pole completed the installation as shown in Photos A and D. For the 220-MHz band, the lengths chosen were about 13" for all elements. At 144 MHz, try 19½", or consult the *Handbook* for something more exotic.

Fuel

Adequate fuel for any Field-Day endeavor must be provided, and Photo A shows the solar panel mounted on an ice chest containing the necessary supply.

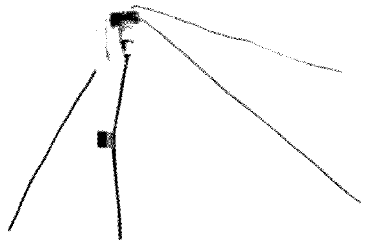
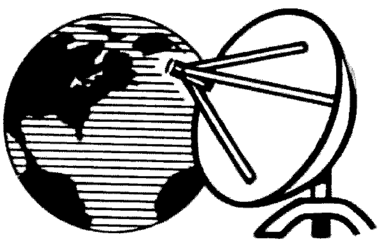


Photo D. The home-brew ground-plane antenna. Radials are #12 house wire.

For a fun competition, set up something such as the greatest number of QSOs per rider before exhaustion. Each 807 consumed might also be counted as a QSO if the flabbier pedalers are to be competing with the athletes. Warning: On VHF, the first few riders will grab off the easiest simplex contacts, so serious competitors should be allowed first crack at these. If you're on ten meters with a converted CB, how about an award for the longest-distance DX, most states per rider, or some such.

As an exercise in computing how much leg power is involved in a horsepower, consider this. The 13-509 on high power transmit consumes 13.8 V × 3.1 Amps = 43 Watts, about 0.06 horsepower. This is about the point where leg pressure becomes noticeable. At 5 Amps (about 0.1 horsepower), it's very noticeable, and at 10 Amps, it's almost impossible to maintain for an average middle-aged ham for even a minute. The pilot (and engine) who pedaled the Gossamer Albatross across the English Channel, Mr. Bryan Allen, developed 0.9 hp for over two hours, an equivalent of 49 Amps! That'll give you something to chat about during your five bike-powered QSOs. (I hope Bryan doesn't show up for our contest. Is he a ham?)

Good luck, and may your club have as much fun as we did with this rig. Who knows, we may score a first with a two-way 807-fueled bike-to-bike contact! Or with good 10-meter openings, perhaps bike-powered WAC or WAS! ■



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No-Crash Autopatch

Dialing and driving don't mix. Build this autodialer and let its fingers do the walking—not yours.

Have you ever wanted to make an autopatch call through your local repeater and were afraid to take your hands off the wheel or your eyes from the road and didn't want to stop? Well, I have. And after one particularly foolish and scary experience, I decided to do something about it.

In analyzing my needs, I realized that the only number that I would call via autopatch would be my home phone number. This greatly simplified my thinking. The circuit had to be automatic, easily activated, and small enough to fit inside my rig. My usual mobile station is a Heath 2036A with touchtone™ capabilities that works fine. I have used it several times to call home very successfully. But with my family of drivers, sometimes my mobile station is visiting the hairdresser or the shopping mall and I am left with the cantankerous clunker. I know I should remove the rig whenever I leave the car, but that grows tiresome. When I must use the clunker, I take along my "kitchen rig," a single-channel, homebrewed, plain-vanilla, no-frills thing. In these days of fully-synthesized, scanning, computerized transceivers, my kitchen rig is nothing to brag about. But it was my first experience on FM, and it was built to see if two-meter FM was my bag before investing lots of bucks in a better rig. I probably will always have it so I decided to add the automatically-dialed autopatch feature inside.

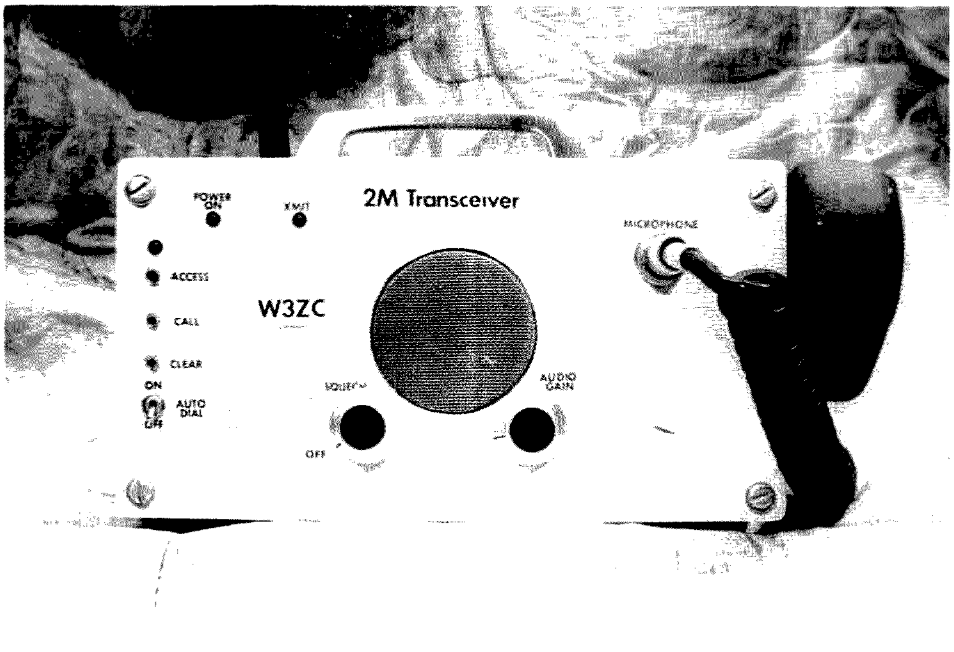

Photo A. Front-panel mounting of switches and LED.

The kitchen rig is not what you would call miniature, but there isn't an awful lot of room inside. Ten C-sized nicad batteries take up a lot of space. Therefore, the addition of autopatch had to be small enough to fit into a corner and had to be easily operated. The circuit of Fig. 1 evolved.

Circuit Description

The heart of the circuit is the 8223, U5, a 32 × 8 programmable read only memory, or PROM. This IC, in effect, replaces the touchtone pad used in normal autopatch applications. The memory inside the PROM must be programmed before being used in any circuit. This circuit is no exception. A detailed description of the PROM programming that I used in the dialer will be discussed later in the article.

Basically, the PROM is separated into three memory segments. One is used for access, one for the phone number, and one for clearing. If programmed and addressed properly, the PROM sequentially drives the 14410 encoder chip, U6, to automatically produce the tones for accessing the patch, dialing the number, and clearing the patch. The PROM is addressed by U4, a 74393 dual four-bit binary

counter. The counters are cascaded because five binary bits are required to address all 32 words in the PROM. A sixth bit drives the end-of-message gate and the remaining two bits are unused. U3 is configured as a free running clock and controls the system timing by stepping the counter through the clock gate, U2A. A pot is used to set the timing.

U1A and U1B are connected as a set-reset flip-flop. This flop is used as the start/stop element by opening or closing the clock gate, U2A. Power-on reset is achieved via the RC network connected to pin 5 of U1B. The flip-flop is set by the ACCESS push-button which starts the operation and is reset by the CLEAR push-button or by the end-of-message gate, U2B. U2B becomes active at count 32 of the counter. I have found that this memory size is more than adequate for the dialer. If you decide to shorten the dialing cycle to less than 32 words, you can use the two inputs tied to Vcc on U2B to perform the logic. The reset, or abort circuitry, consists of gates U1D, U2C, the three germanium diodes, and the CLEAR push-button. Germanium diodes are used because of their low forward voltage drop.

A three-terminal regulator provides the five volts required for IC operation from the 12-volt line in the transceiver. Liberal use of bypass capacitors on the five-volt line is an absolute must. Digital logic and rf are like oil and water—they don't mix too well.

Because my rig is battery powered, I have included a separate switch to remove power when it is not in use. Also, Q1 is used in the Vcc line of the PROM to save about 20 mA of battery current when the circuit is in standby. External connections are made to the transceiver 12-volt line, ground, and the microphone input line. An output pot adjusts the signal level to the transceiver mike amplifier stage.

The PROM

A PROM has the ability to internally store information in the form of ones and zeros as defined by the user. The 8223, U5, is organized as 32 words by eight bits per word. This simply means that there are 32 combinations of the eight outputs. A PROM differs from a random access memory, or RAM, in that a user can write differing combinations of ones and zeros into a RAM and can change them at will. Of course, this means that you will need additional circuitry to perform the write cycle. If the desired program is fixed and will not change, then a PROM is a better choice. You will not need the additional circuitry, but you had better make sure your program is right the first time or you have lost a PROM. You can change PROMs but you can't change what's inside. You must decide at the onset what program will be "fused," or "burned."

A problem that the builder may encounter is how to go about getting his PROM

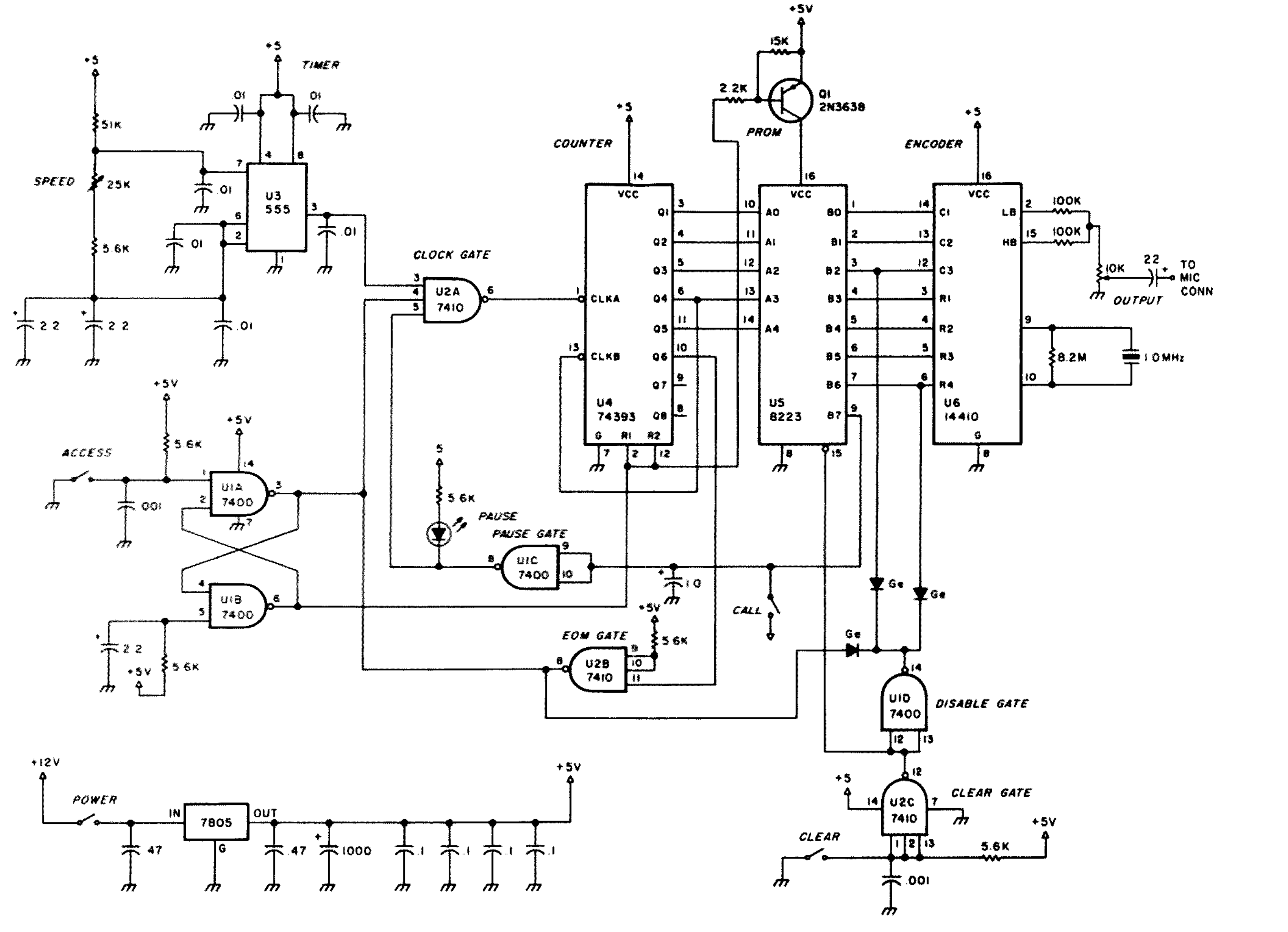

Fig. 1. Schematic of automatic dialer. All resistors ¼ W. All capacitors in µF. All pots screwdriver adjustable.

burned. Since I am employed in electronics, I never had this problem. There was always a PROM burner available. But all too often a writer makes the wrong assumption that everything is available to everyone. However, all is not lost. There are many hams who work in electronics and perhaps one of these fellows could help you out. Ask around. It doesn't take very long to burn a PROM with modern industrial equipment, so your obligation won't be that far-reaching. If all else fails, then you can always take the rough road and breadboard yourself a programmer. I refer you to the article by WB2CZL entitled "An 82S23 PROM Programmer" (*73 Magazine*, June, 1977).

Once a programming source has been located, you must decide what to program. The PROM output lines feed a standard encoder chip, U6. The 14410 requires only seven inputs, so that leaves one PROM line

Desired Tone	PROM Outputs Required to be Low
1	B0 and B3
2	B1 and B3
3	B2 and B3
4	B0 and B4
5	B1 and B4
6	B2 and B4
7	B0 and B5
8	B1 and B5
9	B2 and B5
*	B0 and B6
0	B1 and B6
#	B2 and B6

Fig. 2. PROM programming necessary to produce the desired tones. Create a chart as I did in Fig. 3. Word 00 must be as I have defined it. Select the tones you want and refer to the above figure to determine where the zeros must go. Everything else is ones except for B7. Insert a one at B7 where you want a pause. Start at word 01 and fill in the ones and zeros. The tones will be sent in the sequence that you have defined them on the chart.

free. This line is used as a control bit to perform the pause function between access and call, and call and disable. Refer to Fig. 2 for the programming required to produce the desired tones. I recommend that you write out the entire program map as I have done in Fig. 3. PROMs of this type come supplied with zeros in every location and you need only be concerned about which bits of which word should be burned to ones. However, seeing the entire bit pattern will make it easier to ensure that your bit pattern is burned correctly the first time.

Notice in Fig. 3 that B7 is at a high twice in the sequence. This causes two pauses in the dialing program. Thus, the program is divided into three segments. The first segment is used to access the patch. Our local repeater requires three tones for access and, in my program, six words of memory. Word 00 causes no tones to be produced and is used as the rest state. Inactive states are also placed between the desired tones to separate similar consecutive dial tones. If your access code on your repeater requires two tones instead of three, program words 01 and 02 for the first tone and 04 and 05 for the second. Circuit capacitance and speed are such that each tone spread over two words will sound as one continuous tone at the output. Should a single tone access be required, program words 01 through 05 for that tone. On the air it will come through uninterrupted. Word 06 contains a high on B7. This stops the sequence and causes the LED to light. A lighted LED indicates that the access tones have been sent.

The second segment of the program contains the information necessary to produce the tones for the telephone number. Notice again the inactive words between the desired tones. Should your phone number require a 1 in front of the seven digits, you will need a larger second segment. Instead of programming B7 for a one at word 21, leave it at zero. Make B7 a one at word 23 and you will have enough room to incorporate the eight digits. A pause should always be followed by an inactive state to allow things to settle before the program continues.

The third segment of the program is used to disable the patch. In my case it required a single tone. As many as three tones can be inserted in the disabling segment. Do not plan to use any words beyond word 31 because you will be out of memory and the sequence will loop back to the beginning until a high at B7 is encountered. As stated earlier, you can use the entire 32 words of memory.

A comment about word numbering: Word 00 counts as a word in memory-logic descriptions. Therefore, word 31 is in reality the 32nd word in the sequence. The same is true of bit numbering. Bit 0, or B0, is the first bit in the output scheme. B7 therefore is the eighth bit. Don't blame me. It's what is known as convention.

The circuit consisting of U1D, U2C, the CLEAR pushbutton, and the three germanium diodes is designed for a single-tone disable. If your repeater requires more than one tone to disable the patch, this circuit is of no

PROM Address	PROM Output Lines B0	B1	B2	B3	B4	B5	B6	B7	Tone Sent
Word 00	1	1	1	1	1	1	1	0	-
Word 01	0	1	1	1	1	1	0	0	*
Word 02	1	1	1	1	1	1	1	0	-
Word 03	1	0	1	1	0	1	1	0	5
Word 04	1	1	1	1	1	1	1	0	-
Word 05	1	1	0	1	0	1	1	0	6
Word 06	1	1	1	1	1	1	1	1	Pause
Word 07	1	1	1	1	1	1	1	0	-
Word 08	1	0	1	1	1	0	1	0	8
Word 09	1	1	1	1	1	1	1	0	-
Word 10	1	0	1	0	1	1	1	0	2
Word 11	1	1	1	1	1	1	1	0	-
Word 12	1	0	1	0	1	1	1	0	2
Word 13	1	1	1	1	1	1	1	0	-
Word 14	1	0	1	1	1	0	1	0	8
Word 15	1	1	1	1	1	1	1	0	-
Word 16	1	0	1	1	1	0	1	0	8
Word 17	1	1	1	1	1	1	1	0	-
Word 18	0	1	1	1	0	1	1	0	4
Word 19	1	1	1	1	1	1	1	0	-
Word 20	1	0	1	1	1	0	1	0	8
Word 21	1	1	1	1	1	1	1	1	Pause
Word 22	1	1	1	1	1	1	1	0	-
Word 23	1	1	0	1	1	1	0	0	#
Word 24	1	1	0	1	1	1	0	0	#
Word 25	1	1	0	1	1	1	0	0	#
Word 26	1	1	0	1	1	1	0	0	#
Word 27	1	1	0	1	1	1	0	0	#
Word 28	1	1	0	1	1	1	0	0	#
Word 29	1	1	0	1	1	1	0	0	#
Word 30	1	1	0	1	1	1	0	0	#
Word 31	1	1	0	1	1	1	0	0	#

*Fig. 3. PROM programming used at W3ZC to access patch, dial number, and disable the patch. Access code is * 5 6, my home phone number is 8 2 2 8 8 4 8, and a # series is used to disable. A high at B7 produces a pause at the end of the access tones and at the end of the phone number. The CALL or CLEAR push-buttons override the pause.*

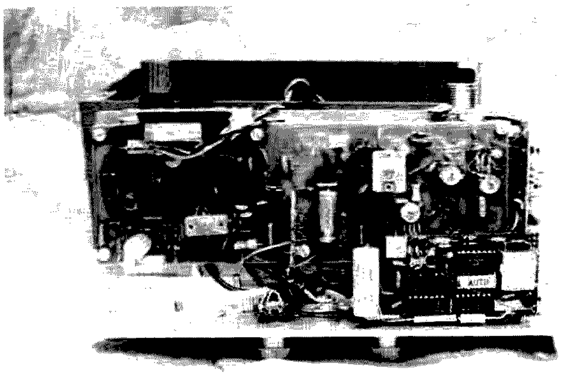

Photo B. The position of the automatic-dialer board inside the transceiver. The board is at the lower right.

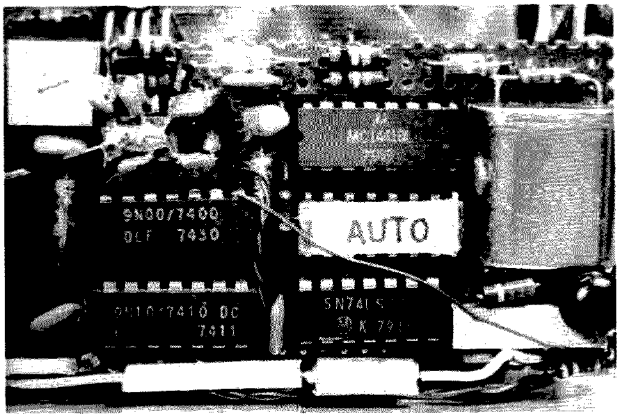

Photo C. ICs are mounted in sockets and pots are PC type. The crystal is at the right and Q1 is mounted between the crystal and the output pot. The speed pot is at the upper left. The 555 assembly is next to the speed pot and is described in the text. The PROM is under the AUTO stick-on label.

use to you. Eliminate it and ground pin 15 of U5 directly. The program must then be used to perform the disabling function. This CLEAR circuitry was incorporated to abort everything should a malfunction occur anywhere in the entire sequence.

Construction

The six ICs and associated components are mounted on a 1½″×2½″ piece of perforated circuit board. Point-to-point wiring is used throughout. Shielded cable should be used at the output. Keep in mind that there may be a lot of rf floating around inside the cabinet, a situation that I encountered during checkout. I instinctively tried a shield over the top of the board. It didn't cure the problem, but it looked like a good idea to retain it. You might want to try yours without it at first.

Notice in the photo the unusual arrangement around the 555 timer. Rf made this chip go wild. The solution was to strip some copper foil from a piece of printed circuit board material, cut it to the size of the 555, place it on top of the chip, and wire it to pin 1 of the chip itself. Bypass every pin on the 555 with a .01-uF capacitor. Don't leave your iron on the IC pins too long. You don't want to ruin the chip. I used sockets for my ICs and if you do, you'll have to wait until you are ready to insert the ICs before shielding the 555. Don't try it on the bench. Solder may run down the leads and you'll never get the chip into the socket. Your installation may not require these extremes, but if your timer is also affected by rf, the solution presented here should work.

An appropriate spot must be found to mount the 7805 three-terminal five-volt regulator. A single hole is required somewhere on the chassis. I used heat-sink compound on the regulator but, in retrospect, it's probably not required. The circuit draws a little over 60 mA and the 7805 should take it without the compound. Just make sure that the mounting surface is flat.

I mounted the three form A push-buttons, the LED, and the toggle switch on the front panel. Bypass the switch contacts right at the switch.

The whole circuit could be built into an external box if you don't mind carrying around another piece. Interconnections would be Vcc, ground, and a shielded audio cable. This arrangement also might alleviate the rf pickup problems.

Operation

The operation of the automatic dialer is described in the following steps:

1. Turn on the toggle switch to power the unit.
2. Depress the mike button and announce your intentions.
3. Still holding the mike button down, push the ACCESS push-button. This produces the tones required to raise the patch.
4. When the LED comes on, release the mike button to determine if you were successful in accessing the patch. If you were, you should hear the dial tone. If you don't hear a dial tone, push the mike button and abort the procedure by depressing the CLEAR push-button and try again.
5. When you hear the dial tone, push the mike button and depress the CALL push-button. When the number has been automatically dialed, the LED will come on again. Release the mike push-button.
6. If you hear nothing but empty air, or if Ma Bell blisters you with one of the taped messages, abort and give it another try. If the ringing is heard, then abide by the customs and procedures appropriate with your repeater. On mine, you announce your callsign and the telephone exchange.
7. When the phone is answered, indicate that the conversation is going out on the air. Complete the call.
8. To knock the patch down, depress the mike button and the CALL or the CLEAR push-button.
9. Turn the toggle switch off.

The CLEAR push-button can be used at any time in the procedure to cancel the whole cycle.

Adjustment

Adjustment of the circuit is easiest if an oscilloscope is available. Double check your wiring before turning on the power. Remember that ICs are totally unforgiving if you have made a mistake.

Turn on the power-on toggle switch and depress the CLEAR push-button. Check pin 3 of U3 for oscillation. Do not turn on the transmitter at this time. You should see pulses of several hundred milliseconds in duration. You should be able to see a speed change when varying the speed pot. Usually in the whole autopatch cycle, the limiting factor as far as speed is concerned is the response time required by the repeater to access. The telephone lines will accept tone durations as short as 70 milliseconds. Rarely will you find a repeater that will respond to

autopatch access commands in a period that short. You'd best start out at a period no faster than 300 milliseconds.

Move your scope probe to pin 6 of U2 and depress the ACCESS push-button. You should see the clock pulses as they pass through the clock gate. Keep your probe on pin 6, U2. At the end of the access count, the pulses should stop and the LED should come on. Reset the circuit and trace the pulses (after restarting) through the counter and the PROM. Check the top of the output pot with the scope. When the circuit is running, you should see two superimposed sine waves representing the required tones for a dialed digit.

If you don't have a scope, you can use your 20,000-Ohms-per-volt voltmeter. Read the voltage at the output of the 555. The reading should be greater than zero and less than five volts. Move the positive lead of your voltmeter to pin 6 of U2 and press the ACCESS push-button. You should read essentially the same voltage as you did at the clock output until the LED comes on. At that time the reading should be zero. Put your voltmeter on ac and move it to the top of the output pot. Push the CALL push-button and you should notice a reading on your meter. This is a high impedance point so the reading will most likely be small. If you don't get a reading, move your voltmeter to pin 2 of U6 and try again. This point is lower impedance. If you still don't get a reading, you will have to trace the pulses through the counter and PROM. Pin 3 of U4 will change states with every pulse, so you should notice something there. As far as the PROM is concerned, pick the output from your PROM map that changes most frequently and look at that particular pin. Checkout of the gates should be straightforward. A high should be read at the output of U1C when tones are being produced, and a low when the sequence is completed. At the output of U2B you should see a high after you depress the ACCESS push-button. It should go low at the end of the entire cycle or when the CLEAR push-button is pressed. By this time, you should be fairly confident that the circuit operates, and you are ready for an on-the-air test.

Enlist the aid of another ham and, if you can, go to a simplex frequency or to a repeater without a patch. Run through your sequence and adjust the output pot as required to produce clear tones. Make sure your companion is as objective as possible. Once the output is adjusted properly, you can give it the acid test on the repeater. If you can't go to a simplex frequency, you'll have to do your testing on the autopatch repeater. Pick a time when it is not busy and give it a try. You may have to adjust the timing to be compatible with the repeater access response. The repeater control op should be able to help you if the tone timing needs lengthening.

Conclusion

If you follow the circuit diagram carefully and play by the rules, your automatic dialer will be a useful addition to your amateur gear. I am also sure that there is room for improvement. Ask yourself what you really want out of the unit and sit down with an IC spec book, pencil, and paper. You will find that your understanding of digital circuitry will improve, and the mistakes and successes of your changes will help you to debug other circuits that you may encounter in the future. ■

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Turn Mobile-Rig Whine into a Whimper

From brute-force filtering to solid-state regulation, K4AJQ has the answers to mobile noise.

If you've spent some time monitoring your local repeater, you should have noticed that some of the signals being relayed could stand some cleaning up. Many of these signals have hum or noise mixed with the audio. Often these are due to a malfunction in the transmitter or transceiver. Many times, however, the source can be traced to the power supply for the rig. Audio hum is fairly common for base stations. It often is caused by a lack of sufficient filter capacitance in the ac power supply or a defective regulator. The noise is usually not a hum in mobile rigs, but it has almost identical causes.

The noise present on mobile signals usually sounds like a whine and can easily be traced to the car's alternator. I have found that alternator whine is a commonly-encountered problem, and it is sometimes very difficult to suppress. Over the years, I have discovered several methods of dealing with this problem. One of them should work for you.

The Problem

The automobile alternator generates alternating current. Because the alternator is driven by the car's engine, the frequency of this alternating current depends upon engine speed. The pitch of alternator whine depends upon the frequency of the ac current. It is this ac that causes problems in most mobile rigs because they are designed to operate from pure direct current.

Before the alternator output can be used to power car systems, it first is converted to dc. This conversion, called rectification, is done by silicon diodes which usually are mounted right in the case of the alternator. The dc then is used to charge the car battery and to power the automotive systems.

Unfortunately, the output of the rectifiers is not pure dc. Because it is composed of rectified sine waves, it still possesses a characteristic frequency which can be related to engine speed. It is this frequency component which must be removed from the power line to the rig to prevent it from being transmitted along with the desired audio signal. The two methods I have used to do this are filtering and regulation.

Filtering

A brute-force method of removing alternator whine is low-pass filtering of the power line. This can be done by using an inductor or an inductor-capacitor combination.

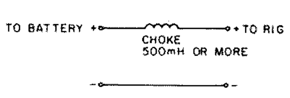

Fig. 1. Inductor used to suppress alternator whine.

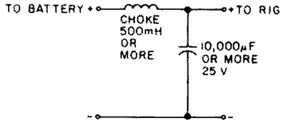

Fig. 2. Inductor-capacitor alternator-whine filter.

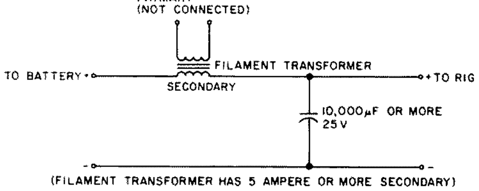

Fig. 3. Alternator-whine filter using filament transformer for inductor.

Fig. 1 shows the simplest whine-filtering circuit. You should use the largest value of inductance available. However, the resistance of the inductor must be low enough so that the voltage drop across it is not excessive. To find the maximum allowable voltage drop, you can connect your rig to a variable-voltage power supply and lower the voltage while transmitting until the power output into a

dummy load starts to fall off noticeably. Next, measure the car's battery voltage with the engine off. From these two measurements, you can calculate the maximum permissible inductor resistance.

With my rig, the power output started to fall off when the voltage was reduced to 12.2 volts. At this voltage, the current drawn was 5.4 Amperes. The car's battery voltage with the engine off was 13.6 volts. Therefore, the maximum permissible inductor resistance was $R=(13.6-12.2)/5.4$, which is 0.26 Ohms.

In Fig. 2, the filter contains both inductance and capacitance. I have found this circuit superior to the one in Fig. 1 and have used it many times. The added filtering provided by the large value of capacitance allows a smaller value of inductance to be used than would be necessary if only an inductor were used to provide the necessary filtering. When this circuit is used and the same inductor is used that was used in the circuit of Fig. 1, the filtering will be better than is possible with the inductor alone.

I have found that filter chokes (inductors) capable of carrying 3 Amperes or more are hard to find in the average ham's junk box. Over the years I've found them only in military surplus gear. A very good substitute is a filament transformer with a secondary winding capable of 5 Amperes or more. I have used 5-volt, 6.3-volt, and 12.6-volt filament transformers. These are plentiful in the junk boxes of us old-timers, who were around before the solid-state invasion. They are available also from many of the surplus dealers who advertise in *73*. Fig. 3 shows a whine filter using a filament transformer.

Regulation

Transistors are here to stay. I finally convinced myself of that and set out to see how those little devils worked. All of the inductor-capacitor whine filters I have built are big and heavy. This was no problem when gasoline was cheap and cars were large, but when I recently purchased an imported subcompact, I found my alternator filter wouldn't fit. In fact, it was almost as big as my engine. *I immediately set out to solve the alternator-whine problem another way—using electronic regulation instead of brute force.*

The circuit shown in Fig. 4 was developed experimentally. It completely removes alternator whine from the transmitted signal. I have tested this regulator circuit in three cars and found the performance the same in each. I have constructed the circuit using point-to-point wiring and using a PC board with the components mounted on the foil side. I used foil on the board for heat-sinking of the two MJE3055 power transistors in the printed circuit version. This has proven more than adequate for use with my mobile rig, which draws 1.5 Amperes on receive and 5.4 Amperes on transmit.

The components used in the regulator are not critical. Almost any NPN power transistors with adequate current-handling capability can be used instead of the MJE3055s.

Transistor Q2 and diodes D1 and D2 form what is known as an amplified zener diode. Essentially, it is a zener diode with the zener voltage the same as that of D1 and a power rating the same as that of Q2. I claim no originality for this circuit. It is old, and I no longer even remember where I first saw it. Fig. 5 further explains the amplified zener concept.

Conclusion

In this article, I have shared with you some ideas for ridding your signal of alternator whine. Some rigs are much more susceptible to whine than others. If your rig is one of those that could stand some cleaning up, get out the old soldering iron and have at it. Either the filtering method or the regulation method may be used. Both give excellent results. ■

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01-5032	3.2	6.0	4.0	8.99
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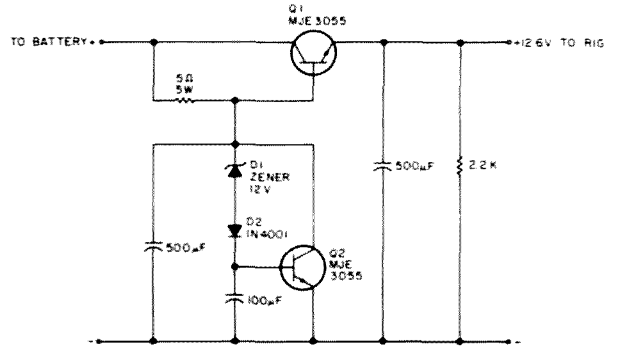

Fig. 4. Electronic regulator to remove alternator whine.

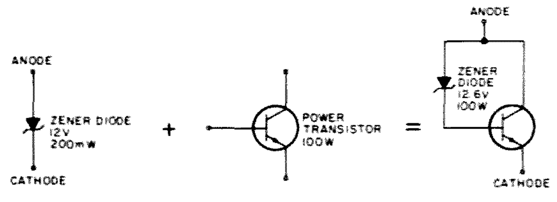

Fig. 5. The amplified zener diode.

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Exploit the Hidden Interfaces of the TRS-80

Sound synthesis, a programmable timed on-off switch, and a CW keyer are all hidden in the TRS-80. You just have to look in the right place.

One day a friend was comparing his Apple II with my TRS-80, pointing out all its special features. Color graphics . . . that's nice. What do you mean, the TV is extra? High resolution graphics needs 16K just to hold the display! I guess I can live without color graphics. Built-in speaker . . . WOW! Now that's something I could use. As limited as the TRS-80 graphics are, sound would sure be a plus to some of the games. It would also come in handy to signal editing errors in programs. And how about a metronome accurate to 1/400 of a second? Too bad there isn't a cheap, easy-to-hook-up interface available. Ah-ha, but there is. And it won't cost you a cent; it's already built in. Didn't know that, did you? How do you think you CSAVE and PRINT#-1 data to the cassette recorder?

The only accessory you will need is an audio amplifier and speaker. What? You don't have an amp! I'll bet you do. What about that pocket radio you junked because the only way you could pick up a station was to stand under the transmitter's antenna. Well, the amplifier's still good. All you have to do is open it up and tap into the volume control. Assuming that most volume controls are generally wired the same, refer to Fig. 1 for hookup details. Note the 3 lugs on the volume control. Ignore the center lug. Remove the plug from the AUX jack on the cassette. Connect a wire from one outside lug of the volume control to the tip (inner conductor) of the plug. Connect another wire from the other outside lug to the ground on the plug. You might have to switch leads to get the loudest output.

If you find you may be using this newfound accessory quite often, you may want to rewire the earphone jack on the radio (no one uses it anyway). Then all you have to do is remove the plug from the AUX jack and insert it into the earphone jack on the radio.

If you really want to get fancy, there is plenty of room inside the video monitor for a home-brew amplifier and speaker.

Now to the meat—how to create the sound!

As you know, sound is made up of sine waves. But the closest thing to a sine wave that a computer can generate is a square wave. OK, so how do I make a square wave? The instruction we use is the OUT instruction to port number 255, using bits 0 and 1. Turning bit 0 on (OUT 255,1) creates the positive half of the cycle. Turning bit 1 on and resetting bit 0 (OUT 255,2) creates the negative half of the cycle (see Fig. 2). Generating 1 cycle won't give you much of a beep. That's where the FOR . . . NEXT loop comes in handy. Try the following:

```
1 DEFINT I-N
10 FOR I = 1 to 200
20 OUT 255,1
30 OUT 255,2
40 NEXT
```

Now we're getting somewhere. Changing the length of the loop will change the length of the beep. BASIC, being much slower than Assembler, will limit the range of tones you can generate. This example is the highest note you will be able to obtain using BASIC.

Any type of delay you might have between the positive and negative cycles will result in a lower frequency.

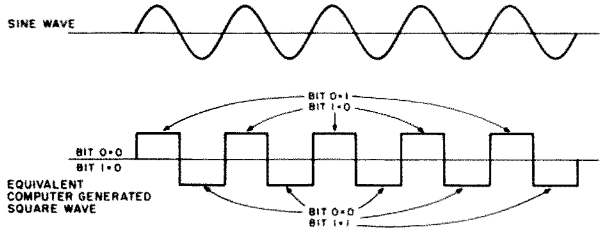

Fig. 2.

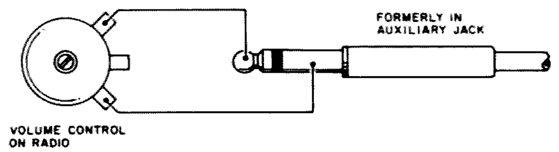

Fig. 1.

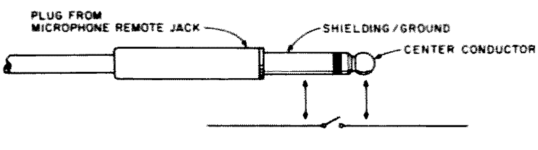

Fig. 3.

Insert the following statements in your program:

25 FOR J=1 TO 5: NEXT
35 FOR J=1 TO 5: NEXT

Experiment with a few examples of your own.

How about a pulsating tone:

```
 1 DEFINT I-N
10 FOR I = 1 TO 30
20 FOR J = 1 TO 10
30 OUT 255,1: OUT 255,2
40 NEXT
50 FOR J=1 TO 10: NEXT
60 NEXT
```

The major loop (lines 10-60) will generate 30 beeps. Lines 20-40 will create each individual beep. Line 50 will create the space between beeps. Line 1 will reserve names starting with I through N for integers. This is a good practice, for it costs only about 10 bytes which you quickly make up by leaving out the "%" to define an integer. Also, your loops will run faster using integer variables. Besides, have you ever tried to keep track of all those %!#$%!#$ variables?

Thought of any other uses for sound yet? If you think you have a good idea, let us in on it.

Now I'll show you another little-known interface which is standard on the Level II.

What use could you find for a programmable on/off switch? Well, just about any type of computerized timer imaginable.

Inside the keyboard there is a small relay used for turning the cassette recorder on and off. Next time you CSAVE or CLOAD, listen for the relay. Remember that this is a small relay designed only to control the cassette. Radio Shack warns of trying to control your air conditioner with it, but if you must, let this relay control another buffer relay which, in turn, could handle the higher power.

How do I make connection between the computer (controller) and the device I wish to turn on and off (controllee)? First disconnect the plug from the remote jack on the cassette. Referring to Fig. 3, identify the two parts of the plug. Consider these two parts as you would the two terminals of an SPST switch. You can use alligator jumper leads for now, but if you're going to be using this feature often, you might want to wire up a jack to the controllee. Then all you would have to do after you CLOAD the program is remove the plug from the remote jack and reinsert it in your newly installed jack.

OK, I got it hooked up. Now what? The instruction we use, to finally make this all work, is the OUT instruction to port 255. What's that, you say? That's the same port we used to make sound? True, but we used bits 0 and 1 to make sound. To control the relay, we use bit 2. To turn on the relay, bit 2 must be set to 1 (OUT 255,4). The relay will remain on until bit 2 is reset to 0 (OUT 255,0) and will remain off until set again.

With the right FOR... NEXT loop(s), you could program a timer to turn *on* or off any device for any amount of time from 1/400 of a second to weeks or months. I won't get into any timer statements here. There are plenty around that you can adapt.

I'm going to let you simmer in this sauce of new knowledge for a while and let you come up with some ideas of your own.

I guess you're wondering what this is all leading up to. What possible use could the ham have for these features?

Well, how about something practical that every ham can use. Have you thought of it yet? Time's up. It's a variable speed, 10-message-memory CW keyer. Told you you'd like it.

Let's go through the program and see just what it will do for you. First of all, we have to come up with some system of encoding our message. We'll use a 59 by 6 array to hold our code table. 59 was chosen to hold all ASCII codes from 32 through 90 (space, special characters, numbers, and the alphabet). 6 was chosen to hold the elements of the larger characters like "." and $\overline{SK}$. A 1 indicates a dot while a 3 indicates a dash. A 2 is used only once for the space code. "0" is used only as a filler or position occupier. Example: "A" will be coded as 1,3,0,0,0,0. Data statements 100-103 define our codes. As you have probably figured out, there are no CW codes for a "#" or a "$". You can still put this space to good use. For example, this program used the "#" as an error, "$" as $\overline{KA}$, "%" as $\overline{BT}$, "&" as $\overline{SN}$, "(" as $\overline{AR}$, and ")" as $\overline{SK}$. Also notice that the comma (3,3,1,1,3,3) is coded twice. The real comma (ASCII 44) will never be used because any comma used in an input string would assume you are asking for two different input variables. To get around this, the semicolon (ASCII 59) is also coded as a comma. You could actually put it in any unused position. A similar problem occurs when using the colon (ASCII 58), so I coded it in the "*" position (shift colon).

At line 500 we set aside enough string space for our message-memory buffers and define our code table.

At line 600 we load up our table from the data statements.

Line 700 gives us the option of using our built-in oscillator (tone) or using our programmable switch (relay). For hookup directions see above. Please keep in mind the small relay. Don't hesitate using a buffer relay.

```
100 DATA 2,0,0,0,0,0, 0,0,0,0,0,0, 0,0,0,0,0,0, 1,1,1,1,1,1,
         3,1,3,1,3,0, 3,1,1,1,3,0, 1,1,1,3,1,0, 1,3,3,3,3,1,
         1,3,1,3,1,0, 1,1,1,3,1,3, 3,3,3,1,1,1, 0,0,0,0,0,0,
         3,3,1,1,3,3, 3,1,1,1,1,3
101 DATA 1,3,1,3,1,3, 3,1,1,3,1,0, 3,3,3,3,3,0, 1,3,3,3,3,0,
         1,1,3,3,3,0, 1,1,1,3,3,0, 1,1,1,1,3,0, 1,1,1,1,1,0,
         3,1,1,1,1,0, 3,3,1,1,1,0, 3,3,3,1,1,0, 3,3,3,3,1,0,
         3,3,3,1,1,1, 3,3,1,1,3,3, 0,0,0,0,0,0, 0,0,0,0,0,0
102 DATA 0,0,0,0,0,0, 1,1,3,3,1,1, 0,0,0,0,0,0, 1,3,0,0,0,0,
         3,1,1,1,0,0, 3,1,3,1,0,0, 3,1,1,0,0,0, 1,0,0,0,0,0,
         1,1,3,1,0,0, 3,3,1,0,0,0, 1,1,1,1,0,0, 1,1,0,0,0,0,
         1,3,3,3,0,0, 3,1,3,0,0,0, 1,3,1,1,0,0
103 DATA 3,3,0,0,0,0, 3,1,0,0,0,0, 3,3,3,0,0,0, 1,3,3,1,0,0,
         3,3,1,3,0,0, 1,3,1,0,0,0, 1,1,1,0,0,0, 3,0,0,0,0,0,
         1,1,3,0,0,0, 1,1,1,3,0,0, 1,3,3,0,0,0, 3,1,1,3,0,0,
         3,1,3,3,0,0, 3,3,1,1,0,0
500 CLS : CLEAR 3000 : DEFINT I-N : DEFSTR S-Z : DIM N(58,5)
600 FOR I=0 TO 58 : FOR J=0 TO 5 : READ N(I,J) : NEXT : NEXT
700 CLS : INPUT "<R>ELAY OR <T>ONE CONTROL";SM :
    IF SM <> "R" AND SM <> "T" GOTO 700
800 CLS : IF SM = "T" THEN IS = 10 ELSE IS = 28
1000 PRINT "ENTER MESSAGE TO TRANSMIT (P,MS#,MR#,CS)" :
     PRINT : INPUT T : IF T <> "P" GOTO 2000
1010 CLS : PRINT "BUFFER #        CONTENTS" : FOR I=0 TO 9 :
     IF S(I) = "" OR S(I) = " " GOTO 1030
1020 PRINT "  "; I; "     "; S(I)
1030 NEXT : PRINT : GOTO 1000
2000 IF LEN(T) <> 3 OR T < "MS0" OR T > "MS9" GOTO 3000
2010 I = VAL(RIGHT$(T,1)) : CLS :
     PRINT "ENTER MESSAGE YOU WISH TO STORE IN BUFFER #"; I; "       "
     PRINT : INPUT S(I) : CLS : GOTO 1000
3000 IF LEN(T) <> 3 OR T < "MR0" OR T > "MR9" GOTO 4000
3010 I = VAL(RIGHT$(T,1)) : CLS
     PRINT "MEMORY RECALL FROM BUFFER #"; I; "     " :
     PRINT : PRINT TAB(4) S(I) : T = S(I) : PRINT : GOTO 1000
4000 IF T <> "CS" GOTO 5000
4010 CLS : PRINT TAB(20) "SPEED IS NOW      "; IS : PRINT :
     INPUT "ENTER NEW SPEED", IS : CLS : GOTO 1000
5000 CLS : PRINT T : FOR J=1 TO LEN(T) : PRINT MID$(T,J,1);
     L = ASC(MID$(T,J,1))-32 : IF L > 58 THEN L = L-32
5100 FOR K=0 TO 5 : IT = N(L,K) :
     ON IT+1 GOTO 5500, 5200, 5400, 5200
5200 IF SM = "R" THEN OUT 255,4 : FOR M=0 TO IS*IT : NEXT :
     OUT 255,0 : FOR M=0 TO IS : NEXT
     ELSE FOR M=0 TO IS*IT : OUT 255,1 : OUT 255,2 : NEXT :
     FOR M=0 TO IS : NEXT
5300 GOTO 5500
5400 FOR M=0 TO IS*5 : NEXT
5500 NEXT : FOR M=0 TO IS*3 : NEXT : NEXT : PRINT : PRINT : GOTO 1000
```

Program listing.

Line 800 sets the initial speed to 15 wpm. The tone-generating loop takes about 3 times longer than the relay loop, which accounts for the different initial speeds.

Line 1000 asks for the message you want to transmit. At this point you can also enter these key words:

"P" will print the contents of all memory buffers not null or blank.

"MS#", where # is any number from 0 to 9, will permit you to store an often used message (example: CQ CQ CQ DE WB9EGA), up to a length of 256 characters, in the buffer number requested.

"MR#", where # is any number from 0 to 9, will recall a message from the buffer number requested. After a recall, all you have to do to transmit the message is hit ENTER.

"CS" allows you to change the speed of transmission. Increasing the number increases the length of the timing loops, which in turn lowers the wpm.

Lines 1010-1030 take care of the print option.

Lines 2000-2010 control the storing of a message into buffers 0-9.

Lines 3000-3010 recall a message from a buffer.

Lines 4000-4010 display the current speed and ask for the new speed. If you decide not to change the speed, just hit ENTER.

Lines 5000-5500 do the outputting of the message. Here we get a little fancy. We clear the screen and print the entire message. On the next line, we print every character as it is transmitted. This lets you know where you're at. At 5000 we also get the ASCII code of each character and subtract 32 to point us to the right entry in the table. We also check to see if you accidentally entered a lowercase letter (ASCII 97-122). If you did, we convert it back to an uppercase letter so it will fit within the bounds of our table.

At 5100 we scan the 6-digit code of the character we are encoding. If the code is a 1 or a 3, we continue at 5200. If it is a 2, we process a space at 5400. If it is a 0, we do nothing but run out the scan counter.

Line 5200 does the timing for dots and dashes. First we check for relay or tone control:

If relay control—We turn on the relay and delay the right amount of time depending if this is a dot or a dash. A dash being 3 times longer than a dot, you can see why I chose 1 for a dot and 3 for a dash. We can use the same timing loop for each just by using this variable. Anyway, after this time, we turn the relay off and perform another timing loop the length of a dot. This gives us the spacing between the dots and dashes within the character.

If tone control—Basically the same idea as the relay logic except instead of turning on and off a switch, we must generate a square-wave signal.

Line 5400 is a timing loop used for the spacing between words.

At line 5500, the FOR . . . NEXT timing loop is used for the spacing between characters.

And that just about wraps up this exploitation of your TRS-80.

I can't think of any reason why any ham with a TRS-80 would not try this program. Think of the time it would save during contests. This program alone could justify, to your other ham friends, why you bought a TRS-80 instead of that 800-channel, programmable, scanning, remote-controllable, portable, glow-in-the-dark 2-meter rig. Well, here it is. Enjoy.■

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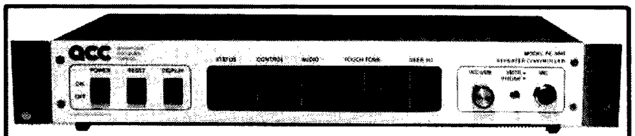

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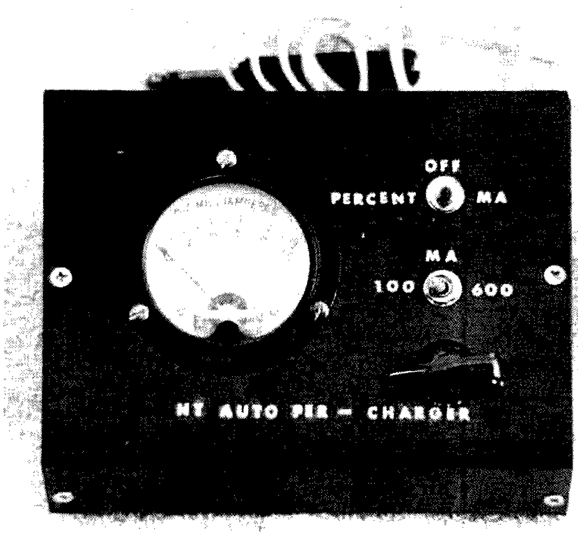
New England's Nicad Per-Charger

Build this and get state-of-charge readout, automatic shutdown, and charge maintenance for your HT. This could be the gift of life for your battery pack.

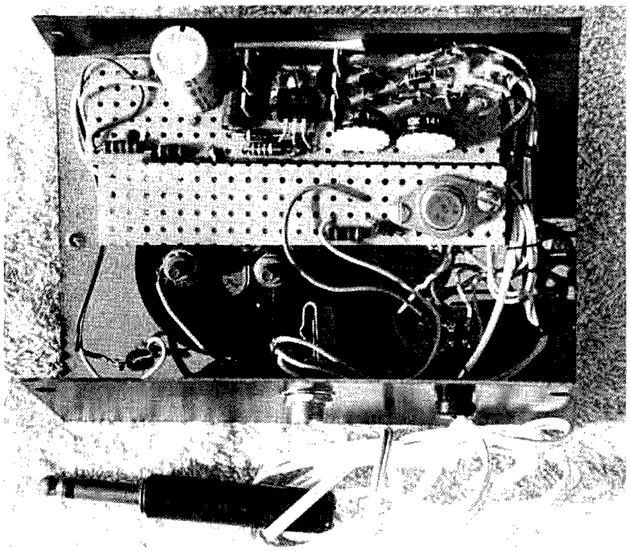
If you use an HT, you will very likely have two battery packs. Proper cycling of charge and discharge is essential for long life for nicad batteries. Carelessness in this regard has recently cost us cells in three nicad packs. One was in a pack for an FT-207; the others were in packs for TR-2400 radios.

Use of the HT auto per-charger will remedy this. It was designed for mobile use, but we have found it invaluable for use in the shack as well. What a pleasure to push a switch and instantly read the state of charge of your battery. It's also great to have automatic shutdown and charge maintenance without time- or record-keeping. The per-charger was designed for the usual 8-cell 9.6-volt pack but is easily modified for another configuration. It incorporates a circuit—Z2-TR1—to protect the HT (which can be used while on charge) from voltage spikes or component failure. It also has a manual override to allow careful charging of the really *dead* battery.

Construction was done on perfboard. The board was insulated from and attached to the chassis with two-sided adhesive tape. A 0-1-mA meter was used and the necessary shunts were made as follows: The 100-mA shunt, with a resistance of about .8 Ohms, was made by winding 57.25 inches (145.4 cm) of #32 AWG enameled copper wire on a 2-Watt 1-meg resistor or other suitable insulating rod about ¼ inch in diameter. The 600-mA shunt, with a resistance of about .13 Ohms, was made by winding 23.4 inches (59.4



HT auto per-charger.


Component layout.

cm) of #28 AWG enameled copper wire on a similar form. The shunts may be checked with a test milliammeter in series with the charger and a battery, in case of slight irregularities in wire size, etc. If the charger meter reads too high, the shunt wire is too long. If the reading is low, the shunt wire should be lengthened slightly.

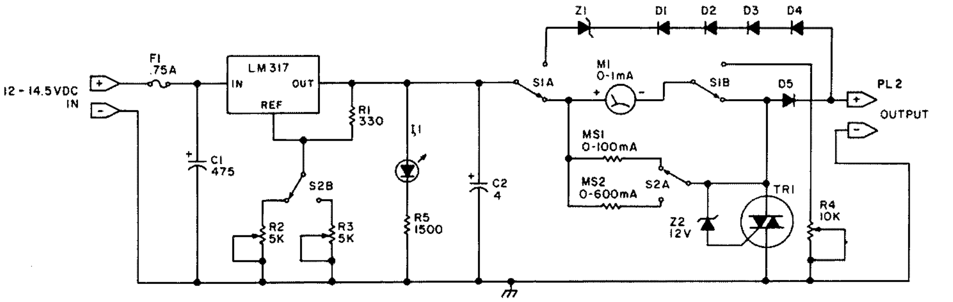


Fig. 1. Circuit schematic.

The percent meter is easily calibrated. With S1 thrown to the percent position and S2 to the high-range (manual) position, attach a voltmeter from PL2 to ground. Temporarily strap J1 to the regulated output at S1a. Adjust R3 for an 11.2-volt reading on the test meter and adjust R4 for a full-scale reading on M1. Then adjust R3 for an 8.4-volt output and check M1 for a zero reading. If necessary, add or subtract diodes in the D1-D5 string to correct this zero reading. Recheck the full-scale reading. Any combination of zener and silicon diodes that will reach 8.2 to 8.4 volts at the M1 meter is acceptable. Throw S1 to the mA position, S2 to the 100-mA position, and set R2 for 11.2 volts at J1.

The TR-2400 has no diode in the battery circuit in the transceiver. If your HT has one, as has the Tempo S1, strap it out and install a diode in the positive cable lead of the wall charger to maintain the input voltage properly. Do not open the wall charger case. Be sure to check your battery specs for the proper charging rate. When starting a charge or when using your auto percharger with a dead battery, always use the high-scale (manual) position of S2 until you are sure that the current has dropped to a safe value, then you may shift to the taper (100-mA) position.

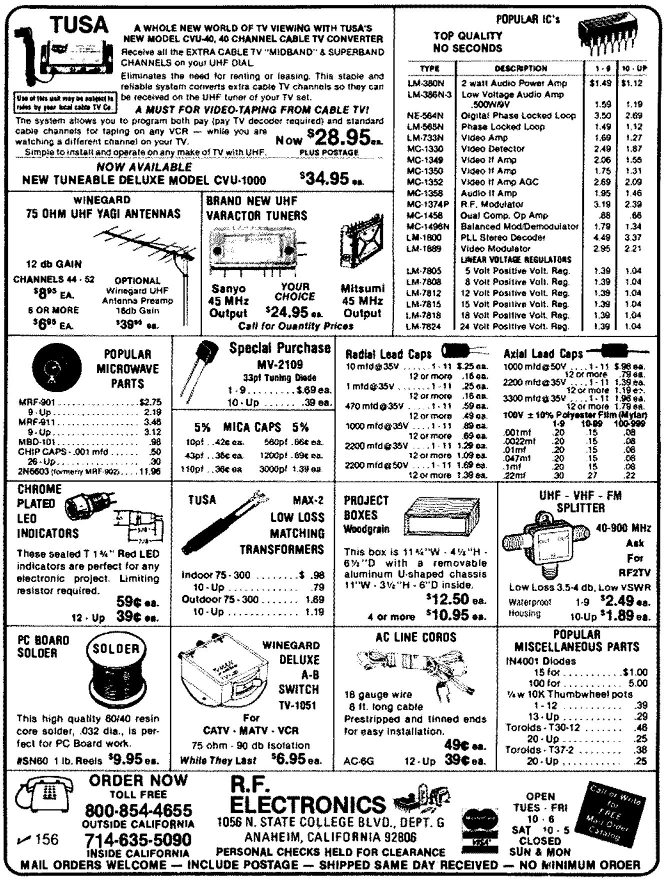
Use the center OFF position of S1 when plugging in or unplugging your HT. The percentage of charge can be checked at any time.

Any 13.8-volt supply can be used, or, if mobile, the cigarette lighter socket is a convenient source of power.

If you have 2 batteries for your rig, extend their life by using one until it is discharged to the zero point on M1, then fully recharge it while using the other. We have found the HT auto percharger to provide the utmost in convenience while using the HT mobile or portable. ■

Parts List

	Radio Shack No.	
LM317	276-1778	$3.99
Z1 6.2-V zener	276-1561	.45
Z2 12-V zener	276-563	.45
Cabinet	270-264	4.95
Heat sink	276-1363	.79
D1-D5 diodes	276-1102	1.50
R2 5k pot	271-217	.59
R3 5k pot	271-1714	1.09
R4 10k pot	271-218	.59
S1 DPDT c off	275-620	2.39
S2 DPDT	275-614	2.19
I1 LED green	276-034	.50
M1 0-1 mA	270-1752	8.95
Tr-1 triac	276-1001	.99
F1 ¾-A fuse	270-1272	.20
Fuse holder	270-364	.89
P1 2 for TR-2400	274-1550	.90
for Tempo S1	274-286	.65
C1 475 uF 35 V	272-1030	.99
C2 4 uF 35 V	272-1024	.49
R1 330 Ohm ½ W	271-017	.10
R5 1500 Ohm ½ W	271-025	.10
R6 1000 Ohm ½ W	271-023	.10
Knob	271-1714	.40
Perfboard	276-1394	1.79
2 2-meg 2-W res.		.38 pr.
Source—Radio Service Lab, Manchester NH		
MS1—6' #32 AWG wire for 100-mA shunt		.11
MS2—2' #28 AWG wire for 600-mA shunt		.09
Source for AWG wire—Commercial Dist., Portland ME (RCA) or any motor or instrument repair shop		
	Total	$35.96



See List of Advertisers on page 114

Al Torres KP4AQI
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Immortalize Your IC-2AT Battery Pack

Why waste your nicads when you're in the car? Build this miniature power supply and your batteries will last forever.

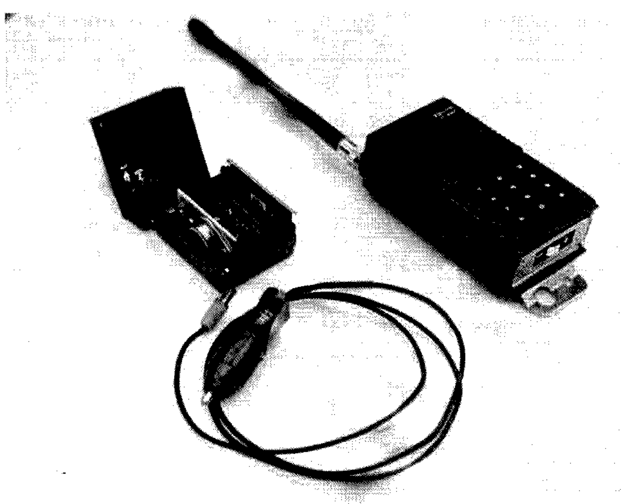
It wasn't long after I received my Icom IC-2AT that I realized the limited battery life of the pack supplied with the unit (BP-3). The pack is rated at 8.4 V @ 250 mAh, which is relatively marginal for the power output of the unit (1.5 W and .15 W). Since most of my transmissions are made while in the car, the idea of saving my batteries for utilization outside the car became extremely attractive. The solution then was either to get an Icom IC-CP1 cigarette lighter recharger for the BP-3 or do something else. The solution of using the lighter charger is simple, though in the long run you pay a penalty; that is, there is no sure way of making the transceiver draw power from the lighter or the battery. It is normally a joint effort since the lighter plug, because of the current-limiting capabilities, can't supply enough power when transmitting. The result is that you reduce the power being drained from the battery pack, but it is not eliminated.

After attending the Hamburg, New York, hamfest, I was able to acquire an IC-BP-4 battery pack for the 2AT. This is nothing more than a case without batteries which is able to accept six AA nicads for a total voltage of 7.5 V at 500 mAh. Icom rates the output of this pack at 1 W or .1 W, which is too little for comfort. So the idea of putting a regulator inside this battery pack and giving the IC-2AT 11.3-V, 1-Amp capability became extremely attractive. By the way, with the above voltage of 11.3 V, the 2AT pumps out a solid 2.8 W or .28 W depending on the power switch on the unit.

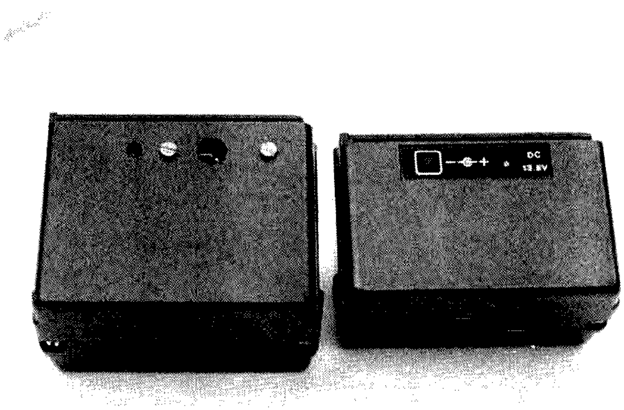
Having my concept reduced to practice was extremely simple. The circuit is shown in Fig. 1. All it is is a simple regulator set at 11.3 volts with a crowbar network just in case the regulator dies (so that it doesn't kill my transceiver). According to the folks at Icom, the unit is capable of sustaining a voltage of 12.5 V; any voltage above that might or might not make your 2AT a piece of history. So why take a chance?

The Circuit

Power is obtained from the lighter plug in my car. The 12 to 15 volts are then



New battery pack and power cord with the IC-2AT.



New pack on left, standard pack on right.

filtered by C1; this is a good practice since ignition noise and generator whine could cause problems later on. The combination of R1 and D4 is just an indicator to tell me when I do have power coming into the unit. Since I drive a car in which all systems are switched off by the ignition, this feature is very convenient. The regulator used is a 5-volt unit that is "lifted" above ground by the zener diode, D1 (a 6.2-V zener), to give us roughly 11.3 volts. The normal sinking current of the regulator is about 4 mA, surely not enough to bias the zener, D1, outside the conduction knee, so another 22 mA of biasing current is provided from the R2 resistor. This gives us a very clean zener voltage of about 6.3 volts. The crowbar circuit is very simple and is made to kick in at 12 volts. When the output voltage reaches 12 volts (it should never do that if your regulator is working properly), it turns on the zener diode, D2, which generates enough voltage across R3 to set the SCR into conduction. This SCR will essentially short the output voltage, thus blowing the 1-A fuse.

Construction

First remove all battery clips from the inside of the BP-4 pack. Cut a piece of aluminum 1-7/8" long by 1" wide. Drill holes to mount the TO-3 regulator. You can then mount this regulator vertically by simply using L-brackets or Super Glue against one side of the plastic battery guide. On the second rail from the bottom, mount the terminal strip (you should cut the two corner lugs from this 5-lug strip). All wiring is done between the lugs and the legs of the regulator. The input capacitor and crowbar circuit are mounted in the first rail with the fuse on the center rail. Do not use a fuse holder; just solder to the fuse ends and route the fuse accordingly. On the lid of the housing and using the belt-clip holes designed to provide power to the BP-3, drill a 1/4" hole and 1/8" hole for the LED indicator. Mount the coax power jack using two screws (if you can find No. 2 screws and nuts, that's ideal; otherwise you must go with No. 4). The lid and the main battery pack are connected with two color-coded wires.

Check-Out

Connect a power supply providing 14 V dc to the input of the unit. The output should read 11.3 V dc. Now increase this voltage to 16 volts and check for the output voltage to be at 11.3. Your unit is now ready for testing on your IC-2AT.

I have used this unit for three months now and it functions beautifully. Since I do operate sometimes from fringe areas, I drive a little amplifier located in the back of my car that takes my 2.8 W and makes them 40 W. Such an arrangement is very desirable, since when leaving the car the radio is put on my belt and the amplifier is in the trunk out of sight. To say the least, there are no worries about something being stolen.■

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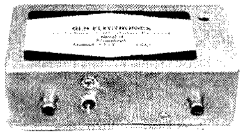

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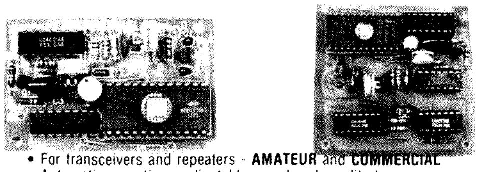
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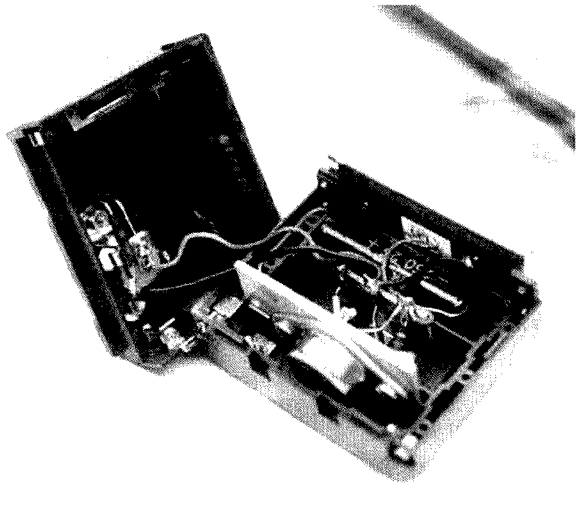

Parts arrangement inside the new BP-4.

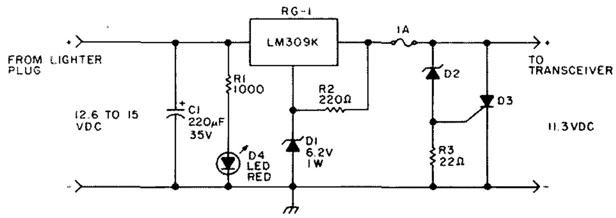

Fig. 1. Battery eliminator for the IC-2AT. D1—6.2-V zener, 1 W, 1N4735 (RS 276-561); D2—12-V zener, 1 W, 1N4742 (RS 276-563); D3—6-A SCR, TO-220 (RS 276-1067) C106; D4—LED red TLR-107 (RS 276-033); R1—1000Ω, 1/4-W resistor; R2—220Ω, 1/4-W resistor; R3—22Ω, 1/4-W resistor; C1—220-µF electrolytic capacitor, axial 35 V dc (RS 272-1017); RG-1—LM309K regulator, 5 V; coax plug (RS 274-1550) and coax jack (RS 274-1549); tie-down terminal strip, 5 lug (RS 274-688); F1—1-Amp fuse (RS 270-1273); lighter plug—RS 274-331; BP-4 Icom battery pack.

✓See List of Advertisers on page 114

Unlock the New Electronic Mailboxes

MSOs are at the forefront of amateur radio's vast communications revolution. WB7QWG shows you how to tune in, log on, and not drop out.

Robert J. Foster WB7QWG/9
10126 Catalina Drive
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As I sit here at my desk with pencil and eraser in hand working on this article, on the other side of the room my computer is happily keeping KB7SF (Gary—Butte, Montana) occupied in a rather active conversation on the teletype® segment of the twenty-meter band.

The computer at the moment is telling KB7SF the tale of how the English mathematician, Charles Babbage (1792-1881), might have ushered in the age of computerization with his invention of the Analytical Engine in 1835, had there not been a lack of government support.

The tantalizing details of Mr. Babbage's pursuits are just one of the information files contained in the trivia section of my Radio Shack Model III computer, acting as a host and responding automatically to user commands.

KB7SF is not the only station that has accessed the computer system this morning. In all, my mailbox contained messages from Connecticut, Florida, and Dee Why, Australia. Not bad operating for someone who has been working on projects other than amateur radio throughout the morning, with a little DX to sweeten the moment!

HAL FORMAT

This is the K9XYZ MSO
.EXIT—TO EXIT (MESSAGE STORAGE OPERATIONS)
.HELP—TO PRINT COMMAND LIST
1500CST / 01-AUG-82 NEXT?

MACROTRONICS FORMAT

(Command Sequence) ZW
NNNN

Fig. 1. Message formats.

The MSO Mystery Revealed

The age of computerization has arrived on the amateur radio bands and has found its way into mailbox, or MSO (Message Storage Option), operations. Hundreds of amateurs are discovering the convenience of sending and retrieving message traffic, computer programs, and personal greetings through the computerized systems which are located on the bands.

The questions most often heard on mailbox frequencies are, "Where are the mailboxes?" and "How do I use them?" This article will end the mystery of the command structures used by the majority of the systems and also provide a listing of mailboxes and their locations. But let's not get the cart before the horse. Before you dive into the command structures of the mailbox systems, you need to have knowledge of the equipment in use.

The Hal MSO

There are two major suppliers of mailbox systems, Hal Communications Corporation of Urbana, Illinois, and Macrotronics Incorporated of Turlock, California.

Hal offers a dedicated system (it will operate only as a teletype terminal and message system). Macrotronics offers hardware and software packages for the Radio Shack Models I and III computers as well as for the Apple II or II Plus micros which allow the computers to operate on RTTY while still allowing the computer to be used for projects other than ham radio.

The stations that are using Hal equipment are easily identified when you are listening on the RTTY band, since it is the only machine that is programmed to respond with the key letters MSO in its output. The Hal system sits passively on a frequency waiting to be activated with an access code. Normally this code is a combination of the letters MSO and the last three characters of a station callsign (e.g., the access code for K4KOZ is MSOKOZ). Once the MSO is activated, it comes alive with a distinctive message.

Note: Access code needed to activate MSO operation. Always begin commands after a carriage return/line feed (CR/LF) at far left-hand margin and preceded by a period.

.HELP Provides summary of MSO3100 commands.
.DIR MSO transmits directory of stored messages including Filename, Date, Time Created, Byte Size of messages, and Security Status.
.SDIR Gives short version of directory with name and Security Status of each stored message.
.READ Must be used in conjunction with the filename of the message you wish to read, i.e., .READ MESSAGE#1 will prompt the MSO to transmit the file entitled MESSAGE#1. You must use the exact listing for the file as written in the directory.
.WRITE Used to write a message for future storage in the MSO. Must be used in conjunction with the filename you wish to list in the directory, i.e., .WRITE MESSAGE#2 (CR/LF) THIS IS A TEST MESSAGE. would prompt the MSO to hold a message entitled MESSAGE#2 and its contents for storage.
.ENDFILE Causes message (from .WRITE above) to be stored. MSO responds with confirmation message.
NNNN Alternate End of Message Flag. File previously written will be stored, but confirmation transmission from the MSO will not be issued.
.DELETE Must be used in conjunction with filename to remove file from storage area, i.e., .DELETE MESSAGE#1 (CR/LF) will delete that file.
.FILEHELP Shows examples of command format.
.QBF MSO responds with two lines of QUICK BROWN FOX.
.RYS MSO responds with two lines of RYRY.
.EXIT Used at the end of contact with MSO to disable MSO functions. The next user will then have to open it with the access code.

Security Status of files are classified as either OPEN, READ, or PRIVATE. OPEN messages may be read or deleted by anyone. READ messages can be read by anyone but deleted only with a password. PRIVATE messages may be read or deleted only with a password.

There also are references made to special commands used for control of peripheral equipment (KY1ON, KY2OFF, etc.). These commands shouldn't be used until you know what they control. Contact the SYSOP for details, as the functions are all user defined.

There also is a command to turn the MSO printer on and off (PRINTON, PRINTOFF), which is handy to leave messages to MSO owners...but once again the system may or may not be set to respond to the command, so check with SYSOP first.

Table 1. MSO3100 command structure.

A command sequence is needed to access the Macrotronics systems. (See text and Table 4.) Since many of the computer systems are using "autostart" demodulators, it is suggested that all commands be preceded with a series of RYRY to open the system. A common practice is to send "RYRYRYR DE CALLSIGN (Command) (CR/LF).

TRS-80

Filenames on the TRS-80 mailbox systems are allocated by the system operator. Users can read or write only to existing mailbox filenames.
(Command Sequence)W(CR/LF) Mailbox responds with an ID format.
(Command Sequence)D(CR/LF) Mailbox responds with a listing of all mailbox message filenames.
(Command Sequence)P(Filename)(CR/LF) Transmits the filename specified in the command. Filename must be exactly as it is written on the directory.
(Command Sequence)M(Filename)(CR/LF) Opens the specified filename for insertion of message traffic. To close mailbox at end of message send NNNN.
(Command Sequence)I(CR/LF) Transmits instructions to new users.
(Command Sequence)R(CR/LF) Opens mailbox system for relay mode. Any material transmitted into the mailbox will be replayed. To end input of material for relay transmit NNNN.
(Command Sequence)C(Filename) Clears all messages stored for that filename.

APPLE A6500

There are some distinct differences between the Apple A6500 software and the rest of the Macrotronics line. The A6500 allows user stations to write their own filenames, whereas the TRS-80 systems do not.

The A6500 does not have a Relay Mode. The R command is for recording messages to the disk system, and the format is slightly different (a space between the command letter and filename).

The command letter for a directory listing is Q on the Apple system.

Finally, the A6500 command letter for deleting old message files is D and not C as in the case of the TRS-80-based systems.
(Command Sequence)W(CR/LF) Mailbox responds with ID format.
(Command Sequence)Q(CR/LF) Mailbox lists all filenames of current messages.
(Command Sequence)P(Filename)(CR/LF) Transmits specified filename as listed on directory.
(Command Sequence)R(Filename)(CR/LF) Opens system for input of filename you specified. Continue with message, ending with NNNN.
(Command Sequence)D(Filename)(CR/LF) Deletes the filename specified from the mailbox system.

Table 2. Macrotronics command structure (TRS-80 and A6500).

To identify Hal equipment, watch for a message format that looks like the one in Fig. 1. The identifiers of the Hal system are the MSO and commands that are preceded with periods.

The equipment behind that message is a Hal DS3100 ASR Communications Terminal with the MSO3100 Message Storage Option, a fairly spectacular-looking microprocessor-controlled package that operates just as good as it looks.

The DS3100 ASR was introduced in 1979 and the MSO option followed about one year later. The concept of having the MSO option was gleaned from a lot of two-meter activity around the Hal plant and just "sort of grew into the MSO," according to Bill Henry, director of Hal Communications Corporation. The MSO option has met with more popularity than he originally dreamed of, he said.

Although the DS3100 terminal has been popular in its own right, Hal has sold 400-500 of the MSO options. Some of the units, however, have been placed in commercial or government use. FCC field offices use the Hal MSO system for their internal teletype communication circuit between field offices.

The command structure for the Hal MSO was designed to follow some disk-operating systems, and according to Hal officials makes the chance of accidental triggering almost nonexistent. Learning the various commands needed for using the MSO is fairly straightforward, and a few minutes of study is all that is needed to become an expert.

Macrotronics Mailbox

Macrotronics equipment is varied and widely used, since they have been producing software/hardware packages for home computers since 1978. The earliest success, according to Ron Lodewyck N6EE, president of Macrotronics, was the M-65 interface board and software that was developed for the PET computer. Shortly afterward, units for the TRS-80 Model 1 (M-80) and for the Apple computer (A-650) were produced.

As time progressed, so did sophistication of the programs and the interface units produced by Macro-

Gaining access to the Super-Ratt-operated system is accomplished through a "log in" sequence. Normally the access code to open the system is the callsign of the host station preceded by a colon, i.e., :K1VYQ, and followed by a carriage return. Once the machine is opened, user stations are asked to "log in" with their callsign, once again preceded by the colon and followed by a carriage return which establishes commands versus "chatter."

User commands include the following:

:(TURN ON COMMAND) Normally the station callsign. Activates the bulletin-board function.
:ENTER Turns on receive-copy buffer for incoming message.
:END Sent at end of message into copy buffer. Prepares system to SAVE, CANCEL, or LIST.
:LIST Causes transmission of text stored in copy buffer.
:CANCEL If after LISTING message you wish to cancel it without SAVEing, this will remove text from copy buffer.
:SAVE Causes text in copy buffer to be written to disk, then computer asks for a filename for the directory. Filename must be preceded by a colon and followed by a carriage return (no more than 30 characters).
:READ (number) Causes message (number) from system directory to be transmitted, i.e., :READ9.
:KILL (number) Deletes a message from system.
:HELP System transmits short listing of message commands.
:COMMANDS Causes complete listing of commands to be transmitted.
:WEATHER System transmits weather file as prepared by SYSOP.
:NEWS Transmits news file as prepared by SYSOP.
:TIME Reads current time from system clock and transmits.
:DIR Sends directory of message file numbers and names.
:LOG Transmits log of system users since last log update.
:BYE Exiting code from system. Resets system to normal operating parameters.
:USER Activates special functions programmed by SYSOP. May not be in use.
:SYSOP Causes Apple speaker to "beep," alerting SYSOP of problems.
:EXPERT Bypasses longer system prompts.
:RYS System sends string of RYRYRYRY.
:QBF Causes string of QUICK BROWN FOX to be transmitted.
:ASCII Switches to ASCII mode and sends line of RYRYRY.
:BAUDOT Switches to Baudot code; sends line of RYRYRY.
:45BAUD Changes speed to 45 baud.
:74BAUD Changes speed to 74 baud.
:110BAUD Changes speed to 110 baud.
:110ASCII Places machine in 110 ASCII.
:TAPEON Activates game I/O to turn on audio tape recorder. May not be used on all systems.
:TAPEOFF Turns off tape recorder.
:C/RON Activates 72-character carriage return.
:C/OFF Turns off auto carriage-return function.
:INPUTA, :INPUTB, :INPUTC, :INPUTD If these commands are utilized, special analog data input may be transmitted from instrumentation custom-installed by individual station owners, i.e., current temperature, S-meter reading, etc. It is best to check with system operators on these commands.

Table 3. Super-Ratt command structure (Apple II).

Software	Interface	Computer
M8000	M-80	TRS-80 Model I
M8300	M-83	TRS-80 Model III
T3000	TERMINALL	TRS-80 Model III
T1000	TERMINALL	TRS-80 Model I
A6500	A650	Apple

Fig. 2. Macrotronics units.

tronics. Their latest entry on the market is the Terminall, which interfaces the TRS-80 Models I and III as well as the Apple computer to the world of amateur RTTY operation. As this article was being written, mailbox software for the Apple version of the Terminall was not available. "Not yet," Ron Lodewyck said, implying that mailbox service for Apple owners who have the Terminall is in the works.

How the original idea developed for computerized on-the-air mailboxes is a little hazy. Macrotronics is quick to admit that the idea was presented to them by an amateur radio operator who desires anonymity, and some of the base ideas for the system came from that unknown individual. (I personally thank that unknown for the concept.) Another ham who was in on the earliest stages of experimentation of mailboxes was Irv Hoff W6FFC. Although Hoff and others weren't using the Macrotronics equipment at the time, many of the operating procedures and even the current command structure for the Macrotronics mailbox systems can be traced to their early twenty-meter activities.

The interface/software packages that do support mailbox operation from Macrotronics are numerous—see Fig. 2. The A650 and A6500 combination has been discontinued by Macrotronics, but some of the units are still on the air and around flea markets. The Terminall for the Apple soon will fill the void left by the discontinuance of the A650.

Macrotronics has sold about 1000 of the mailbox systems, with the models for the TRS-80 computer outselling Apple about 2 to 1. Some of the units have found their way into commercial and government use, with NASA being listed on the Macrotronics-owners list.

Command structures for the Macrotronics systems at first seem to be a little bewildering, but with a few moments at the keyboard accessing some mailbox station, the brilliance behind the structure can be recognized. Macrotronics systems use a combination of a command sequence and letter of the alphabet to tell the computers what function is desired. The command sequence is the variable in each station's operation and is normally the last three letters of a callsign followed by the letter Z. (In my case, my call is WB7QWG and the command sequence for my mailbox is QWGZ.)

Recognizing the Macrotronics system is easy when tuning the bands. The stations invariably end each transmission with a sequence of four Ns—NNNN. This is a standard termination code for the Macrotronics-programmed computer, indicating that no further action is anticipated without another command.

Custom Cuties

In addition to the two major suppliers of mailbox systems, you will find a number of customized stations on the air. Operating systems range from home-brewed computers and CP/M-based software for business machines to Apple Basic.

Some of the stations are fascinating. I have logged a German station operating on 15 meters that called for contacts automatically, logged you in with a QSO number, and gave you an RST report—all without hands-on support from its originator! (And seemingly without the constraints of FCC rulings!)

Another computerized mailbox on 40 meters operates on ASCII, filled with Microsoft Basic programs that can be spooled into your personal computer!

Most of the systems that have been logged here, though, follow command structures that have been in use by Hal and Macrotronics. Learning how to use

Callsign	State	Call-Up	Freq	Baud*	System**
KØVKH	SD	MSOVKH	14.087.7	1	3
K1VYQ	CT	:K1VYQ	14.097.5	4	1
W1CDM/6	CA	CDMZW	14.097.5	4	1
W1UKZ	MA	:W1UKZ	14.085	1	5
WA1IUF	CT	IUFZW	14.097.5	4	1
WA1URA/4	FL	:WA1URA	14.097.5	4	5
K4CZ	KY	CZZW	7098.5	1	3
K4DXR	FL	DXRZW	14.077.1	1	3
K4ILC	FL	ILCZW	14.077.1	1	1
K4KOZ	FL	MSOKOZ	14.087.7	1	3
KE4TV	??	:KE4TV	7.085	1	5
K4ZBG/6	CA	ZBGZW	14.077.1	1	1
KA4V	NC	KA4ZW	14.077.1	1	1
WB4ZQB	NC	ZQBZW	80 MTR	1	1
WD4MTC	FL	MSOMTC	14.087.7	1	3
K5FL	TX	MSO5FL	14.087.7	1	3
W5QXK	TX	MSOQXK	14.087.7	1	3
WB5NYA	OK	MSONYA	14.087.7	1	3
KA6CDC/4	KY	:KA6CDC	14.097.5	4	5
W6ZRR	CA	MSOZRR	14.087.7	1	3
WB7QWG/9	IN	QWGZW	14.097.5	4	1
K8IF	OH	IFZW	10.145	1	4
K8EWK	OH	MSOEWK	14.087.7	1	3
K8ZGZ	OH	MSOZGZ	7.083.5	1	3
WD8CEB	OH	.CEDZ	7.091.0	5	4
WB9ERE	IN	:RBBS	145.150	1	5
K9KWW	IL	MSOKUW	14.087.7	1	3
VK2BHF	DX	BHFZW	14.097.5	4	1
VK2XY	DX	2XYZW	14.097.5	4	1
ZF1GC	DX	XFGC1ZW	14.097.5	4	1

*Baud Rate: 1 = 60 Baudot, 2 = 66 Baudot, 3 = 75 Baudot, 4 = 100 Baudot, and 5 = 110 ASCII.
**System: 1 = Macrotronics TRS-80, 2 = Macrotronics Apple, 3 = Hal MSO3100, 4 = Custom, and 5 = Super-Ratt.
Note: Send additions, corrections, and deletions to Robert J. Foster WB7QWG/9, 10126 Catalina Drive, Indianapolis IN 46236.

Table 4. Mailbox directory.

these two systems will make entry into the custom stations a lot easier.

Speak to Me, Computer!

Tables 1 and 2 list the command structures for the Hal and Macrotronics systems. Studying the information in the tables will ease your entry into the mailbox crowd. But some hints are in order at the same time.

Keep in mind that the mailbox frequencies will have a number of users and that someone far distant from your station that you can't hear could be accessing the mailbox. Always wait a couple of minutes before you start transmitting, since you could interrupt someone's RTTY artwork that he is depositing in a mailbox. (You don't know anger until you have "hit" some temperamental artist halfway through his ten-minute masterpiece!)

Most of the mailbox systems are crystal-controlled and depend on stable frequency for good reception and transmission. Experiment with the tuned frequency on your dial and center exactly on the host station before sending material into it.

Be sure that when you leave a mailbox system you don't leave something active that will cause heartburn for the system operator. It's considered bad form to open a mailbox and then leave it absorbing everything on the frequency and creating a two-zillion-bit message of garbage!

Keep in mind that the regulations regarding proper IDs apply. You and the mailbox must identify according to current rules.

To save time in mailbox operations, go "off line" to compose your message onto tape or disk or memory, and then return to the mailbox to send your traffic. Standing by with some hot traffic waiting for a 10-word-per-minute hunt-and-peck artist to finish with his painful pecking on a 100-word-per-minute machine can be exasperating.

There are some distinct differences that you will find going from one mailbox to another, since so many of the stations have added custom features such as baud-rate changes or switching between ASCII and Baudot. Study the basic instructions contained in the tables and then monitor mailbox operations for awhile to see the differences between one machine and another.

Where to Find Them

Mailbox systems are popping up on all of the active amateur bands, but most of the activity seems to fall on the 20- and 40-meter bands. Table 4 lists some of the stations of which I currently have knowledge. The listing falls far short of being complete, and I would like to hear from system operators whose stations aren't listed. Perhaps an update of a "mailbox directory" will be possible in a few months.

Some of the more active mailbox systems include WA1IUF (Jerry—New Haven, Connecticut) and WA1URA/4 (Frank—Miami, Florida), located on 14.097.5; there are many stations, including KØVKH (Dick—Rapid City, South Dakota), on 14.087.7; and K4CZ operates a station on 7098.5 that seems to be easily the most popular operation on 40 meters.

WA1IUF and WA1URA were among the first computerized systems on the air with the Macrotronics line in 1978. Since that time they have logged in a lot of stations that check in daily, and the frequency "network" has stretched from Europe to Australia. VK2BHF (Horst—Dee Why, Australia) is one of the newest stations to show up on that particular frequency.

The Mailbox Future

Undoubtedly not wishing to let any marketing secrets out of the bag too early, both Macrotronics and Hal were sketchy in their descriptions of future plans in the computerized mailbox area.

Hal responded to "What's in the future?" with the fact that they are concentrating on a new version of the MSO system that will be ideal for traffic handlers and MARS applications. The new system (Hal TRO3100) will collect and store message traffic, allow

easy editing of the messages, allow rearranging of the messages in whatever priority is needed, and then transmit them.

Macrotronics evidently has a number of irons in the fire, but as Ron Lodewyck pointed out, the development time for the software is enormous. Approximately two man-years of time was devoted to the original M8000 program, so future editions of the mailbox and RTTY programs for computers will take awhile.

One interesting note from Macrotronics was a reference to the Atari 800 and 400 computers and the fact that they seem to be the cleanest computers from an RFI standpoint; progress is being made for software for those computers.

The future of RTTY and new modes of error-free communication also were discussed. AMTOR and Packet Radio undoubtedly will find their way into mailbox/MSO systems and general data transmission.

While those companies that have been providing systems in the past continue to upgrade and market their mailbox systems, new entries are being made in the amateur radio market. Universal Software Systems, Inc., of Ridgefield, Connecticut, just released the Super-Ratt program for the Apple computer which is causing some heads to turn on the mailbox frequencies.

Not a package system, Super-Ratt is the software to drive an Apple II with 48K of RAM, Applesoft Basic in RAM, and at least one disk drive. The Radcom RTTY card is supported, or some other type of TTL-compatible terminal unit may be used through the Apple game I/O.

Super-Ratt combines most of the desirable features found in older systems with some new functions found only in the Ratt-Soft program. What kind of features? You name it! How about automatically including the temperature and humidity conditions around the shack location? Analog-input capability of the Super-Ratt leaves your imagination to devise new functions. In all, some 33 commands are available in the Super-Ratt bulletin-board mode, with other routines available to the system user (see Table 3).

A very unique feature of the program allows error-free file transfers between two Super-Ratt stations. After being placed in the transfer mode, the two station's begin transferring data, with the receiving station's computer verifying line-oriented check sums of each line, acknowledging error-free reception, or requesting a repeat of the material. The two computers "handshake" the file being transmitted until it is finally received error-free.

Although the Super-Ratt is currently available only for the Apple computer, Bill Barrett of Universal Software reports that software for the Commodore 64 and TRS-80 Models I and III will be available in a few months.

I see a trend toward specialized mailbox systems springing up across the country. As with computer bulletin boards accessed through telephone lines, people with specific interests can start exchanging ideas on ham-radio mailbox systems. In fact, I have a healthy interest in the TRS-80 and mailbox systems. As a starter, let's list my mailbox on 14.097.5 as the "Mailbox-Mailbox."

Will be looking for you on twenty meters! ■

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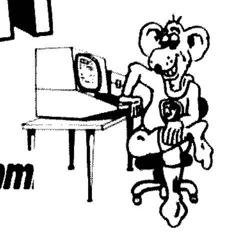

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How E.T. Really Called Home

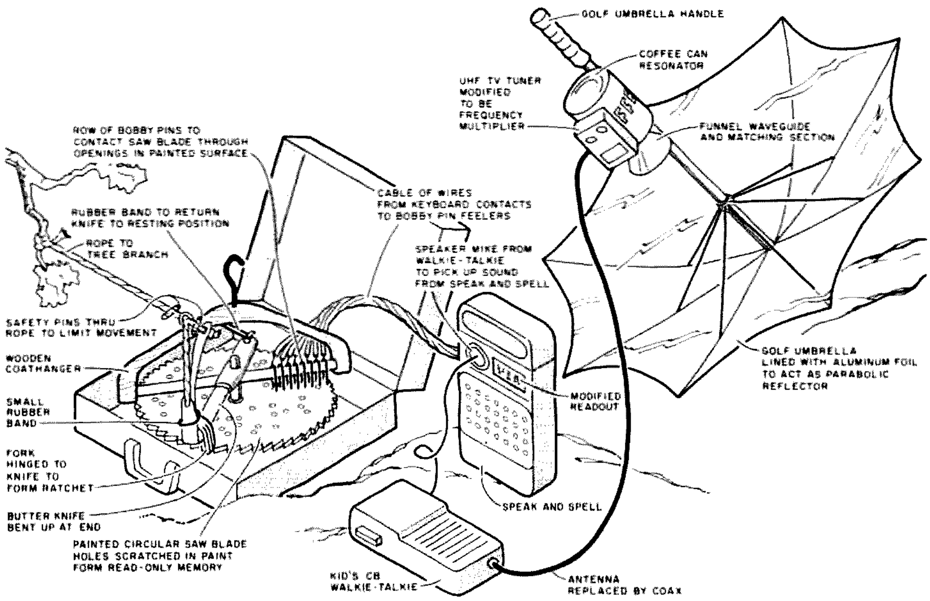
If it were not for an inventive ham, E.T. might still be trying. In this exclusive article, the designer of the little guy's communicator unveils its inner workings.

Henry R. Feinberg K2SSQ
415E 85th Street
New York NY 10028

"TGIF," I thought as I returned from lunch to my office in the exhibit department of Bell Labs. Lying on top of my desk—on top of a pile of exhibit plans—was a telephone message asking me to call Kathleen Kennedy in Hollywood. Now, the public relations department of Bell Labs gets many requests for information, but this one was considerably more unusual than most.

Ms. Kennedy, who produced *E.T.* with Steven Spielberg, had called Bell Labs earlier that day to find someone who would work at home during the weekend, designing a space communicator to be used by a stranded alien to contact his space ship. Few other details were given, as a great deal of secrecy surrounded the film. Even the name of the film was a secret. I was told that the alien was called E.T., short for extra-terrestrial, but the working title given me for the film was deceiving; it was called "A Boy's Life."

I guess the call was referred to me because of my experience in using household objects to explain science. My title at Bell Labs at the time was Exhibits and Science Presentations Coordinator. Before coming to the Bell system, I worked with Don Herbert, TV's "Mr. Wizard," designing experiments using everyday materials to explain scientific principles. At the Labs, I continued my work popularizing science through films, demonstrations, and exhibits. Currently, my work at AT&T involves corporate exhibitions such as the Bell System's Futurecom at Epcot Center in Walt Disney World.



Pictorial drawing of the E.T. communicator.

Kathleen Kennedy asked me to work by phone with Melissa Mathison, who was writing the *E.T.* script and who was also associate producer. I had several long phone calls with Melissa, discussing items found around the house that could be used in a communicator. As an avid ham-radio operator with a limited junk box, I first looked for household objects that could actually transmit a signal. Transmitters of various sorts were too ordinary, of course. I was looking for something more exotic, something like a microwave oven that could be converted to send a signal into space.

Plausibility was a big fac-

tor. While the communicator didn't actually have to work, I wanted it to be plausible enough that my ham friends at Bell Labs wouldn't laugh me away from the "ham table" in the cafeteria. I also wanted to avoid a science-fiction look with a lot of blinking lights, coils, and sparks. It was important to me that people seeing the film would not be scared away from the science, and might even understand how a communicator like this might work.

Using a microwave oven as a transmitter seemed plausible enough, and I expanded on the fanciful design by placing a round hubcap in the oven to focus the microwave energy out the door and into a waveguide made of flexible aluminized air-conditioning duct. The duct could be run out the kitchen window to an antenna made by inverting a metal patio umbrella and using it as a parabolic reflector.

At this point, before I'm accused of gross ignorance for failing to recognize how the oven would be de-tuned or how inefficient the system would be, remember that the objective was plausibility, not practicality. It was the thought that counted, and I was having fun thinking of possibilities such as building a flying spot-scanner using a combination of mechanical and electronic components—like Christmas tree ornaments and loudspeakers with mirrors attached. Melissa Mathison told me that Steven Spielberg liked the microwave oven idea but wanted a portable unit to work from a forest clearing. Back to the drawing board.

During my years with Mr. Wizard, we put together one Rube Goldberg contraption after another to illustrate scientific principles. Invariably, we would use household materials in unorthodox ways. Psychologists call this type of creative brainstorming a release from

The E.T. communicator. (Photo copyright © 1982, Henry R. Feinberg)

"functional fixedness." Briefly stated, it means that you can do more with an old 813 than build a lamp with it. The trick is to analyze the desired result by function, breaking down each section to as simple a scale as possible; then it's easier to build the unit from the ground up in a new way. (Sounds a lot like writing a computer program, doesn't it?)

What Spielberg wanted was a beacon transmitter—something to say "Here I am! Come and get me!" I reasoned that three main parts were needed for a basic beacon: a means of producing a message, a programmer to repeat the message, and a way of transmitting the signal into outer space.

Working backward, I knew that a golf umbrella lined with aluminum foil would make a plausible-looking parabolic reflector. And on my last trip to the Dayton Hamvention, I saw coffee cans being used as resonators for receiving MDS TV signals. In fact, a UHF TV tuner purchased there *could* be extensively modified to act as a multiplier to select the umpteenth harmonic of a CB signal from a toy handie-talkie. The resulting microwave signal *could* then be directed from the coffee-can resonator toward the umbrella reflector through a waveguide/matching section made from a funnel. Ah, the license of plausibility!

To produce the message, I used a Speak and Spell™ learning aid made by Texas Instruments. The unit contains a speech synthesizer, a keyboard, a flourescent readout, and a speaker. E.T. deserved his own alphabet, so I rewired the segments of the alphanumeric readout. It took several tries to make the resulting gibberish look like another language. No changes were made in the speech circuits since I thought the sound-effects people would add their own sound. Actually, they never did, and in the film one doesn't hear any sound at all from the communicator—not even the original "message" I devised with the help of Debbie, my wife. It was our names repeated over and over.

The remaining problem was how to program the Speak and Spell to repeat the same message over and over. To begin with, wires were attached to each keyboard contact. A set of feelers was needed for the other end of the wires. Originally, I used a row of safety pins inserted through the dowel of a wooden coat hanger. But these were a problem to keep straight under pressure. Debbie deserves the credit for suggesting bobby pins. Their flat cross-section prevented them from moving sideways.

The coat hanger was positioned across a child's record player. On the turntable, a circular metal saw blade took the place of a record. The surface of the saw blade was coated with several layers of spray paint which served as insulation, preventing the bobby pins from contacting the metal blade. The message was programmed on the blade by carefully scratching through the paint. This created a pattern of openings similar to those on a punched card through which selected sets of bobby pins could make contact with the blade as it turned.

But how to turn the saw blade? Well, since the com-

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municator was to work by itself in the forest and saw blades have teeth, I decided to use wind power to rotate the blade via a ratchet mechanism. A knife and fork were hinged together and made to pivot on the spindle of the turntable. Each back-and-forth motion of the knife and fork pulled another tooth of the saw blade around and created another set of contacts. A rubber band returned the knife between pulls. A string tied between the knife and a nearby tree branch was all that was needed—the rest was a breeze!

How were the electronics powered? As Melissa Mathison rationalized it, E.T. came from an agrarian society that had learned to tap the forest for electrical power. On the set, the day's shooting schedule didn't leave time to wire the trees, so a battery was used. Score one for practicality over plausibility.

The close-ups of the communicator were filmed in a sound stage dressed to look like the forest. To achieve a misty quality, the trees were sprayed with water before each take. Everything was damp, including the boulder on which E.T. placed the Speak and Spell. At one point, the bare circuit board made contact with the wet surface and it stopped working. Panicked thoughts of zapped ICs flashed through my mind as all eyes turned to me for help. I was scared, but I said a silent prayer and asked for a hair dryer to be brought onto the set.

There's a scene in the film where Elliott helps E.T. set up the communicator in the forest. As the wind starts to blow, Elliott shouts, "It's working! It's working!" I remember that scene, because I was standing right next to the camera, wiping my brow and mouthing the same words. ■

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Buyer's Guide to Dayton

From securing accommodations to planning your expenses, WA4BPI helps you make the most of your Hamvention buck.

Is this great hobby called ham radio starting to get you down? Maybe you've had your fill of QRM and the woodpecker and you're ready to swap your low-band rig for a set of golf clubs?

Don't worry. It's not the end of the amateur radio world for you. It's something we all go through at one time or another. It's just a time to find a new phase of the hobby to jump-start your interest in ham radio again. And the biggest pulse of charging current in ham radio is just around the corner—on April 29, 30, and May 1, the dates for the 1983 Dayton Hamvention.

First, let me say that I don't have any ulterior motives for writing this article. I don't live in Dayton, Ohio, I'm not a member of the Dayton Chamber of Commerce or of the Dayton Amateur Radio Association, I don't have a vested interest in the Dayton Hamvention, and I don't even have relatives living in Dayton. I just love their hamfest and look forward to it every year. The purpose of this article is simply to pass along some of the things I've learned after attending the Hamvention many times. Hopefully, what I've learned can help you improve your annual trip to Dayton (if you've been before) or, if you've never been, to encourage you to attend and get in on the fun.

Transportation and Accommodations

Most years that I've attended the Dayton Hamvention, I've traveled in private vehicles, but many others fly (it's almost 500 miles from where I live) and still others, I imagine, have taken the train.

The first year we traveled in a Winnebago and, as nice as that was, there were a few drawbacks. The RV route can be troublesome, depending on the size of the group and the people that make up the group. If you've been on trips before with the folks and get along well, the chances are that you'll enjoy a trip to Dayton with them in the RV. But even a husband and wife have arguments, so it's best to make sure you have a congenial group since you'll be sharing some close quarters for a few days and nights.

RVs are also a problem in that unless you have a second vehicle you have to unpack everything when you get to camp and hook up water and electricity, and then repack and unhook everything to drive to the Hamvention. Driving the RV and finding a place for it at the Hamvention parking lot also can be a grueling situation even with the help of the many courteous parking lot attendants. A car is a lot easier to maneuver in tight spaces.

Icom promoted its concept of "The World System" with its exhibit at the '82 Dayton Hamvention. It was one of the largest exhibits among the 180 dealers with displays.

I've also stayed in a pop-up camper, and even though it was economical, the weather at Dayton in April is changeable; the weekend we camped out, the overnight temperatures dipped to the 30s and it was very uncomfortable sleeping in the cold.

With experience as my teacher, I've found that the best way to make the trip is to drive a car, stay at a motel, and share the car and room costs with two or three fellow hams. The Hamvention Housing Bureau can be a big help in locating suitable accommodations, so avail yourself of their services. A total of 38 hotels, motels, and inns work with the bureau to help you find a place to stay, so you have a wide selection of rooms and prices. But the Bureau works on a first-come, first-served basis and it's best to get your reservations in early. If you insist on waiting until the last minute, the deadline for reservation requests is April 1.

Why go the motel route if camping is cheaper? The

Seen at the Icom exhibit was this super-sized version of the company's popular IC-2AT handie-talkie.


One-on-one conversations with dealers and designers are commonplace at the Dayton Hamvention and give potential buyers an insight into new equipment and operating procedures.

answer is convenience. You have a substantial structure surrounding you when you stay in a motel or hotel and therefore are not at the mercy of the Dayton weather. Plus, you'll have clean sheets to sleep on, a clean room to come back to after a hard day of hamfesting, and you'll have your own private bathroom to use instead of having to share a campground latrine with all of the other hams who are trying to get to the Hamvention at the same time you are.

The motel room is also more secure than your typical RV or pop-up camper. It's not very comforting to leave the $500 bargain you bought at the hamfest Friday sitting in a tent or the trunk of a car for two days and nights while you are busy searching the flea market for other prizes. And you certainly can't lug the rig around the flea market with you for two days, can you? You can lock it up in a motel room and feel relatively secure. Even if the maid goes in the room to clean and sees your prize sitting there, chances are she won't know what it's used for and won't have any idea of its value. That makes a motel room a pretty good place of safety for a traveling ham.

Expenses

Now that you're convinced that you want to go and have picked your method of transportation and suitable accommodations, let's get down to the grass roots and talk about money. Using my own trips as an example: To travel approximately 500 miles one way and stay three nights in Dayton and then drive back, I've found you will need at least $100 for basic expenses such as gasoline, accommodations, and food. The gasoline and room allowances are based on splitting the cost with at least two other people (it's not much fun to go alone).

As far as food is concerned, it's probably best to keep that separate. If you do stay in a motel you'll have to eat out, and if the cost is left on an individual basis you can order according to your pocketbook. That way, if you want to save as much money as possible to buy that dream rig, you can live on coffee and crackers and save the cash for the really important stuff like a new handie-talkie. Plus, buying your own food will avoid an argument between you and your companions when the waiter brings the check and you try to figure out who ordered the watercress sandwich and who should pay for the extra cheese dip. Food prices are reasonable in Dayton and at the Hamvention, so don't worry. If you have the cash, you won't starve.

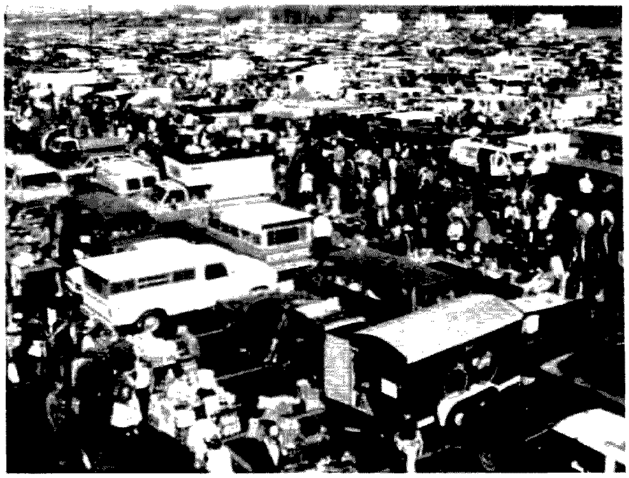
How to get the needed cash to pay for the trip is another problem. The best way I've found to raise the necessary capital is to sell some unused equipment. You could try to save up out of the regular budget, but in my case, extra money there is scarce. I know of some hams who sell equipment at their local hamfest and use the proceeds to pay for their trip to Dayton where they buy more gear to resell at their next local hamfest. It's a vicious but very successful circle.

Another way of making money is to rent a flea-market space at the Hamvention and sell some of your unused gear there. After all, 20,000 hams will be passing by your table over the three-day period of the Hamvention, so there's a good chance you'll find a buyer no matter how exotic the equipment is that you have to sell. And that means more money for you to put toward that item you've been searching for. Another successful circle, right?

The flea-market space also has other advantages. It's inexpensive when everyone in the group splits the cost, and it gives your group a meeting place to talk or simply to rest between raids on the flea-market vendors. Even if I wasn't going to sell, I'd still get a space just to have a place to rest and to locate the cooler. (Food prices at the Hamvention are reasonable, but you can beat the beer prices by buying your own.)

While I'm on the subject, the flea-market space is easier to handle if you take two cars to Dayton so that you have one vehicle to drive back and forth to the motel

Sellers meet buyers at the Dayton Hamvention. Shown here is just one of the three large rooms filled by dealers—over 180 at every recent Hamvention.



This bird's-eye view of the '82 Dayton flea market was taken with a wide-angle lens.

and another to leave at the flea market to hold your space for the next day. Last year we couldn't take two cars, and since we had to transport a Teletype® machine to sell, we rented a small trailer. We left that at the Hamvention to hold our flea-market space. The Hamvention has guards at the flea market overnight so there's no problem of theft, and that makes it okay to leave the equipment there that we haven't sold or gear that we've purchased to take home. Also, the trailer was cheaper to pull to Dayton than to pay for the gasoline and wear and tear on another vehicle.

The trailer also gave us a lot more room to carry equipment home and kept us from having to load down a car's trunk with a lot of gear. People who fly to Dayton may get there quicker, but if they find a super deal on a complete Collins station, they'd have to pass it up or pay extra for shipping. The airlines wouldn't classify the Collins as carry-on luggage, would they?

Clothing

I've seen the weather in Dayton shift from below freezing one day to clear skies and 70 degrees the next, so having the proper clothing for the climate is important. The key to dressing for Dayton is the old outdoorsman adage—dress in layers. That way, you can put on or take off clothing as the weather changes. Blue jeans are a basic of my Dayton wardrobe since we're usually too tired to dress up and attend the Friday night FM bash or the Saturday night banquet after running through the flea market and indoor exhibits all day. If you wish to attend one or both of these gala events, be sure to bring along suitable clothing.

But for dressing for the daytime activities, from the belt down, a standard pair of blue jeans, a pair of crew socks and some comfortable, sturdy shoes (that are good for lots of walking) are the prime items. From the belt up, let me suggest starting with a T-shirt followed by a long-sleeve shirt (you can roll up the sleeves if warm weather prevails), a sweater, and a waterproof or water-resistant jacket to turn back the wind and the rain. Also, carry a heavy, winter coat that can be left in the car so it's within reach should the weather take a turn for the worse like I've seen it do.

In addition, I wear a cap, something like a baseball cap, to keep rain and the skin-burning sunshine off my face, and I carry a tube of lip balm in my pocket. Last year the rain and cold weather stayed away, but the wind was crisp enough to leave everybody in our group with chapped lips after the first day.

Group Communications

As far as which radio to take along for communications, your trusty HT is probably all you'll need for staying in touch with the other members of your group. Despite all of the rf produced by 20,000-plus hams, we usually find a two-meter frequency that can serve as a standby. The HTs allow the group members to wander the flea market at will yet stay in touch in case somebody finds a super deal on an item that another member is looking for. The radio link is also good for bringing the group together when it's time to head back to the motel or campground. My HT and a speaker-mike make the perfect combination.

Activities

Planning is also very important once you get to Dayton and inside Hara Arena. As soon as your tick-

CHECKLIST FOR YOUR DAYTON TRIP

- Secure room reservations early, for the nights of April 29 and 30, and if you intend to arrive early on Thursday, for April 28.
- Purchase Hamvention tickets in advance and, if applicable, flea-market space permits.
- Have the members of your group committed to attend the Hamvention and determine your transportation requirements.
- Save enough money to cover the cost of the trip and to cover the cost of any planned purchases. Turn most of your cash into traveler's checks as these are readily accepted at the Hamvention and at the flea market. Personal checks are NOT a readily-accepted method of payment. If a dealer has a choice of a cash sale or taking a risk of accepting a personal check, he'll probably take the cash.
- Pack clothing necessary for your three- or four-day trip. Don't forget, the weather is very changeable.
- Arrange for time off from work if you're part of the laboring class.
- Make and carry a list of things you intend to purchase at the Hamvention. The abundance of equipment found at the Dayton flea market is mind-boggling and could make you forget what you came in there to buy.

et is punched, workers hand you a plastic bag that contains your copy of the Hamvention program. Take a moment to look through this booklet and note the days and times of the various forums and discussions. Check the ones you'd like to attend and try to plan your day's activities around the forum times. The flea market will be there for the duration, but those forums are a one-time thing. If you don't attend them when you can, you might regret it later.

Other Tips

If you want to get a flea-market space close to the building, you'll have to get in line Friday morning pretty early. Selling on Friday starts at noon but those holding advance flea-market permits are allowed to enter the area to set up beginning at 8:00 am Friday. We got into line at 6:00 am last year but had to wait until almost 9:00 to get through the gate. Still, we got a pretty good space, but you can't always depend on luck. Get there early and be sure to buy your permit in advance. It's cheaper that way, plus it lets you check out the bargains before the main crowd comes through the gate.

It's also a good idea to carry a small bag with you if you intend to purchase small parts. That way, resistor, plugs, and transistors don't get misplaced or crushed if you have no place other than your pocket to put them.

Now, if you can remember all of the suggestions listed, a great experience awaits you at the Dayton Hamvention. I'm sure there are a few things I might have overlooked, and there might be some other things you'll want to add because of personal preference, but what I've listed here should be enough to guarantee you a super time at Hamvention 1983. ■

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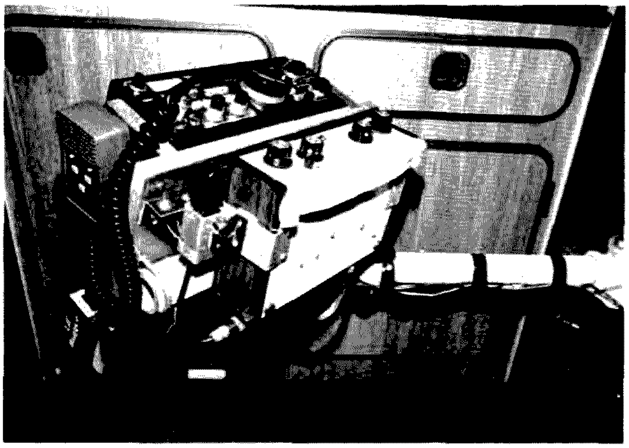
The Best Way to Mount Your Mobile Rig

If you have a van and HF gear, this is what you need to put them together—including a movable mount.

My wife and I walked out of the car dealer's office after deciding to buy a new camper van. "It will be great," I thought, "to be able to throw kids, dogs, and gear into the van and go." Just then an awful second thought occurred. "I wonder if the HF rig will fit in there?" I ran back into the showroom to eyeball the situation. "Hmm—the two-meter rig will fit to the left of the steering column, but no way am I going to get the HF rig under the dash."

Has this happened to you? Do you have a utility van or four-wheel-drive vehicle with no good place to put a rig? How about a camper or RV where you would like the rig in the front seat for traveling but in the back when stopped or during emergency or public-service operation?

That was the situation I faced—nowhere under the dash to put a rig without major alterations, and a desire to have a more convenient operating position when stopped for the night and a means to tuck the rig out of the way when it was not being used. This article will describe how I installed a rig in a 1980 VW camper. I designed a swinging gimbal mount, easily constructed from pipe and fittings available at most hardware stores, which could be adapted for use in vans and RVs with a central passageway between the two front seats.


Gimbal mobile mount.

Some Basics

First, let's take a look at some good mobile-installation techniques because one should begin by thinking carefully about the installation of mobile radios in modern vehicles and follow some basic principles. Attention should be paid to the 12-V-dc supply, transient protection, the antenna installation and ground system, noise suppression, and theft protection.

The 12-V-dc power should come directly from the battery. Depending on the length of the run and the amount of current, a wire size in the range of 8-12 gauge should be used. (Refer to the *ARRL Handbook* for information on the current-carrying capacity of various wire sizes.) A direct battery connection reduces the chance of high-voltage transients which can easily damage solid-state equipment.

The most damaging transients in an automobile are produced when starting and stopping the engine. Part of the checklist for pilots of light aircraft is to make sure the radio equipment is turned on *after* the engine is started and off *before* it is shut down. This simple procedure can be followed to protect your mobile radio installation. Further transient protection may be obtained by installing transient-suppressive devices in the power-supply leads at the radio. Techniques described by recent articles in *73* and *QST* show how to use devices now available. (See the list of references at the end of this article for more information.)

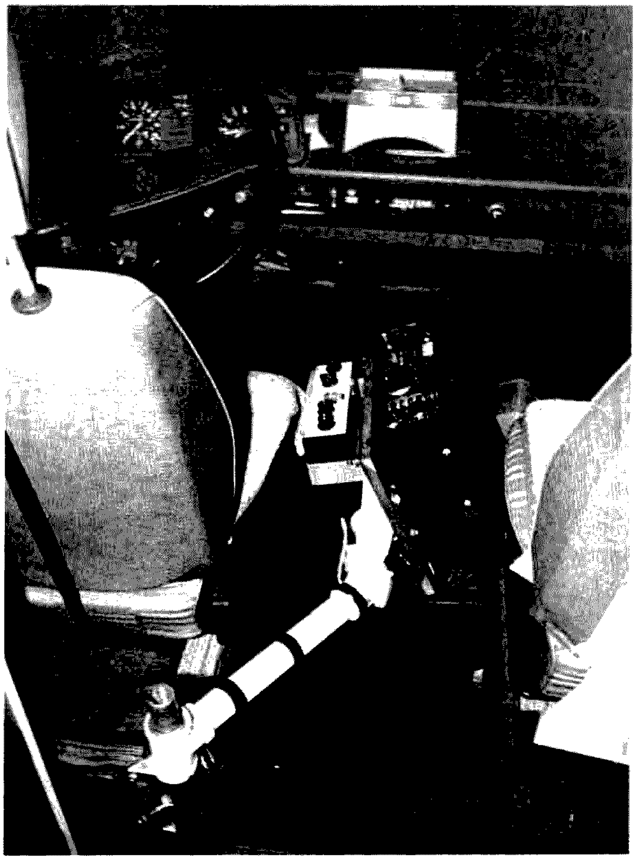
After the supply of a transient-free 12-V power source, the antenna is the most important aspect of a mobile installation. When the antenna is mounted on the rear of a van or station wagon, the rear door or tailgate can sometimes be in the way, so I have adopted an unconventional antenna mount. Good results have been obtained with two van mobile installations by mounting the antenna on the front of the vehicle. It works just as well, allows a much shorter coax run, and one can see the antenna in the front and watch out for overhead obstructions more easily. It also places the antenna away from the electrically-noisy engine compartment on the rear-engined VW van. The mounting bolt on the front bumper was removed and a longer one used to mount the antenna base. This directly connected the antenna to the chassis of the vehicle and provided a good ground for the antenna system.

A good grounding system is essential in a mobile installation. Many of today's cars have plastic parts in the dash and you must make sure that the rig is securely bonded to the chassis with as short a ground strap as possible. The antenna must be grounded to the frame as well. This can sometimes be difficult. One mobile operator I worked had taken the view that it was so difficult to get a good ground in the mobile installation that he isolated the base of the antenna from the automobile chassis and installed a ground plane by winding wire back and forth under the vehicle. His potent signal on 20 meters verified that this is also a good approach.

Antenna matching also is important. In the old days when rigs with tube finals were used, the swr on the antenna was of little consequence as long as the final would dip into resonance. In fact, best results were obtained by tuning the antenna with a field-strength meter for maximum signal output regardless of the swr indication. With today's solid-state transceiver, however, the swr protection circuits shut down the power output when the swr is greater than about 1.5:1. This means that an antenna tuner is required in most cases, especially if operation is required over any appreciable bandwidth. There are a number of small antenna tuners available today which are very suitable for mobile operation.

Noise can often be heard in a mobile installation. Noise sources fall into four categories—ignition or spark-plug noise, alternator or charging-system noise, instrument noise, and body noise. The 1982 *ARRL Handbook* gives good information on reducing spark-plug, charging-system, and instrument noise. Body noise is caused by various parts of the body not being electrically bonded to the chassis. Differential static charge can build up on these parts and cause severe noise when discharges occur. The solution is to bond the bumpers, trunk lid, and hood to the body electrically with grounding straps. I've found that noise is not a big problem when a good ground system is installed and a transceiver with a noise blanker is used.

Theft protection is best achieved by not advertising the presence of the rig. Quick-disconnect antenna mounts allow the HF antenna to be removed when you are not operating mobile. The swinging gimbal mount described below allows the mobile radio to be shifted around behind the driver's seat to be out of normal view from the outside. It also is designed so that the rig can be removed from the van easily when I am not operating mobile. (In case the worst happens, make sure your gear is fully insured.)



Gimbal mobile mount in operating position.

The Swinging, Gimbaled, Mobile Mount

The main design requirements for the mobile mount in my van were that it could not be under the dash (no room), it had to be movable so that it would not block the center aisle when it was not in use, and the rig had to be easily removable so that I could use it as my base station. These objectives were met with the design described here. In addition, the radio now is accessible from the back when somebody else is driving or while we are stopped for the night.

The photos show the mobile mount. The 12-V-dc power supply is directly connected to the battery, which is conveniently located behind the passenger seat. The radio-mounting bracket is constructed from wood but could be folded from sheet metal. (One also could use the manufacturer's bracket mounted on a piece of wood or sheet metal.) The mount is attached to the top bar of the swinging gimbal with U-bolts. As shown in the photos, the antenna transmatch is mounted under the transceiver. A paddle and small keyer are on the side of the mount and are within easy reach of the driver when in mobile operation.

Fig. 1 shows the design of the swinging-gimbal portion of the mount. It is constructed from two pieces of 1¼-inch pipe, one pipe tee, one regular elbow, and one street elbow. The maximum length of "A" is determined by measuring the distance from the fixed-mounting point to the nearest obstruction which the mount must clear. Subtract 3.5 inches to allow for the tee and elbow connections to be made. The minimum length of "A" is the same as the width of the transceiver-mounting bracket plus about an inch.

Thread this pipe and securely screw the tee and regular elbow onto the ends. The tee and elbow are tapped for 1/4-20 machine screws as shown in Fig. 1. These serve as tension adjusters to keep the mount from swinging too freely. Make the length of "B" the same as "A" but thread only

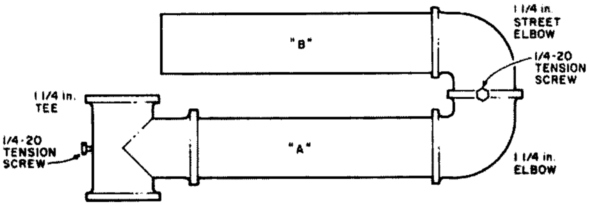


Fig. 1. Gimbal-mount construction detail.

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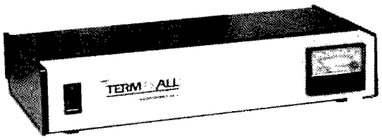

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one end and securely screw the street elbow onto it. You are now ready to install the mount in the vehicle.

I had a table mount in back of the driver's seat onto which I slipped the tee joint and tightened the tension screw. You may have to provide a vertical pipe screwed into a pipe flange mounted on the floor of your vehicle. If this is the case, replace the tee in Fig. 1 with an elbow. Screw the street elbow on the end of pipe "B" into the regular elbow on pipe "A" and tighten the tension screw so that the arm will swing from the storage position to the operating position. Use U-bolts to attach the transceiver mount to "B." Dress all power-supply leads, grounds, coax, and speaker leads along the pipe with the mount extended, and tape securely.

Conclusion

It is very easy to start mobile operation with today's solid-state rigs. A little care with the installation can result in many hours of happy mobiling. By providing a transient-free environment one also is able to protect the transceiver from destructive voltage spikes. A good grounding system is the key to an effective antenna installation and also will help reduce noise. A swinging, gimbaled, mobile mount as described above can be adapted for use in many vehicles where there is not enough room to mount a rig under the dash. ■

References

1. *ARRL Radio Amateur's Handbook*, 1982 edition, chapters 10 and 17.
2. Keith Grenier AK0Q, "Surviving the Unthinkable—part II: some practical ideas," *73*, June, 1982.
3. Ken Stuart and Gene Collick, "Protect Your Equipment from Damaging Power-Line Transients," *QST*, February, 1982.

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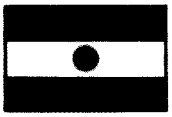
73 INTERNATIONAL

Beginning this month, 73 brings you amateur radio news from around the world. In this collection of reports from our foreign correspondents, 73 will present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to the country editor or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Avery L. Jenkins WB8JLG.*



INDIA

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India

The Government of India has permitted each Indian ham to obtain foreign exchange to the tune of about 1,000 dollars every year to import amateur equipment, parts, and instruments. It is not necessary to obtain an import license; hams can just go to the bank and obtain a draft or open letter of credit on the basis of a pro forma invoice. Customs duty is about 68 percent for transceivers and more than that for other items.

Three Indian amateurs distribute equipment made by Yaesu, Icom and Kenwood. During the middle of 1982, Yaesu offered a "slashed price" for their equipment and "rock-bottom concessions" for the VHF hand-held FT-207R. As a result, there is a sudden growth of VHF activity in India, and about 80 of the FT-207R rigs are expected to arrive by the end of 1983. Fifteen FT-207Rs were used to maintain a communication link between the stadiums of the 9th Asian Games at New Delhi and Jaipur.

The IBP Indian beacon is now operational around the clock at New Delhi. Its callsign is VU2BCN, and it is on FM at 28.295 MHz.

The decades-old 10-kHz slice in the 80-meter band has been expanded to 50 kHz. VU amateurs now operate from 3500-3540 kHz and from 3890-3900 kHz.

The total number of valid amateur licenses was expected to pass 1,100 by January, 1983.

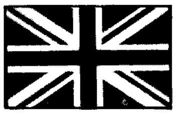
The new WARC bands have not yet been opened for use in India.

Air-Net India assembles every day on 14.150 MHz at 1530 UT. There also are daily nets on 7 MHz and 3.5 MHz.

Commemorative callsigns, past and present:

- October, 1969—prefix VU0 rather than VU2 to mark the Gandhi Centenary Celebrations. The Amateur Radio Society of India issued a Worked Republic of India (Gandhi Centenary) Award.
- August-December, 1972—Callsign VU25 instead of VU2 marked the 25th anniversary of Indian independence.
- May, 1979—VU25ARS marked the 25th anniversary of the Amateur Radio Society of India.
- November, 1981—AU2CD was issued to mark the annual children's day celebrations, which begin every year on the birthday of the late Jawaharlal Nehru, the first Prime Minister of India.
- December, 1981—AU2SIF was issued to the station at the South Indian Fair at Hyderabad.
- August to December 15, 1982—Callsign prefix VU9 instead of VU2 to mark the 9th Asian Games being held in India at New Delhi, Bombay, and Jaipur.
- November 14, 1982 to December 4, 1982—Callsign VU82AG was issued to VU2CJ/VU2ARD to begin on the annual children's day celebrations at the site of the celebration. This callsign was to continue until the end of the 1982 Asian Games.
- November 24, 1982 to December 4, 1982—Callsign AU9ASG was issued to VU2APR (Hyderabad APARS) representing the 9th Asian Games. A group of amateurs from South India, Hyderabad, maintained HF communications between Jawaharlal Nehru stadium, New Delhi and the Asian Games stadium at Jaipur.

A cyclone hit the western India coastal area in November of 1982. Civil communications links were disrupted, and three radio amateurs from APARS Hyderabad (South India) rushed in and rapidly established communications on HF along with radio amateurs of Gujurat. Successful two-way communications around the clock were provided from eight affected stations for the district authorities who were conducting relief operations. This is the second major participation of amateurs in India since the disaster of the Morvi floods in the same state a few years ago.



HONG KONG

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Causeway Bay Commercial Building
Causeway Bay
Hong Kong

P. J. Weaver VS6CT
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91 Leighton Road
Hong Kong

The Hong Kong Amateur Radio Transmitting Society, better known as HARTS, has been in existence and actively engaged in amateur radio in this Pearl of the Orient, the British Crown Colony, since pre-WWII days.

At present, there are approximately 150 licensed members. HARTS is affiliated with the Radio Society of Great Britain. It also is a member of the International Amateur Radio Union. The membership is extremely unusual in that it is composed of many nationalities, e.g., Chinese, British, German, Canadian, American, Australian, and others.

Just last year and for the first time, a Visitor License was introduced, and approximately a dozen amateurs from other countries received this unique license. It is issued to the holders of amateur licenses with whom the United Kingdom has reciprocal agreements, and is issued to those persons who will not be residents for more than 90 days. The only requirements are to have the original license (with photocopy for Post Office file) and passport, and upon payment of $100.00 HK ($16.00 US), permission to operate using the home call /VS6 will be granted. This license is valid for one year. For further information, one should write directly to: Telecommunications Division (Maritime Services), G. P. O., 2 Connaught Place, Hong Kong.

Remember that HARTS does have a warm HEART! If any amateur radio friends pass through this crossroad of South East Asia, they are invited for an "eye ball" at the regular Tuesday meeting, 1700 local (excluding public holidays) at the Cable and Wireless Sports Club, Caroline Hill Road (Hong Kong Island side). For additional information concerning HARTS, please write to its president, Bob Frost VS6BQ, HARTS, PO Box 541, Hong Kong.

HONG KONG AWARDS

CATCH 22 AWARD. Applicant must submit verified evidence of two-way contact with other amateur stations located on the 22nd parallel of latitude north (see list). A Hong Kong station contact is obligatory.

Only contacts after 1st January 1980, are valid. Endorsements for mode and band may be requested.

The award is available in three classes: Class 3—contacts with at least 15 countries; Class 2—contacts with at least 20 countries, and Class 1—contacts with all 25 countries.

Fee US$7.00 or equivalent currency.

All awards will be returned by airmail, and upgrade stickers may be applied for with a fee of US$1.00.

Countries list:

1.	VS6	Hong Kong
2.	CR9	Macao
3.	BY	China
4.	BV	Taiwan
5.	XV	Vietnam
6.	XW	Laos
7.	XZ	Burma
8.	S2	Bangladesh
9.	VU2	India
10.	A4X	Oman
11.	A6X	U.A.E.
12.	HZ	Saudi Arabia
13.	ST	Sudan
14.	SU	Egypt
15.	5A	Libya
16.	TT8	Chad
17.	5UT	Niger
18.	7X	Algeria
19.	TZ	Mali
20.	5T5	Mauritania
21.	CN	Morocco
22.	C6	Bahamas
23.	CO	Cuba
24.	XE	Mexico
25.	KH6	Hawaii

NINE DRAGONS AWARD. One contact with a country in each of the following 9 zones: zones 18, 19, and 24 to 30 inclusive. Contact for zone 24 must be a VS6. Stations within the 9 zones require 2 contacts in each zone, with 2 VS6 contacts. Only contacts after 1st January 1979 are valid. Fee is US$3.00 or 25 IRCs.

FIRECRACKER AWARD. Six contacts with different VS6 stations. Stations in zones 18, 19, 24 to 28 require 10 contacts with different VS6 stations. Only contacts after 1st January 1964 are valid. Fee is US$2.00 or 10 IRCs.

The usual conditions apply to these awards: Send certified log extracts only; no QSL cards are required. Payment to be made in cash or checks payable to HARTS. If sending postal orders please leave payee blank. Claims to Awards Manager, HARTS, G.P.O. Box 541, Hong Kong.

HONG KONG—ACORNS TO OAK TREES

A couple of years ago, the International DX Foundation ran an expedition to several different countries in the Far East which ended up in Macau where, after completion, the team left for the United States and left the amateur radio gear in Macau to be used by subsequent visiting amateurs. The equipment was in fact used twice and then returned to me (VS6CT) in Hong Kong for return to America. However, by the time freight costs were taken into consideration, it was felt that it would be better to sell or donate the gear to worthwhile persons. A Yaesu 901 was sold, a Denton linear was donated to 9M8PW, and the other transceiver—a Yaesu FT-101ZD—was donated to the Boy Scouts Association of Hong Kong.

As a direct result of this donation, one of our regular licensed amateurs, Kenny Chan VS6CN took on the task of organizing a radio club within the Scouting movement here in Hong Kong and commenced training classes for 20 interested Scouts. Happily, they all sat for the City and Guilds of London, Radio Amateur Examination, held at the beginning of December and we eagerly await the results, due early in 1983. Possibly by the time you read this, VS6EA, the Boy Scouts Club station, will be on the air operated by new licensees whose introduction to amateur radio was brought about solely because of the International DX Foundations donation of gear.

Another tale in a similar vein was that of the committee of the Hong Kong Amateur Radio Society (and myself as President) getting the Hong Kong Post Office to extend the no-code VHF license currently available in the United Kingdom to Hong Kong. The first committee session with the Post Office was set up early in 1981, and after much discussion the first VS6X license was issued in the spring of 1982. To date, we have 55 no-code VHF licenses issued, opening a new era in amateur radio activity in Hong Kong. The most interesting aspect was in persuading the local Post Office not to follow the UK regulations too tightly and allow local use of 50 MHZ in keeping with ITU recommendations that no-code licenses be permitted to operate above 30 MHZ.

The enthusiasms of this new group of amateurs is refreshing; the first weekend in December, on their own initiative, they attempted 2-meter DX to Japan from Hong Kong, spending 36 hours under canvas on a high hilltop above Kowloon with a 40-element array on 2. Japan was heard, but the reverse, this time, was not, so all that could be credited was a cross-band contact; but it's a great start for a totally new group of amateurs and we are hoping for greater things to come.

AMATEUR RADIO IN HONG KONG

As Hong Kong is linked with the United Kingdom in all matters relating to international affairs, it follows that we adhere to those conditions of licensing applicable in the United Kingdom, except where region three varies in frequency allocation, i.e., we use 50 MHz, which is not allocated in the UK.

There currently are two classes only of amateur license issued in Hong Kong, the full license for all bands, all modes and the restricted license, telephony mode with frequencies in the 50, 144, and 430 MHz bands.

The requirements for a class A license issued to a newcomer to amateur radio in Hong Kong are that he should be over 16 years of age, a British subject, have passed the City and Guilds Radio Amateur Examination, be proficient in the Morse code,

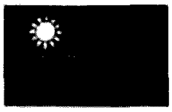
tested to 12 wpm, and have paid a HK$100 annual license fee.

For a class B license (restricted, telephony only) there is no requirement for the Morse-code proficiency test.

The above licenses are issued to persons who will be resident more than three months in Hong Kong. In the event that a person takes up residence and has an overseas license, he will be granted a full VS6 license of the class which he holds, i.e., a full or restricted license.

Currently, the conditions of the existing license are being reviewed as it contains no permission to operate mobile, although oral agreement has been given and we have considerable activity on two meters, where we have two repeaters—VS6HK, 145.650-150 and VS6KP, 145.750-150.

For propagation purposes we also are operating two beacons, both located at Mt. Kellet on Hong Kong Island at an elevation of 500 meters—VS6TEN on 28290 and VS6SIX on 50.075.



TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan
Republic of China

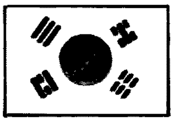
Sherry and Wayne W2NSD were here to participate in an electronic show sponsored by Taiwan manufacturers. The Greens had been to Taipei at least three times in years past, and were pleased to see the changes and development of Chinese electronic products. The exhibition takes place annually and attracts visitors and buyers from all directions. In the show this year we saw that computer science is quite popular and fascinating.

During October and November I had 25 hams or radio fans visiting my station BV2A/BV2B (the only licensed station in Taiwan). In November, I won the first place trophy of the International Lions Club Radio Contest on CW. This led to considerable publicity which I was able to use to promote the interests of hams and amateur radio. For example, the Taiwan Broadcasting Corporation and its substations across the territory have widely commended the great interest in ham activities and urged local authorities to grant more station licenses without delay.

Director chairman David Rankin 9V1RH/-VK3QV was traveling on his way to Singapore from Tokyo and stopped over at Taipei last October. Accompanying me, David was to exchange information on world amateur radio with a VIP of the Post and Telecommunications Department. His impression is that Taiwan is a free and open society with a booming economy and many progressive youths keeping abreast of the state of the art in sciences. He felt that there should be many more ham stations on the air. However, the China Radio Association and Amateur Radio Commission are working closely on this matter.

Please note the following:

- For BV2A, QSL manager is Charlie Moraller K2CM in the States.
- For BV2B, QSL direct to PO Box 30-547, Taipei, R.O.C. (Box 101 will not be used after February, 1983).
- On Wednesday, 1130-1400Z BV2A CW 21030/21100 or 14025/14040, and SSB 21270/21350 occasionally. Also, 1400-1600Z BV2B SSB 14218/14250±.
- On Saturday, 2300-2400Z BV2A CW 14025/14040 or BV2B SSB 14218/14250.
- On Sunday, 0000-0200Z BV2A CW 21030/28030 or BV2A SSB 21350/28530.



KOREA

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CPO Box 2961
Seoul, Korea

Amateur Radio in Korea is on the upswing with the announcement last year that Seoul would be host to the Asian Games in 1986 and the Olympics in 1988. Until that time, little notice was given to the public relations aspect of ham radio by the Korean government or by the average citizen. With the active efforts of KARL (the Korean Amateur Radio League) and AARCK (American Amateur Radio Club of Korea), ham radio has almost become a household word. In the past year, many newspaper and broadcast accounts of the public service aspects of the hobby have reached the public, and the government is beginning to ease its stringent control of the import of transmitting equipment and also is allowing new modes of operation.

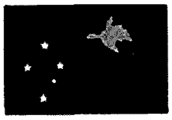
In Korea, operation is permitted by Korean nationals who pass a written exam and, in some cases, a CW test. The most popular license is the 3rd class radiotelephone license. This is obtained by passing a comprehensive theory, regulation, and operational examination administered twice a year by the Ministry of Communications (MOC). There is no code exam for this class license and the written exam is roughly equivalent to the US General Class FCC exam. Privileges for this class are phone operation only in the 80, 40, 15, 10, 6 and 2m bands. The 3rd class radiotelegraph exam is the same as for radiotelephone but includes a CW test and allows CW operation on the same group of frequencies. The power limit in both cases is 50 Watts output.

A more difficult exam, including a section on English ability and a faster code test, brings a Korean ham the 2nd Class License with 100 Watts and additional operation on 20 meters. A small number of Korean hams have the coveted 1st Class Ham License which permits transmitter output power up to 500 Watts and has an equivalently more difficult examination. If an aspiring Korean ham successfully gets his operator's license, he may operate a club station and/or apply for his own station license.

At this writing, although the licensed operators number more than 7,000, fewer than 700 club and private station licenses have been issued. There are several reasons for this, the most important being the difficulty in getting suitable transmitting equipment. Additionally, the issuance of a station license (and hence a callsign), is extremely difficult. Due to the security problems of a divided Korea, the north being a hostile state, a close background check is conducted on all individuals applying for a station license. When the background check is cleared, then permission to construct a station is forthcoming.

If an individual is successful in obtaining some transmitting gear and puts up his antenna system he will then be issued a callsign. But his actual permission to operate is not issued until inspectors from the MOC have visited the ham's shack and confirmed that the station complies with current regulations as specified by the ham's class of license. Only then may the new ham go on the air and begin to really enjoy the international hobby to its fullest extent.

Even if the new ham submits his application for station license immediately, it takes upwards of 6 months to get on the air. For the benefit of newcomers with no knowledge of amateur radio regulations, operation, or theory, KARL conducts three-week cram classes several times a year. What about those HL9 stations you hear with American accents? We'll cover amateur radio licensing for foreigners in next month's column. 73 from the Land of the Morning Calm.



PAPUA NEW GUINEA

Siegi Freymadl P29NSF
PO Box 165
Rabaul, Papua New Guinea

In a country of inaccessible terrain such as Papua New Guinea has to offer, communications are of vital importance. As far as telecommunications are concerned, this country has one of the most modern microwave systems with some of the transmitters powered by solar energy. We can dial STD and ISD. This is a country of paradoxes, where Stone-Age and modern technology coexist.

The radio amateur is privileged in PNG, as generally he is not restricted as to number or height of antennas and has less QRM to contend with. This is particularly so in my case. I live on New Britain Island 80 km from Rabaul, on a cocoa/copra plantation. We have no neighbours for 5 km on either side, no television, and no local council to object to the "antenna farm"—an amateur's paradise.

To become an amateur, one has to sit for exams identical to those given to candidates in VK, on the same days, and at the same time as in Australia. For the CW exam, one now has to make the trip to Port Moresby where the radio inspector will give the test (700-km crow-flight miles, but *many* more by sea from Rabaul). That is one reason why I now will have to remain a Novice! Traveling that far is out of the question.

When I sat for the Morse exam a little over three years ago, the radio inspector came to various centers to hold the tests, but, of course, it proved to be too costly an exercise for the department. Then, the theory and regulations papers were mailed and kept in the care of the local postmaster until the day and hour of the exams. One then completed them under his watchful eye.

Amateur licenses are issued by the Radio Branch of the Posts and Telecommunications Corporation in Port Moresby and the licensing fee is K6.00 per annum (about $7.50). The Papua New Guinea Amateur Radio Society is the official body representing amateurs in PNG, and Peter P29PS is the interim president. The address of the PNGARS is PO Box 204, Port Moresby; the address of the QSL Bureau is PO Box 141, Port Moresby. There now is a North Solomons Radio Society for amateurs on Bougainville Island, but at this time I have no further details.

There are around 120 amateurs in PNG, of whom one is a national: Sidney Kulupi P29SK, who is the manager of the Radio Branch.

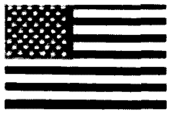
There are two repeaters: P29RPM Port Moresby 146.40/147.00 and P29RAE Mount Albert Edward 146.05/146.65. A repeater is in the process of being built at Bougainville which we hope will link up with Mt. Albert Edward.

The PNGARS has a society net every Thursday on 3565 KHz ± QRM, at 0930 GMT. The Society also publishes a newsletter, *Garamut* (a garamut is a native drum), which appears sporadically. One of the biggest problems probably is that the amateurs are scattered over such a vast area. For instance, on my 600+ km long island there are only two other amateurs, both in Rabaul: Andy P29SA and Syd P29SS.

The PNGARS sponsors the very attractive Bird of Paradise Award. Requirements are seven contacts (all bands permitted, all modes) with amateurs in five different provinces. (There are 19 provinces in Papua New Guinea, although there are not amateurs in every province.) The awards manager is Col Button P29NAB, PO Box 2450, Konedobu, National Capital District, Papua New Guinea; the fee is K2.00 or 10 IRCs. It is a good idea to ask for details of the province, when making contact with a P29 amateur. The Bird of Paradise Award is a beautiful one and certainly an adornment to any shack, but Col reports very few applications of late; so how about it?

At the moment, conditions are very poor on 15 and 10, but I am very active and doing my best to put P29 on the map. Of course, 20m is off limits, as I am only a Novice.

That's all for today. I'll see you next month with more news. Best 73!



GUAM

J. T. Pogue KH2AR
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We have a popular T-shirt here that reads WHEREINTHEHELLISGUAM? That's a fair question, and the answer to it seems like a good way to begin this column about our island.

For you geographers, Guam is located at 13°28' north and 144°45' east. For the rest of us, that translates as roughly 3600 miles west of Honolulu, 1500 miles east of Manila, 1500 miles south of Tokyo, and 6000 miles west of Los Angeles. It is the largest island connected with the US government between Hawaii and the Philippines, as well as the most populated. Indigenous residents (composed mostly of native-born Guamanians and people of Filipino, Japanese, Chinese, and Korean ancestry) number approximately 85,000. There are also another 20,000 people connected with the US armed forces and US government.

Guam is often known in this part of the world as the "Caribbean of Japan." With more than 75% of the annual 300,000 tourists coming from there, the title seems to fit.

From 1521 when Magellan stumbled upon the island until 1898, Guam was part of the Spanish Colonial Empire. Administered first from Mexico, then later from the Philippines, Guam was an important link in the flourishing galleon trade between east and west. As a result of the Spanish-American War, Guam came under the mandate of the US government. With the exception of a period of Japanese occupation during WW II, the island has progressed steadily toward modernization, Americanization, and self government.

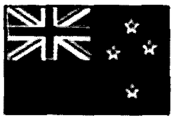
The island's present status is that of an unincorporated territory. However, there now is a newly-kindled interest in changing this status to full commonwealth. The people here remain some of the most loyal and patriotic citizens under the US flag.

Ham radio got an early start on Guam. With the presence of many US servicemen and civilians in the early part of the century, it proved to be a great source of recreation as well as a convenient way to stay in touch with the rest of the world. The FCC didn't seem to show much interest in callsigns prior to WW II, so the fellows who operated from here invented their own prefix. The OM prefix (which stood for Oceania-Marianas) may be familiar to some old-timers.

After the war, the FCC got its act together and established the KG6 prefix with the additional allocation of KG6R, KG6S and KG6T for the newly acquired trust-territory islands of Rota, Saipan, and Tinian respectively. Later, in their sometimes confusing "wisdom," the feds once again changed these prefixes to KH2 for Guam and KHØ for the Northern Marianas.

At present, there are approximately 100 hams on Guam, with roughly 60% of them active on HF. The ham population is about 75% military and 25% civilian. With frequent transfers for the military people, the ham population receives a constant infusion of new operators anxious to add the KG6 or KH2 prefix to logs around the world.

Until next time, Hafa Adai from Guam.



NEW ZEALAND

D. J. (Des) Chapman ZL2VR
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Napier
New Zealand

The amateur radio scene in New Zealand as observed through the latest available IARU statistics informs us that there are 5631 licensed operators here, 2898 (51%) being members of the New Zealand Association of Radio Transmitters (NZART), the New Zealand equivalent of the ARRL. Our current net annual increase in licensed amateur operators is about 6%, or around 300 each year. Amateur radio operator examinations are held twice each year, in March and September, and they attract about 500 candidates; the pass rate is approximately 50%.

A growth comparison with the United States from the same IARU statistics available here in New Zealand indicates the present US net growth rate is a little over 1%, so, even though there are many more amateur radio operators in the USA, the growth rate here is approximately six times the US growth rate for our hobby. Therefore, even though we are a small country (population about 3.5 million) amateur radio is very much alive and on the increase in popularity here, "down under."

Our regulatory body is the New Zealand Post Office, a government agency. (The Post Office in New Zealand operates, controls, and constructs the telephone, telegraph, telex, and radio-telephone communications network services, savings bank services, collection and distribution work on behalf of other government departments and agencies, as well as the postal and mail-handling services.) The amateur service is controlled and regulated by Radio Inspectors of the Post Office, who also control and regulate all radio broadcasting and communications services, commercial and private. There is an annual license fee of about US$10.00 for an amateur radio operator's license, and our maximum allowable power input is 150 Watts.

The ZL scene covers most aspects of our hobby—ATV, slow scan, RTTY, VHF, UHF, SHF, EME, AMSAT, and, of course, CW, SSB, and a little old-fashioned AM.

In future columns I shall discuss in depth the activities in these and other specialized aspects of our hobby practiced here on the New Zealand scene. Also from time to time I will cover awards within ZL, DXpeditions within our area, contests, and other subjects considered to be of interest to amateur radio readers of *73*.

BITS 'N PIECES

For prospective visitors to ZLand, a reciprocal license is easily obtainable from the Radio Inspectors Branch of the Post Office, provided the amateur's country of origin has reciprocal rights with ZL; I shall supply the necessary information on this subject in another issue.

There is a fairly extensive 2m VHF repeater network covering the two main islands, and also some 70cm UHF repeaters in the four main centers and in one or two other areas. So, for the visitor, a 2m hand-held opens up the ham scene through any of the 45 repeaters in the system as you travel throughout our country. If the overseas amateur operator is fortunate to be visiting a locality when the local Radio Club monthly meeting night is scheduled, a warm welcome awaits the visiting ham, and he/she is usually escorted to the meeting venue by one of the local members. Over the past 12 months my local club, in a town of just under 50,000, has been host to visitors from Canada, the United States, Australia, and South Africa at our monthly meetings—and it is only one of the 80 branches (clubs) of the NZART scattered throughout New Zealand!

COMING ZL HAPPENINGS

World Communications Year, 1983—New Zealand Activity Day, 0000 GMT to 2400 GMT, May 21—the Council of NZART has designated this 24-hour period as our main activity for WCY. ZL operators will be active on all bands and modes for the 24-hour period to ensure that New Zealand does its bit toward WCY. Special callsigns will be used for WCY Activity Day—ZLland has been divided into 8 regions, and each regional coordinator has been allotted a WCY callsign for use by the stations operating in their areas, demonstrating ham radio to the public.

Look for ZLs 1 to 4 and 6 to 9 WCYs during the 24-hour period on all bands and all modes; see if you can work all 8 regions on the special activity day.

Commemorative QSL cards will be sent to all stations contacted by New Zealand WCY Activity Day/stations via the QSL Bureau system. However, if your station does not participate in the system, the operator *must request direct QSL at the time of the QSO*, and send an SAE plus 3 IRCs with details of the QSO, to the ZL WCY station worked, c/o NZART QSL Bureau, PO Box 40-212, Upper Hutt, New Zealand. It is not necessary to send your QSL card—our Commemorative QSL card will be sent automatically via the QSL Bureau unless otherwise arranged during the QSO.

NZART Annual Conference and Convention—Friday, June 3, 1983, to Monday, June 6, 1983, at Dunedin in the South Island, ZL4 land. Overseas visitors very welcome. Enquiries to PO Box 6050, Dunedin, New Zealand.

Should there be any questions from *73* readers about the ZL amateur radio scene, or on topics discussed in this column, write to me at my ZL address, but please include 2 IRCs for an airmail reply. All letters will be answered, provided the return postage is included as requested.

CHILE

Patricio Fernandes H. CE3GN
PO Box 14781
Santiago de Chile

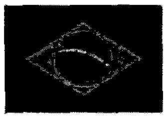
The Radio Club de Chile was founded by a small group of visionary radio experimenters on July 12, 1922, and has just celebrated its 60th year since that date of historical significance for all Chilean hams. The Chilean Society has grown to be one of the most active radio organizations in all of South America.

The club, a member of the IARU since its founding, owns a comfortable two-story building with a variety of facilities for the club's 2,200 members. There is a conference hall which can hold over 500 people and three radio shacks with modern equipment for all modes. The building also contains several classrooms for students attending the various courses given throughout the year which prepare them for the final examinations before getting their Novice and General tickets.

The Import Department provides members with up-to-date equipment from different manufacturers all over the world. The club even has a stock of a variety of gear which is sold to members at convenient prices. Another office, the VHF Department, is in charge of the various 2-meter repeaters belonging to the club, which are located at very high spots around Santiago. The QSL bureau service is also very active, handling over 150,000 cards per year.

The events commemorating the 60th anniversary showed that the club holds an important place in Chilean affairs. There was a Chilean commemorative stamp issued on December 29, 1982, and a big meeting at one of the auditoriums of the Diego Portales Building in downtown Santiago. Over 400 members and important government authorities were present, including Colonel Jaime Machuca, Subsecretary of Telecommunications. The Colonel was representing the President of Chile, General Augusto Pinchet Ugarte XQ3GP. Also present were Carlos Kaufman, president of Radio Club Argentino, representing both the IARU and the ARRL, and Sr. Enrique Sazie, one of the founders of the Radio Club de Chile. A plaque and gold medal were presented to him in recognition of his extensive work on behalf of amateur radio.

Also, a private lunch was held at CE3JK's QTH in honor of Carlos Kaufman, and in the evening there was a meal served for over 250 people at a private club in Santiago, at which Rogelio Gomez, president of the Radio Club de Chile, presided.



BRAZIL

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Brazil

Gerson Rissin PY1APS/PY7APS
PO Box 13178, Copacabana
20000 Rio de Janeiro, RJ
Brazil

The Rio DX Party first sponsored last October by the Brazilian CW group, PPC (the Picapau Carioca—the Carioca Woodpeckers), with the cooperation of all other Brazilian CW groups, will be held again from 1500 UTC March 26 to 1500 UTC March 27. The main purpose is to promote two-way QSOs between Brazilian and DX stations, enabling both to FB QSL for awards and so on. No logs, no nothing except quick QSLing is essential. Exchange RST/Name/QTH, and try to get as many rare Brazilian prefixes as you can. There are 26 (or even 27 if you are lucky to get one of the rare Brazilian ocean islands PYØ prefixes).

For best fun, the best CW operators in Brazil will be invited by calls and letters to join in so that prefix-hunters can have a good day! Ever get a PU8 CW QSL? No? Neither have I! So, I'll meet you at the Party, with the PT8s, PR7s, PT9s, PS8s, PY9s, and, who knows, maybe even a PU8, too!

All HF bands, first 20 to 50 kHz, and also from 21130 to 21150 kHz, aiming at USA Novices.

Brazilian prefixes, in order, are:
PP1—Espirito Santo ES
PP2—Goias GO
PP5—Santa Catarina SC
PP6—Sergipe SE
PP7—Alagoas AL
PP8—Amazonas AM
PR7—Paraiba PB
PR8—Maranhao MA
PS7—Rio Grande do Norte
PS8—Piaui PI
PT2—Distrite Federal DF (Brasilia)
PT7—Ceara CE
PT8—Acre AC
PT9—Mato Grosso do Sul MS
PU8—Amapa AP
PV8—Roraima RR
PW8—Rondonia RO
PY1—Rio de Janeiro RJ
PY2—Sao Paulo SP
PY3—Rio Gran de do Sul RS
PY4—Minas Gerais MG
PY5—Parana PR
PY6—Bahia BA
PY7—Pernambuco PE
PY8—Para PA
PY9—Mato Grosso MT
PYØT—Trinidade Island
PYØF—Fernando de Noronha Is.
PYØS—Sao Pedro/S. Paulo Rocks

RECIPROCAL LICENSES IN BRAZIL

These are the countries Brazil has reciprocal licenses agreements with: Germany, Bolivia, Canada, Chile, Costa Rica, Great Britain, United States of America, Paraguay, Portugal, Dominican Republic, Sweden, Switzerland, Denmark, Venezuala, Colombia, and France.

OLD MISINTERPRETED CW

Just like everywhere else, in Brazil there are many yeses and many nos to CW! The same empty arguments, the same Bla-Bla-Bla (empty talk) we hear and read from all parts of this radio amateur world of ours! The only difference is: Here we are acting different! We work for CW instead of keeping talking and talking. Since 19 years ago, the PPC Group (the only CW group) has been helping, developing, and stimulating CW use among radio amateurs in Brazil. First there was a very simple 10-Member QSO Award; then a National CW Contest; then a second one (a QRS Contest for beginners); then Certificates—about 5 or 6—and a PPC Certificate Hunters Club; then new awards and certificates aiming at DX operations, jumping frontiers in all directions and considering two-way interests; and now, the Rio DX Party twice a year and supervision of the WWSA CW Contest (Worldwide South American Contest), sponsored by *Electronica Popular*, the only Brazilian radio amateur magazine, and in close supervision of GACW Argentina CW Group, wherefrom came the idea.

And how about results? You may ask! First, many many other CW groups were

born, all aiming exactly at the same ideals. New Brazilian hams are studying CW not just for examination purposes but because they love CW and because CW is now a very strong mode in Brazil.

Still suspicious, friends? Well, question the fabulous family of Brazilian CW groups: GPCW in Santos SP, CWSP in S. Paulo, GCWA in Araras SP, ABCW in SP, UBR in Recife, PACW in Para, CWSA in SP, CWRJ in Rio, PRCW in Curitiba, MCG in Rio Grande do Sul, Tabajara Tribe in Espirito Santo, Pantaneiro in Mato Gosso, CWDF in Brasilia, CWMG in Minas Gerais, and I *can't* finish because there's a new one born every moment!

RESULTS OF THE 1982 WORLDWIDE SOUTH AMERICA CW CONTEST

DX Winners

7 MHz—JH7BDS
14 MHz—OK2TBC, JH1IFS, JA1OHP
21 MHz—F6DKV, W4VQ, DL1BBO
28 MHz—EA7CJM
Multi-Band—DL8KJ, AI9J, N6MU
Multi-Op—LZ1KDP, OK3KEX, JA7YOJ

South American Winners

3.5 MHz—CX8DT, LU2DPW, PY2RNJ
14 MHz—PY5MR, PY7HQ, PP2JT
21 MHz—PY1DPP, PY1TCJ, PY4SS
28 MHz—PY1CBW, PY1EHN/PY8, PY7CW
Multi-Band—CX7BY, LU9DIE, YV4BOU
Multi-Op—PY2EXD, PY1EDB

Continental Winners Multi/Single

Africa—	ZS6ME
Asia—	JF1YPF
Europe—	DL8KJ
N. America—	AI9J
Oceania—	KH6CP
S. America—	CX7BY

Continental Leaders—Multi/Multi

Asia—	JA7YOJ
Europe—	LZ1KDP
S. America—	PY2EXD

AWARDS

UBR AWARD. Sponsored by the CW group Uniao Besouros do Recife, the UBR Award is available to all licensed amateurs for confirmed contacts with UBR members. Contacts must have been made after September 1, 1975, on any amateur band. Only two-way CW mode. No QSL. Send GCR log of stations worked (call, date, time, band, mode, and report) and 10 IRCs to: Uniao Besouros do Recife, PO Box 1153, 50000 Recife, Pernambuco, Brazil.

There are no special endorsements for the UBR Award.

UBR Members:

PY7AEF	PY7CC/1	PP6AAC
PY7ADL	PY7DM	PP7IE
PY7AEV	PY7RO	PP7FAL
PY7AOR	PY7RX	PP7JCO
PY7AVZ	PY7ZZ	PR7AEN
PY7AW	PY1AFM	PR7CM
PY7BBX	PY1APS	PT7AW
PY7BTX	PY1DHG	PT7AC
PY7BXC	PY1RJ	PT7PA
PY7CCZ	PY3AVF	PT9EJ
PY7CW	PY5NR	

DCM AWARD. Sponsored by LABRE—Rio de Janeiro, the DCM (Wonderful City Award) is available to all licensed amateurs for confirmed contacts with stations located in at least 10 Administrative Regions (RA) of the city of Rio de Janeiro (the well-known Brazilian Wonderful City). There are no special endorsements for the DCM Award. Contacts may be made on any date, in any band, and in any mode. Send log of stations worked (call, date, time, band, mode, and report) together with the QSL cards and 5 IRCs to: DCM Award, LABRE—Rio de Janeiro, PO Box 58, 20100 Rio de Janeiro, RJ, Brazil.

THE FIRST BRAZILIAN AMATEUR

In 1909, in the city of Curitiba, state of Parana, South Brazil, Livio Moreira began his first experiments in wireless transmissions. Together with his friend Flavio Luz, they constructed two radios with crystals of carborundum and with antennas sixty-five feet high. In 1910, for the first time, they could exchange signals between their houses, about 1.2 miles of distance. In 1912, when he was in Germany on a governmental mission, he studied what Germany was doing in that field.

After the first World War, Livio continued his experiments, and after hard work he finally built in 1924 a transmitter delivering 10 Watts which he used for his rare contacts. The first broadcast station, founded in his state in the same year, also used this equipment for its transmissions.

After the establishment of the Brazilian Amateur Radio League, he received the callsign PY5AG. Our homages to Livio Moreira—The First Brazilian Amateur.

SWITZERLAND

Peter W. Frey HB9MQM
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Switzerland

Switzerland may be the country of breathtaking scenic beauty, the land of banks reportedly solid as a rock, and of cheese famous the world over, but it is certainly not an award hunter's heaven. I know of only two awards issued by local clubs (Old Lucern Award and Lake Zurich Award), and the national society, the Union of Swiss Short Wave Amateurs (USKA) also has just one award to offer—the Helvetia Award.

This last award, named after the tribe of the Helvetians who settled in Central Europe during Caesar's reign, is definitely not an easy one to work. You are required to show proof of contact with stations in all of Switzerland's 26 cantons (or states), many of them smaller than an average county in the United States and some of them with a ham population of fewer than ten amateurs licensed to operate on HF. Whereas it's quite common to get in contact with a station in one of the big city cantons of Zurich, Berne, Basle, or Geneva, it can prove rather frustrating trying to get hold of an amateur in one of the rural cantons like Appenzell-Innerrhoden or Obwalden where there are fewer than five licensed operators! No wonder a German award hunter recently remarked to me, "It's darned-sight easier to work 50 states for the WAS than it is to work 26 cantons for that Swiss award!"

The Helvetia award is issued for HF contacts on or after January 1, 1979, in three categories: CW and/or phone, RTTY, and SSTV. The award can also be worked on 144 MHz, 430 MHz and 1.3 GHz. So far, no diploma has been issued in the RTTY or SSTV categories and only one Swiss amateur has succeeded yet in working all 26 cantons on 23 centimeters. Hansruedi Lauber HB9RG, the proud owner of the first Helvetia award on SHF: "Exactly half of the contacts were made with expeditions staged especially for the purpose of giving me another canton. Without the help of many friends this would not have been possible!"

Expeditions—that is the way to work those rare cantons on HF, too. Expedition time in Switzerland is coming up soon: During the Helvetia contest usually all cantons are put on the air, and this year's affair runs from Saturday, April 23, 1400 UTC until the same time on Sunday, April 24. There is a good chance, for example, to get hold of the canton of Appenzell-Innerrhoden during this contest. Listen for the call sign HB9OE. Or, if you still need that rare canton of Uri, the operators of club station HB9AJ will be happy to be of help. The Helvetia contest runs on all bands from 180 meters to 10 meters, WARC bands excluded, and is a phone/CW affair.

If the Helvetia awards sounds like a challenge to you, why don't you contact USKA's awards manager for a copy of the rules. Write Walter Blattner, PO Box 450, CH-6601 Locarno, Switzerland. If you would like to know more about the Helvetia contest, the man to contact is USKA's traffic manager, Gody Stalder HB9ZY, Tellenhof, CH-6045 Meggen, Switzerland. Both would appreciate an SAE with two or three IRCs for an airmail reply.

WEST GERMANY

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West Germany

Ralf Beyer DJ3NW
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3300 Braunschweig
West Germany

If the purpose of a contest is the testing of one's own station and operational abilities under difficult conditions, this one may be considered as a contest in the classic meaning. The calls and comments we received after the contest indicated that many alterations of individual FAX stations were made as a result of gained experiences. This first FAX contest resulted in a number of function-related discoveries, not only in a technical sense but also from an operational point of view.

Responses were very positive as a rule and all participants seem to have enjoyed the event. Total participation of about 30 different stations was unexpectedly high. We wish to thank especially the 18 stations which sent in their logs. Class A was well represented with an input of 9 logs. Unfortunately, no log was received for class B. Also, we missed the logs of those amateurs from class C who are usually involved in satellite receiving. Contest traffic took place on 80-, 20-, and 2-meter bands. A maximum of 7 countries could be worked.

The following stations were monitored on shortwave: DF7NF, DF7XA, DF0BUS, DJ8BT, DL2XP, DL6FAG, DL6LAG, EA4TI, F8ACU, F6AEO, F6CDX, G3ZJG, G4KGB, HB9BZY, LX1BC, LX1PO, LX1SW, LX2FD, and OE9AHI. Also on UKW were QRV: DB2HA, DB4LM, DB0DB, DD8BP, and DL9LAG.

The conditions on 80 and 20 meters were satisfactory, depending on the time of day. Conscious interference by CW, RTTY, and/or SSB stations could not be observed, and we are grateful to these operators. The contest rules have proved valid, in our opinion, but rules for the next contest will have to be revised in connection with club stations.

We wish to express our gratitude in the name of the German Amateur Radio Club (DARC) to all contestants and their efforts. Our congratulations for the winners of class A and C. All contestants who sent in their logs to the first DARC FAX contest will receive a certificate in remembrance of this event.

CONTEST 1983 DARC "CORONA" 10-METER RTTY

DARC has the great pleasure to invite radio amateurs worldwide to participate in the annual 10-Meter RTTY Contest, which is held to increase RTTY activity on the 10-Meter amateur band. There will be four tests through the year. Each test scores separately.

Schedule: 1st Test, March 5th, 1100-1700 UTC; 2nd Test, May 8th, 1100-1700 UTC; 3rd Test, September 3rd, 1100-1700 UTC; 4th Test, November 8th, 1100-1700 UTC.

Band: The recommended portions of 10 Meters.

Contest Call: CO CORONA TEST.

Exchange: RST/QSO Nr./Name

Points: Each station to be contacted once only. Each complete 2-way RTTY QSO is worth 1 point.

Multiplier: Use the WAE and DXCC country list, add each district in W/K, VE/VO and VK.

Scoring: Total multipliers times total number of QSOs.

Classes: A—Single or multi-operator; B—SWL printer.

Logs: Must contain name, call, and full address of participant/Class/Time in UTC/Exchange/Final score. SWL printers apply according to the rules.

Deadline: Each entry must be received by the manager within 30 days after each test.

Manager: Klaus Zielski DF7FB, PO Box 147, D 6455 Erlensee, West Germany.

Plaques: Will be awarded to the leading

RESULTS OF THE FIRST DARC FAX CONTEST

Class A	Points	QSOs	Countries	Bands	Class C	Points	OSO	Countries	Bands
1. F6ACU	40	8	5	2	1. DK1RB	102	17	8	2
2. GSZJG	32	8	4	1	2. DK6ZW	90	15	6	2
3. LX1SW	16	4	4	2	3. DL8HAV	78	13	6	2
4. HB9BZY	15	5	3	2	4. DF7NF	40	8	5	2
5. F6CDX	15	5	3	1	5. G3VZX	35	7	5	1
5. DF0BUS	12	4	3	2	6. DL3LAT	30	8	5	1
6. EA4TI	8	4	2	1	7. DJ1OT	18	6	3	1
7. DL8LAG	4	2	2	1	8. ON8AG	15	5	3	1
8. DL2XP	1	1	1	1	9. DB4LM	4	4	1	0

Class B: No input
Checklog: DJ8BT

stations in each class with entries with reasonable scores.

LICENSING

As you may know, reciprocal licensing agreements exist between a number of countries and the Federal Republic of Germany. And it is interesting to know which choices you have to obtain a license in this country.

First, the class of license you may apply for: Class A requires something like a Novice or Technician ticket. It allows a maximum power output of 150 Watts or, alternatively, a rig with a maximum plate/collector dissipation (manufacturer's data) in the final amplifier of 50 Watts. You are allowed to operate from 3520-3600 kHz and 21090-21150 kHz in CW and RTTY and from 3600-3700 kHz in AM/SSB. From 28.0-29.7 MHz and 144-146 MHz you may use CW, AM/SSB, RTTY, and narrowband TV.

If you have something like a General or higher ticket, you may apply for a class B license. The power levels permitted are different for individual groups of bands and are indicated in the form of maximum power output/maximum plate or collector dissipation. The following bands are available: 1815-1835 kHz and 1850-1890 kHz for CW and 1832-1835 kHz for CW and SSB at a power level of 75/10 Watts, 3500-3800 kHz, 7000-7100 kHz, 14000-14350 kHz, 21000-21450 kHz, 28.0-29.7 MHz, and 144-146 MHz for CW, AM/SSB, RTTY, and narrowband TV at a power level of 750/150 Watts. The 10100-10150 kHz, 18068-18168 kHz, and 24890-24990 kHz bands are reserved for CW only at a power level of 150/50 Watts. The band subdivisions are governed by the IARU recommendations.

The class C license is a no-code license for 2 meters and up. No comparable counterpart exists in the US. However, amateurs from other countries with a similar license may apply for class C and enjoy AM/SSB, RTTY, and narrowband TV on these bands.

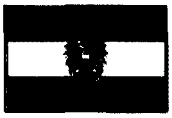
There are several ways to apply. If you are visiting the country for a period of up to 3 months only, you should apply for a license through the German Amateur Radio Association (Deutscher Amateur Radio Club e.V. (DARC), Postfach 1155, 3507 Baunatal 1, Federal Republic of Germany). No particular forms are required but you should state your nationality, full name, date and location of birth, home address, domestic call and class of license, membership in an amateur radio association if applicable, the 3-month period for which a license is desired, your address in Germany and/or the license plate number of your car, a copy of your domestic license, a statement that you have transferred the fee of DM 15.00 to DARC, and a mailing address for your German license after issuance. The DARC will check your application and forward it to the responsible directorate (Oberpostdirektion Duesseldorf) of the German Department of Telecommunications. After 4-6 weeks you will get your license from there with a call like DH/W8XYZ for class A or DL/W8XYZ for class B.

In case you are a civilian staying in Germany for more than 3 months, the procedure is different but not much more difficult. You have to apply directly to the directorate of the Department of Telecommunications of the state you are living in. They will send you the appropriate form on request. But as you have to present a residence permit and a certificate of good conduct, you should be living in the country already before writing your application. Your call will be taken from the DJ0AAA-DJ0ZZZ block with a two- or or three-letter suffix. The annual fee is DM 36.00 (about $15.00).

All applications by military personnel have to be addressed to the responsible section of your unit, which will get in touch with the German Department of Telecommunications directly and provide you with all the information you need. You will be assigned a callsign from the DA1AA-DA2ZZ block.

This is a very brief run-down of what you may expect when applying for a license in Germany. Of course, there is much more in store like operation above 2 meters, getting a license if you have no domestic license, using broadband TV or telecommand modes and so on. These and other topics are covered in full detail in the brochure *Bestimmungen ueber den Amateurfunkdienst* which is much more elaborate than its translations *(Regulations Concerning the Amateur Service* or *Reglement relatif au service d'amateur)*. Copies may be obtained from the Bundesministerium fuer das Post und Fernmeldewesen, 5300 Bonn 1, Federal Republic of Germany.

But best of all: On special events, like international radio amateur conventions in Germany, you may get a license on-site, free of charge, without filling in special forms, and good for 1 week. So have your domestic license always handy when you visit Germany and enjoy some of the most liberal amateur radio regulations in the world.



AUSTRIA

Dr. Ronald Eisenwagner OE3REB
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A-1014 Vienna
Austria

Austria, located in the central part of Europe, has today about 4500 radio amateurs. There is one big society, the OVSV (Osterreichischer Versuchssenderverband), which is a member of the IARU, Region 1. A good 4200 of these radio amateurs are members of the OVSV. The activity is very varied. There are about 40% with permission to operate on all bands; real DX activity is poor. Not more than 200 amateurs can be heard in international traffic and most of the operators can be heard only on the repeaters.

We have two different types of licenses in Austria; one is a General license, which gives the owner the permission to work on all bands and in all modes. For this license, one needs to pass a CW examination at 12 wpm. The other type of license (without a CW examination) gives the possibility to work 144 MHz and above, phone and RTTY only. Repeater activity is big, especially in and around bigger cities such as Vienna, Linz, Salzburg, Innsbruck, and Graz. There are more than 25 repeaters for 2m and a good 15 for 70cm in operation, but as elsewhere, the activity is great only in the morning and evening hours and on weekends. There are some groups with SSB and CW activity on the UHF bands, too, but only a very few are operating in the EME circuits.

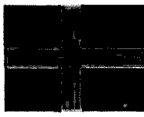
Hearing an Austrian can tell you some information as soon as the call is recognized. The number (1 up to 9) tells you the area from which the station is transmitting. OE1 = Vienna, OE2 = Salzburg, OE3 = Lower Austria, OE4 = Burgenland, OE5 = Upper Austria, OE6 = Steiermark, OE7 = Tirol, OE8 = Karnten, and OE9 = Vorarlberg. The number 0 is not used currently. Normally, the first part of the call is followed by two or three letters. Each letter combination can be found only once in Austria! The administration has put out three-letter calls in the last 15 years, so the owners of two-letter calls have been radio amateurs at least 17 years! For special purposes, the first letter can give further information: X stands for a club station (e.g., OE1XA, the club station of the OVSV, district Vienna), Y for a young lady, and Z for a guest license with permission to operate for more than three months. If a station is portable, it has to put on the end of the call the area locator (e.g., OE1XA/3). For short-time guest licenses one takes one's own call and adds OE on the end (e.g., WB2VMM/OE). No problem to get a guest license, but please keep in mind that everything needs time here, hi!

The technical activities are very varied. There are still many putting together their own gear, or at least parts of it, but most Austrians prefer to walk around the corner and buy the rig. There is not a broad variety of equipment on the market, but one can get nearly every station. Most of the boys are using Japanese gear, but there are also a good number of Drake users. Collins is well known but rather expensive, so one finds only some older models; haven't heard of a new KWM380 in use here.

A whole variety of antennas is in use—mostly Fritzel from Germany, but also Hy-Gain, and some of the top DXers are riding on KLM and more expensive beams. There is not too much antenna home-brewing; most prefer to buy one and put it up! As 99% of the amateurs are limited in space one does not find special antennas for the low bands (and you will find few OEs on 160 and 80). There is no rotatable 80m beam in action here and only a few 2el for 40 from Hy-Gain. So for the low bands one prefers dipoles, verticals, and some forms of longwires. As we are also limited in power, it is a rather difficult job to be in a DX fight!

Presently, the upper limit for personal calls is 400 W HF power output. Club stations are allowed to run 1-kW output. With a new regulation, it is possible to own commercial linears such as the L4B, L7, SB200, and SB220. Before, when we had been limited to 100 W anode dissipation power, most of the linears had been home-brew ones with 4 to 6 TV tubes in them (or a black box below the table, hi). That time is over now, and we hope that with final new regulations, which are expected at the end of 1983, we will be allowed to run 1 kW.

The connection to our PTT is everything between very good and "like a family," but as a good father does with his children, they keep an eye on us! Being on the wrong way can cost some $50 to $100 and in some cases one can lose the license altogether (hasn't happened in recent years).



SWEDEN

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Sweden

Amateur radio is unique in its way of bringing people from all over the world together on a man-to-man communication basis. We feel like we know each other very well thanks to our common interest. Although the amateur radio regulations in all countries are based on the same international ITU regulations, amateurs in various countries are facing different laws. Most of us are not aware of these differences.

This new section will cover amateur radio in Sweden mainly, but being so closely related to the other Scandinavian countries historically and linguistically, news concerning laws and operations in Denmark and Norway will also be dealt with—and also Finland.

In a wider sense, one can talk about the Nordic countries all together and include more or less exotic prefixes like JW, JX, JY, OX, OY, FT, and even 3Y Bouvet in the South Atlantic Ocean. All of these are in some way related to either Denmark or Norway and usually have similar regulations for ham radio.

That there still are considerable differences among these countries, however, has become obvious by the efforts made to institute a common Nordic License. Apart from the sensitive east-west relations because of our geographical location, there are other factors causing difficulties in achieving this. Sweden has four classes of licenses, while the others have only two. Denmark, Finland, and Norway require a code proficiency of 12 wpm for their highest class of license while Sweden requires 16 wpm. Sweden has one class of license for VHF/UHF without code requirement; this is different from the other countries. Finland does not allow mobile operation by a foreigner operating from there. The new WARC bands have been opened for the other countries, but all that Sweden has opened so far is 15 kHz on the 160m band with 10 W input from April 1, 1982. There also are different maximum power levels in these countries. Finland has a maximum power level of 600 Watts output compared to 500 Watts dc input in Sweden.

Today a reciprocal license has to be applied for and a license fee paid when visiting a neighboring country. A reciprocal license in most European countries is valid only for three months per calendar year, and processing time can be over three months long. In a future column I will give specific information on how to apply for reciprocal licenses in Scandinavia and in Finland.

The Swedish Telecommunications Commission (Televerket) has just recently revised our amateur regulations. In a coming column I will tell about the requirements for obtaining a ham license in Sweden and make comparisons with the other countries. I will talk also about the privileges we have and make comparisons with yours in North America.

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2 BAND SLOPER · 80 & 40 Meters	41 ft. long	$ 30.00 frt ppd
3-BAND NO TRAP DIPOLE, 160, 80, & 40M	113 ft. long	$ 66.00 frt ppd
2-BAND NO TRAP DIPOLE, 80, & 40M	84 ft. long	$ 49.00 frt ppd

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BOX 393-S MT. PROSPECT, IL 60056

Pat Williams W4HJW
3575 Arizona Drive
Pensacola FL 32503

The Florida T-R Switch

Get your 2m amplifier out of the way—without a relay.

I had quite a bit of fun being QRP mobile with my TR-2200A and a quarter-wave whip; it's amazing how little power you need to work into the repeaters and even to work simplex. However, it is quite frustrating to need to get out and not be able to. I was, therefore, very interested in the two articles that appeared in *73* (November, 1977 and December, 1977) describing how to build a small amplifier using any of a number of available transistors.

I chose to build the WA2INM variety, but without the COR. The amplifier worked great (getting about 10 Watts out with two Watts input), but no means existed for T-R switching.

A variation of the scheme in W4MNW's design was tried and it worked great. This amounted to the addition of two 1/4 wavelengths of RG-174 as shown in Fig. 1. When receiving, the low level rf is below the threshold to cause the diodes to conduct, so there is a direct path from the antenna to the receiver around the amplifier. Any attenuation from shunting is negligible since the impedance of the tuned circuits is sufficiently high. When transmitting, the high level rf causes the diodes to conduct, which produces a short at the midpoint. The impedance one-quarter wavelength away from a short is high; therefore, the rf passes through the amplifier to the antenna. No T-R switching was used for the 12-volt supply since the amplifier operates class C and no current is drawn until it is excited. A power switch should be provided to apply the 12 V dc, however. The basic construction is still identical to the original amplifier.

Both Jim WA4GND and I have been using one of these units for quite a while and have had excellent results. There has been no noticeable degradation of receiver sensitivity with the diode switching arrangement, and it sure beats having to repeat the call several times. ■

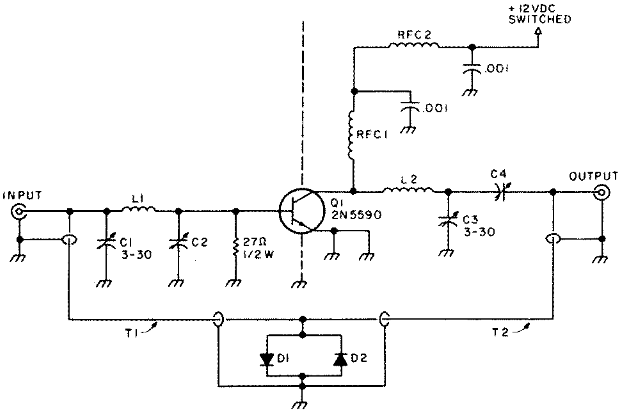

Fig. 1. Amplifier schematic. C2—68 pF mica in parallel with 7-45 pF trimmer; C4—7-45 pF trimmer; D1,D2—1N914; L1,L2—2-1/2 T, #22 solid wire, 1/4" dia., spaced 3/4"; RFC1, RFC2—approx. 6 T #22 PE, 1/4" dia., close-spaced; T1,T2—1/4λ, RG-174 (approx. 13-1/2").

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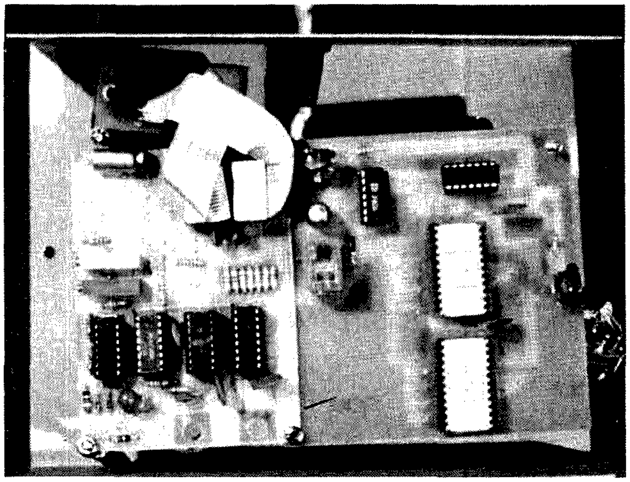

Photo A. Interior view of the cabinet, showing the Motorola kit and the control board.

Lindsey Riddle W5JG
5646 Bellaire Drive
New Orleans LA 70124

Want to stop your TVRO dish on a chosen satellite with a minimum amount of effort? With this system the dish can be changed many times during an evening of viewing without requiring you to get out of your chair.

It is possible with a properly aligned polar mount and dish to swing the dish through a complete orbit (horizon to horizon) and stay properly lined up. (See *Coop's Satellite Digest*, June, 1981, "Polar Mount For All Seasons.") To accomplish this, the BCD (Binary Coded Decimal) of an analog-to-decimal converter (A/D) that is used to show a relative digital readout of the position of the dish is used to open the holding contacts of a relay when the readout of a chosen satellite comes up.

For quite some time, I had been looking for a simple A/D converter that would show the look angle of a

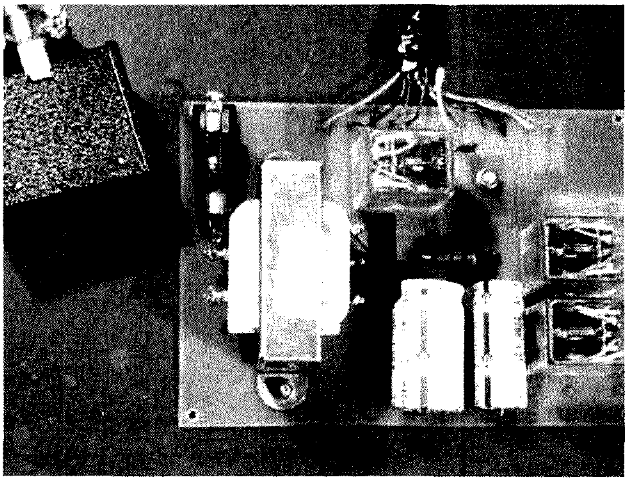

Photo B. The power supply and cable.

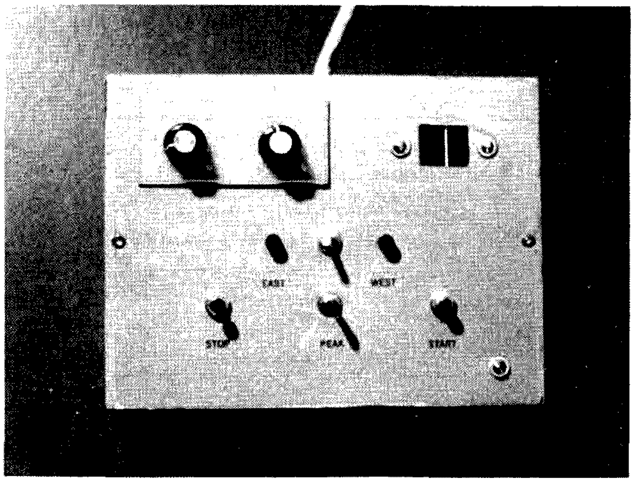

Photo C. Dish control cabinet.

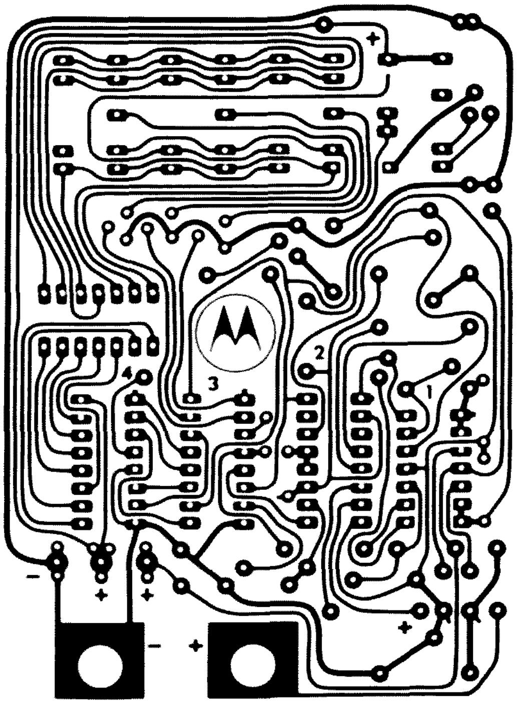

Fig. 1. Motorola PC board (foil side).

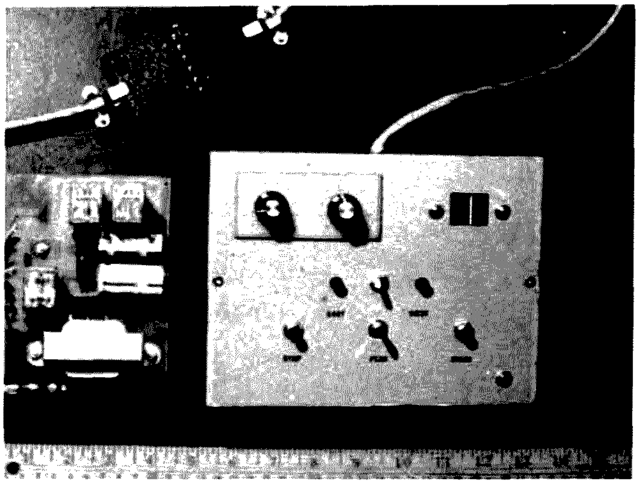

Photo D. Cabinet, power supply, and connector.

dish while allowing the BCDs to be available to control relays, etc. The Motorola 3½-digit voltmeter talking kit had all these features except that it was a strobed unit and I was unable to find a method to interface it to a relay. The unit was sent to Ira Miller of Motorola, and he and Joe Carbaico came up with a strobed BCD-to-line driver (MC 14514) that would allow this to be accomplished.

This article was completed and almost ready to be sent in when disaster struck. It was discovered that the kit had been discontinued. Upon checking with Motorola, I found out that all parts were available except the circuit board. Luckily, I had one on hand, and it was possible to make a film negative. The kit included only the board and the four ICs. The chips are now available from Circuit Specialists, Box 3047, Scottsdale AZ 85257 (MC 3403P, $1.30; MC 1405L, $8.95; MC 14435, $5.95; MC 14511, $1.44). Fig. 1 shows the one-sided board; it measures $2\frac{7}{8}$" × $3\frac{15}{16}$".

Theory of Operation

Potentiometer 1 (Fig. 3) is

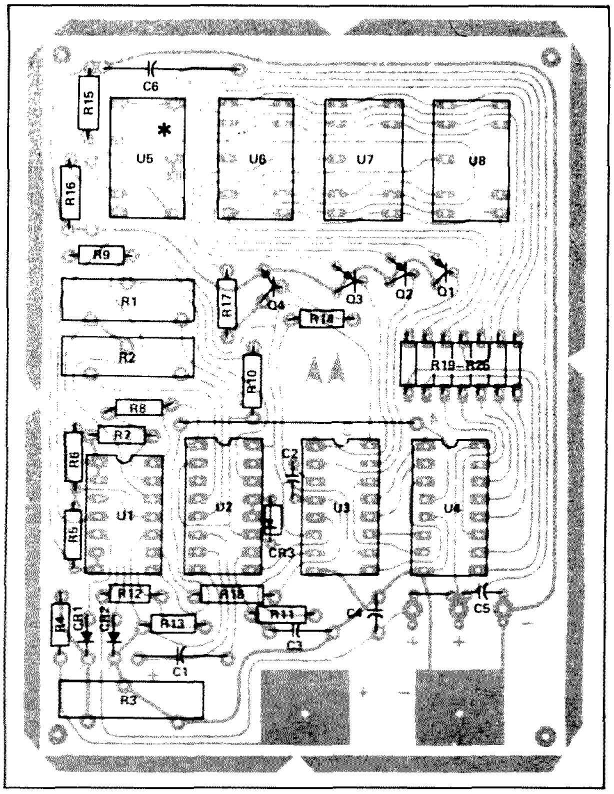

Fig. 2(a). Motorola PC board (component side).

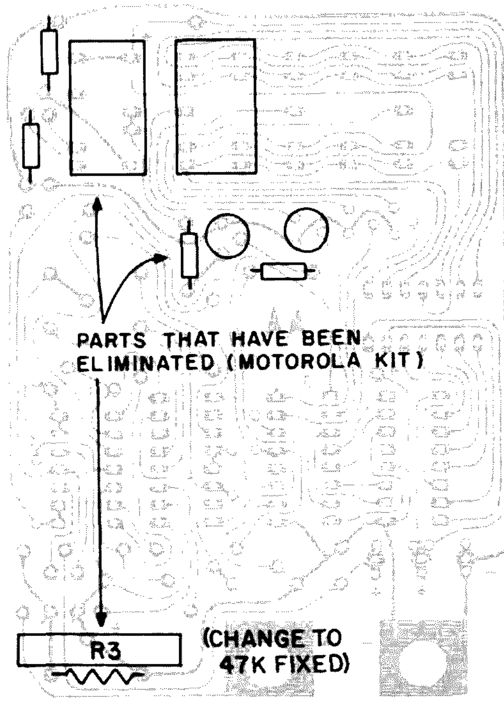

Fig. 2(b). Component side of the Motorola board showing which parts are not used.

mounted so that it turns with the dish and feeds a small varying voltage to the A/D converter; the converter gives a relative readout of the position of the dish. The BCD of the converter is tapped and fed to two MC 14514s (U9, U10)—a 4-bit latch-to-line driver. The converter is not disturbed by this and operates in a normal fashion. A 14514 will take a BCD signal at its input and come out with a pulse on the proper output. It has 10 outputs, so with a 10-position switch it is possible to select any number from 0 to 9. With two 14514s and two switches (SW1, SW2), we can select any number from 0 to 99.

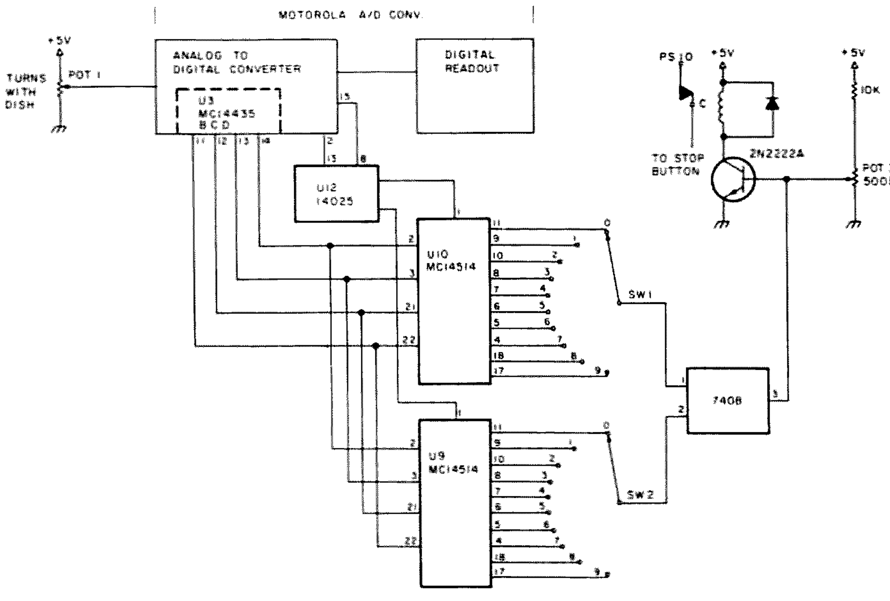

Fig. 3. Theory of operation.

The outputs of the two switches are fed to the two inputs of a 7408 (U11, 2-input positive AND gate). There will be an output pulse of the 7408 only when there are pulses present at both inputs at the same time. When the 7408 has an output pulse it will trigger the 2N2222A causing Relay 4 to open; that breaks the return ground of holding Relay 1 and kills the power to the motor that is turning the dish. The 14025 (U12) takes

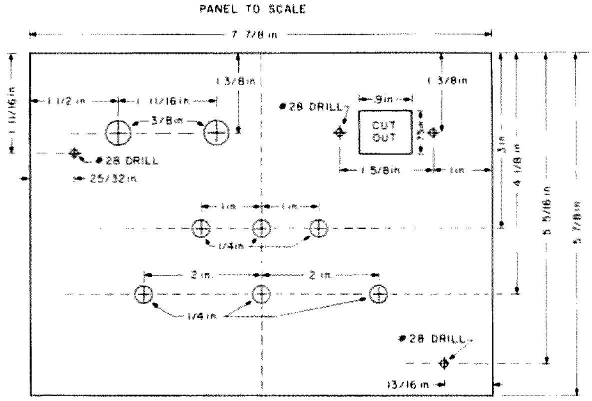

Fig. 4. Front panel layout.

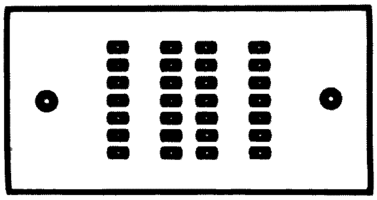
Fig. 5. Etched board for mounting the two MAN 74 readouts on the front panel.

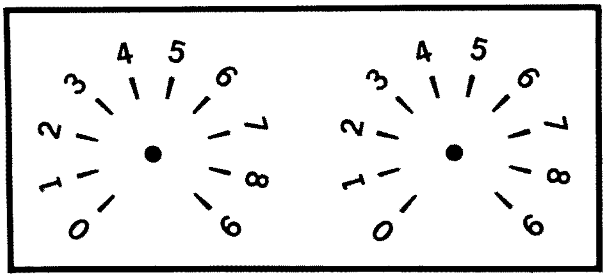

Fig. 6. Etched plate to show the positions of SW1 and SW2.

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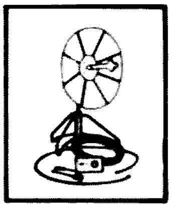

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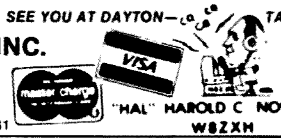

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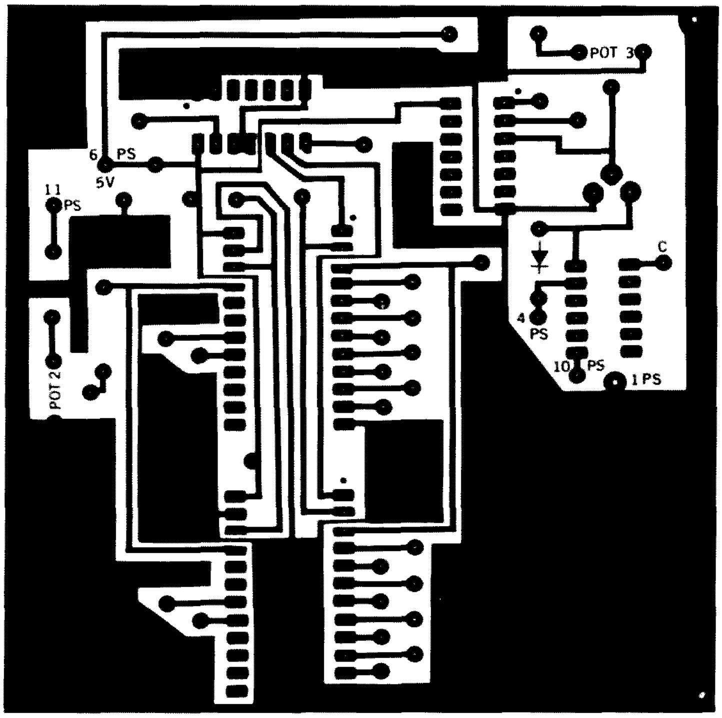


Fig. 7. Control PC board (foil side).

the strobe of the 14435 and turns on the line drivers at the proper time.

Construction

The unit is constructed in a Radio Shack cabinet. Unfortunately, this is a steel cabinet and is hard to work with. Fig. 4 shows the layout of the panel. The panel holds the switches 1 through 6, two LEDs (east and west), and the two MAN 74 readouts (U7, U8). The readouts are mounted on a PC board that should be etched for this purpose (Fig. 5). The board should be mounted on the panel with 6-32 bolts, so the readouts can be made flush with the panel.

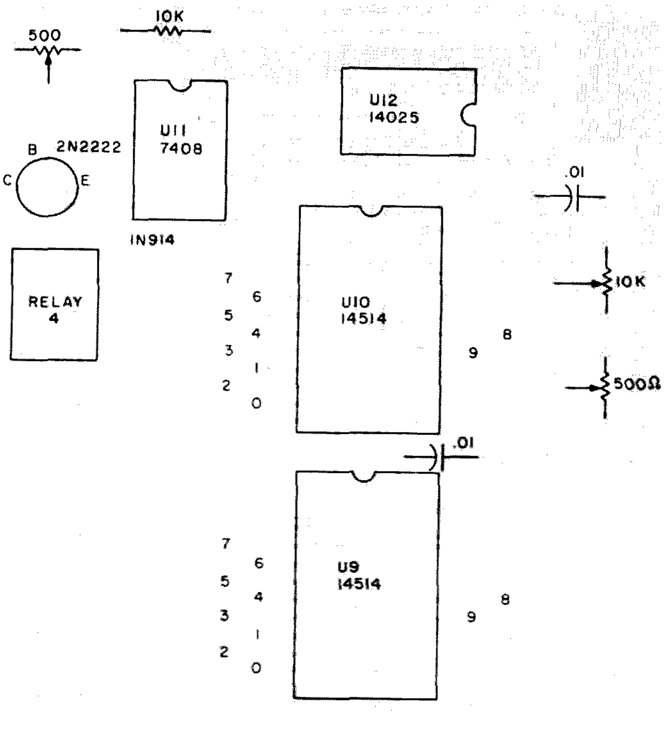


Fig. 8. Control PC board (component side).

Plug-in DIP jumpers can be used to extend the readouts to the board. A double 14-pin DIP jumper with 12 inches of ribbon cable can be cut in the middle, giving six inches for each readout. Since it is necessary to extend only 10 leads for each readout, small flexible wire could also be used with headers. For SW1 and SW2, small wire is better than ribbon wire. Leave enough slack so that the panel can be turned back for servicing. Fig. 6 is for an etched board that marks the positions of the switches.

The A/D and the control board (Fig. 7) are joined together with a couple of 4-40 bolts. The A/D board should be on top to eliminate any chance of a short. Before the boards are mounted in the cabinet, the following wiring should be done: The four BCD outputs of the MC 14435 (U3) must be connected to the already-paralleled inputs of the 14514s (see Fig. 13). Number 2 pins should connect to pin 14 of the 14435, #3 pins to 13, #21 pins to 12, and #22 pins to 11.

To strobe, pin 13 of the 14025 (U12) should be connected to pin 2 and pin 8 should be connected to pin 15; by reversing, these two lines will change the order of SW1 and SW2. The wires for these switches should be connected before the board is mounted. The boards should be grounded to each other, and the 5 V extended from PS6 to the A/D 5-V in.

Relay 4 fits into a 12-pin socket, so a couple of pins can be ground off a 14-pin socket. Some kind of marking should be put on the relay and socket since the relay is not marked. It is difficult to plug the 24-pin ICs in-

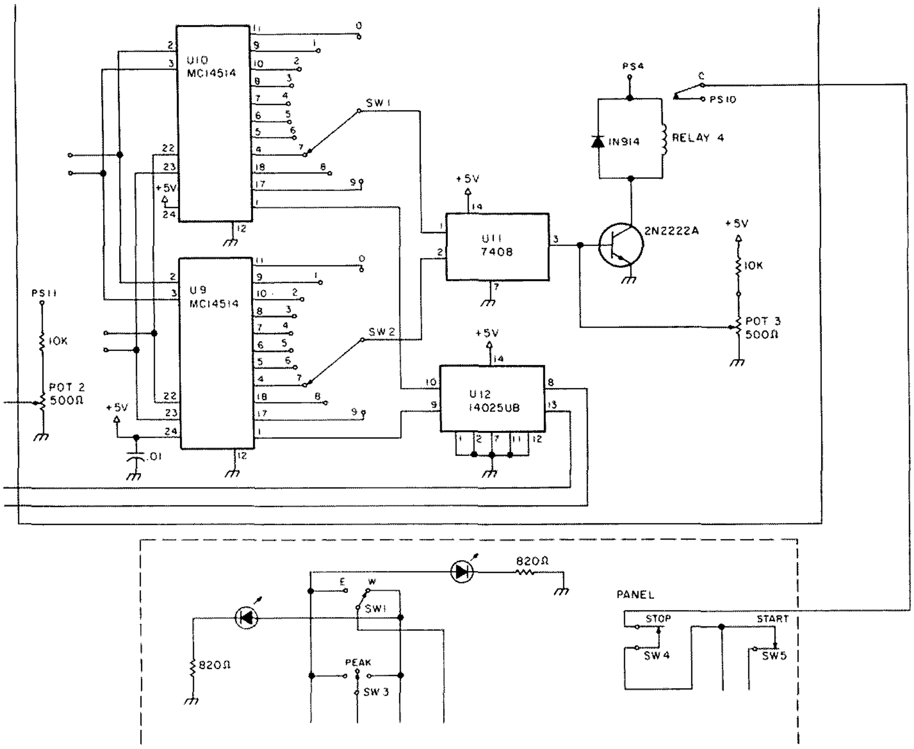


Fig. 9. Control panel schematic.

to a new socket, so I broke it in by using one side of a 14-pin IC, working it around a couple of times.

The boards are mounted in the cabinet by using a couple of long 6-32 bolts and nuts; after the bolts have been made secure, they should be bent parallel with the front and back cabinet. With nuts on the bolts, it is possible to secure the boards so they do not push against the switches but will allow the cabinet to close (Photo A).

A 13-wire cable can be used to connect the control unit that is located at the receiver location to the power supply that is located at the dish. The board has the relays to start, reverse, and stop the motor.

The power supply (Fig. 10) should be installed in a weatherproof box large enough to permit a female chassis connector to be installed in the bottom side. I used an 18-wire cable and 18-prong Jones connector in case more wires are needed at a later date (Photo B). The female chassis connector in the power-supply box is paralleled with the cable so that the control unit can be taken to the dish if necessary. The ac power for the power supply can come from the TVRO receiver if one wants the unit to go on and off with the receiver; otherwise, it can be fed from the dish location.

The construction of the power supply is straightforward except that the 7805 is

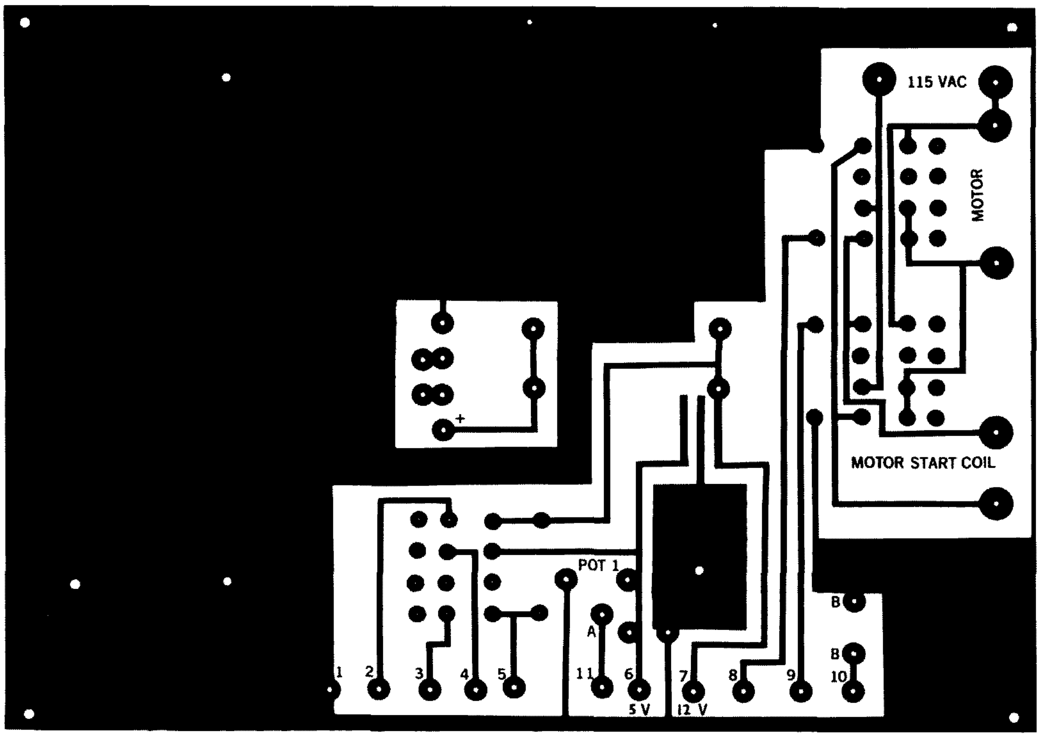


Fig. 10. Power supply PC board (foil side).

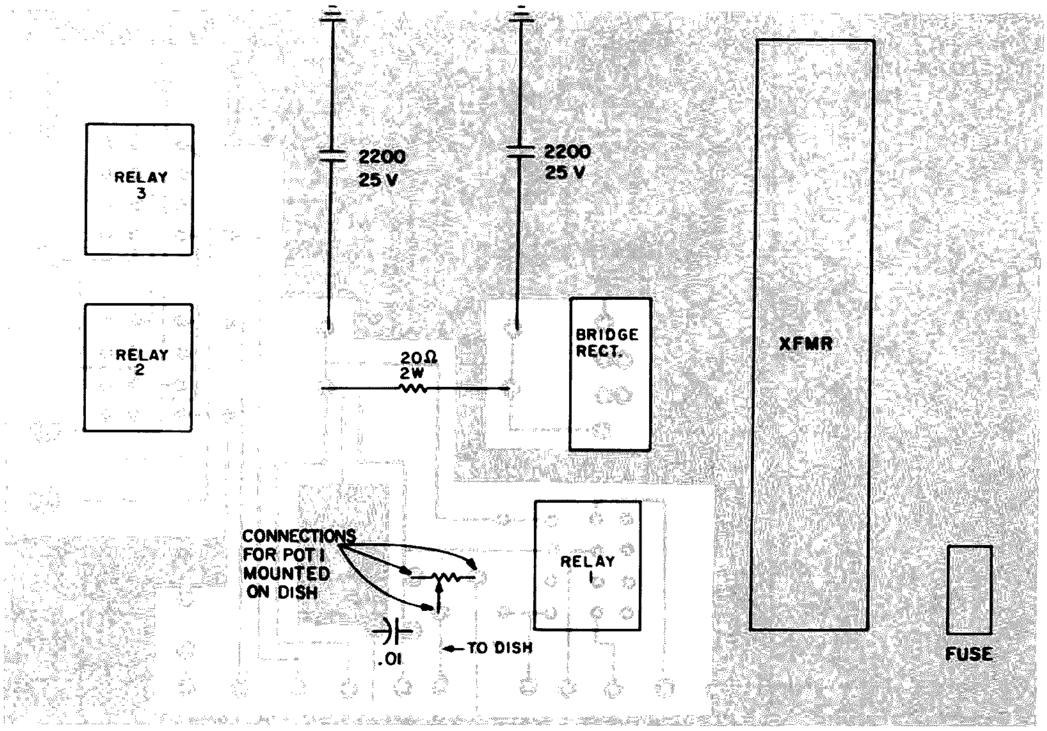


Fig. 11. Power supply PC board (component side).

mounted on the trace side. You should make sure that the 7805 supplies at least 5 V. If it does not, the relays will not operate correctly. If a heavy-duty motor is used, the 3-Amp relays may not be heavy enough, so heavier relays might have to be substituted on a separate mounting. If a permanent-magnet-type motor is used, it would be connected in place of the starting coil. A #54 drill is used for the relays, and a #55 for the bridge rectifier and the 2-Watt resistor.

Knowing that all equipment is subject to failure, I used two mechanical switches (one for the east, one for the west) that will open if the dish turns too far. These switches are connected in the ground return of the holding relay and are connected at BB on the power-supply board. If the switches are not used, B and B should be connected with jumper wires. I also have two other mechanical switches in the ac line which open in case the other switches fail.

Pot 1 at the dish is installed so that it turns with the dish, and it will not be turned off completely on F1 (135° West). The safety switches, if used, should be set so that they will open before the pot reaches its limit of turning. If the reading is backwards, the 5 V and ground leads should be reversed.

The A/D converter is lined up by setting R1 so that the output of R1 is 1 volt. Pot 2 on the control board is adjusted so that when the dish is on the most westerly direction (F1) the reading will be around 5. This will give the most easterly direction (F4—83°) a reading of approximately 60. Pot 3 is adjusted so that each time the 2N2222A receives a pulse, Relay 4 will open. In this adjustment, remember that there will be no power to R4 until the holding relay is closed.

Should you desire to mark the panel (Photo C), dry transfer letters are excellent. Such letters can be removed easily with Scotch tape. After labeling, spray on a thin coat of Krylon™. The Krylon and letters soon wear off, so they should be protected with a sheet of clear mylar™. (Sheet mylar with adhesive on one side can be purchased from office supply houses.) The mylar wants to peel, so with an X-acto® knife trim about 1/8" off around the edges of the panel.

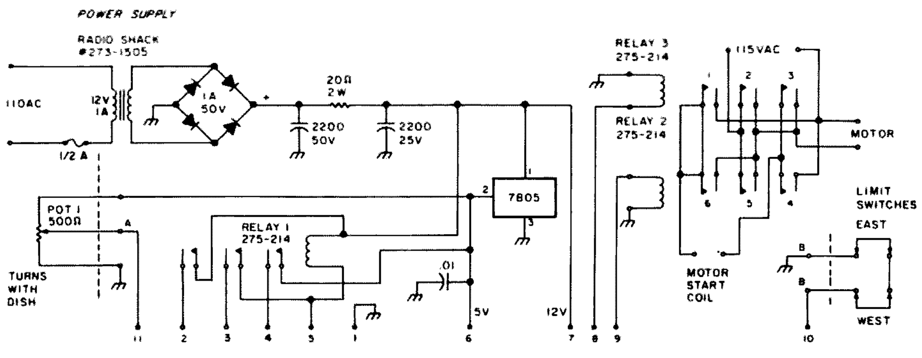
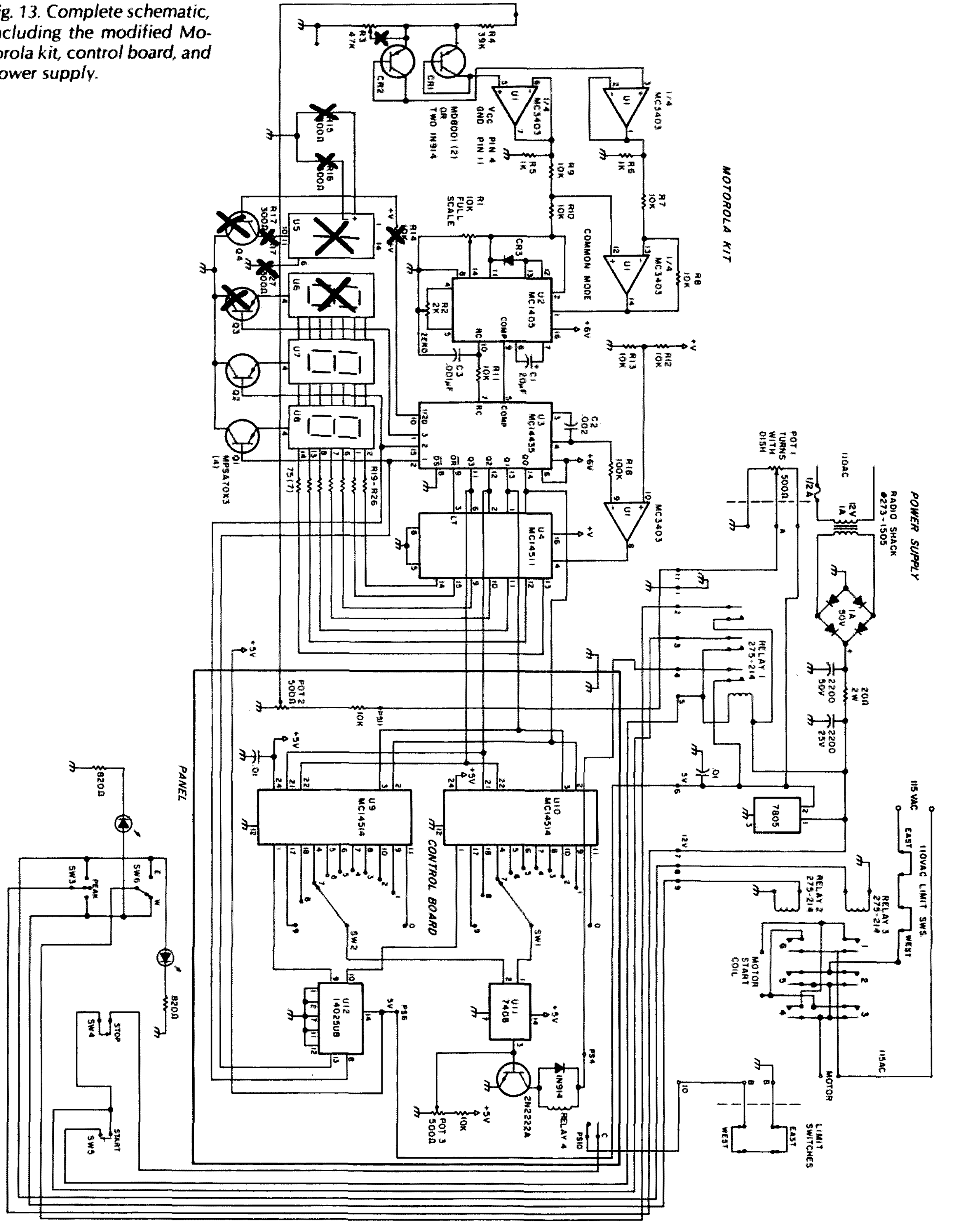


Fig. 12. Power supply schematic.

Operation

To operate the unit, it is necessary to put the two dial switches on the readout number of the chosen satellite, flip the east-west switch in the direction the dish must turn, press the start button, and wait for the dish

Fig. 13. Complete schematic, including the modified Motorola kit, control board, and power supply.



to move to the new satellite and stop. On weak transponders, it might be necessary to peak the dish. This is done with the peak switch, SW3.

Since there are no holding contacts, the dish will stop as soon as the switch is released.

It would have been possible to eliminate the east-west switch and use pushbutton switches instead of the mechanical switches, but after using this method for quite some time, I decided that the extra circuitry, memories, etc., were not worth the details involved. If one wants to connect it to

a computer, this can be done simply by using only a 4-PDT switch in the BCD lines to get the BCD information from the computer.

Since most ham antenna rotators feed back a small varying voltage for the meter reading, it may be possible to control a ham antenna by adding another readout for 360°.

After putting this unit into operation, you will be pleased with the convenience it offers of scanning the satellites with hardly any effort, and you will be looking forward to the next project. ■

Motorola Kit Parts List

U1	MC3403
U2	MC1405
U3	MC14435VP
U4	MC14511
U7, 8	Common-cathode 7-segment display (MAN 74) .3"
Q1, 2	MPSA70
Q4	MPSA20
CR1, 2	1N914 (or dual transistor MD8001)
CR3	1N914
R1	10k ten-turn cermet
R2	2k ten-turn cermet
R3	47k
R4	39k
R5, 6	1k
R7, 8, 9, 10	10k
R11, 12, 13	10k
R18	100k
R19 thru R26	75Ω
C1	20 μF, tantalum + to pin 7
C2	.002 μF
C3	.001 μF
C4, 5	.1 μF
C6	25 μF at 15 volts

Note: All resistors ±5%, ¼-Watt. All capacitors ±10%.

Control Board Parts List

1	5-V-dc SPST relay (Radio Shack #275-216)
2	MC14514 ($2.95)*
1	7408 ($.31)*
1	MC14025 ub ($.40)*
2	24-pin socket
3	14-pin socket
2	.01 50-V capacitor
1	IN914
2	10k, ¼-W resistor
1	2N2222A
2	500-Ohm vertical mount pot

* Available from Circuit Specialists, Box 3047, Scottsdale AZ 85257

Power Supply Parts List

3	12-V, 4-PDT relays (Radio Shack #275-214)
1	12-V, 1.2 Amp transformer (Radio Shack #273-1505)
1	3 AG clip in fuse holder
1	.5-Amp fuse
1	1-Amp, 50-V bridge rectifier
1	2-Watt, 20-Ohm resistor
1	2200-uF, 50-V elect. capacitor
1	2200-uF, 25-V elect. capacitor
1	.01 25-V capacitor
1	7805—5-V voltage regulator
1	Box (see text)

Mounted on Dish

1	500-Ohm, ½-Watt linear potentiometer

Cabinet Parts List

1	Radio Shack #270-265 cabinet, 7⅞" × 5⅞" × 1⅞"
2	14-pin sockets
2	1-12-position switches (Radio Shack #275-183)
1	SPDT small toggle switch
1	SPDT momentary spring-return-to-center-off (or Radio Shack #275-637)
1	momentary-push-button switch SPST NO
1	momentary-push-button switch SPST NC
2	820-Ohm, ½-Watt resistors
2	LED with holders
1	14-pin double DIP jumpers with 12" wire

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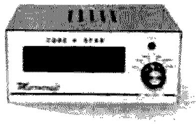

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The Ultimate Protection Plan for Your HT

Bangs, bumps, scrapes, and crashes make life tough for HTs. Make these modifications to protect your investment.

Please don't drop it! How many times have you said this to yourself and others that have examined your handie-talkie (HT)? Well, with the addition of a simple elastic band and clip assembly, your concern is minimized. This idea can be used on any of the popular models such as the Kenwood TR-2500, the Icom IC-2A, a Yaesu model, or any hand-held with provisions by the manufacturer for a belt-clip attachment.

Since there are many times when one does not wish to use a belt-clip or when convenience dictates that one could not be used, the addition of this elastic band (shown in Photo A) may be the answer. The use of a strap may not be new to some of the older hams, as the hand-helds of World War II vintage used a piece of leather behind the hand for support. However, I believe my technique of attachment is worthy of consideration.

I wanted to be able to fully utilize the unit under all conditions, walking, running, driving, etc., and not have to worry about it falling. Yes, the optional wrist strap was tried, but it did not provide the desired security.

I did not wish to alter the case of my new Kenwood TR-2500, and the need to remove the battery pack prompted the development of this project (see Photo B).

Construction

Simple hand tools such as pliers, metal-cutting snips, a

Photos by Gregg A. Haas

Photo A. Rear view of HT, showing attachment of elastic band to metal clip at base.

Photo B. The felt-lined metal clip is easily removed for battery pack changing or charging.

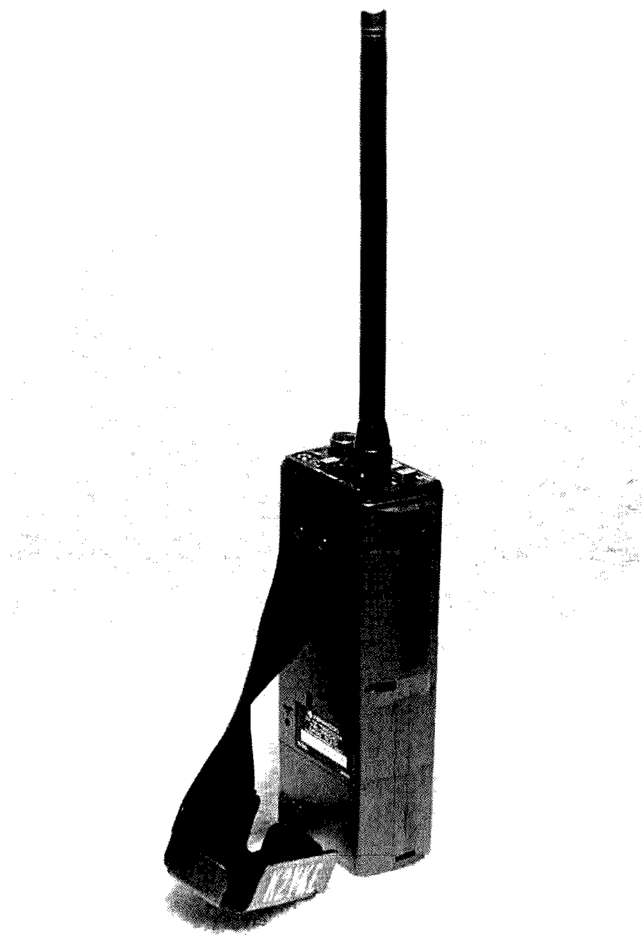

Photo C. *Detail of attachment of band to top rear of unit using the belt-clip mounting nuts already in the unit.*

metal file, a hammer, and a screwdriver will enable the average ham with very little knowledge of metal-working to complete this in a couple of hours.

A piece of aluminum or steel (18-22 gauge) 3½" ×3¾" is used for the clip and two ½"-wide by 1⅞" strips are used like washers over the black elastic. The piece of 2"-wide elastic 6½" long was obtained in a local fabric store along with the thin black felt at least 3½"×3¾". The elastic sells for about $1.25 a yard, so you can see that the 6½" piece cost less than 25¢; the felt 12-inch squares cost 39¢. The only other items necessary to obtain were 2 soft aluminum, flat-head ⅛"-diameter × ¼"-long rivets.

For strength, each end of the elastic was doubled over a distance of ½" and cemented in place with contact cement. Next I cut a ½"×3¼" strip of metal; this in turn was cut in half, leaving 2 pieces ½"×1⅞". The transceiver was set upright upon the remaining metal, centering same on all sides. With a thin felt marker pen, the rig was outlined on the metal. In essence, the base of the HT is used as a pattern for the clip (see Fig. 1).

After cutting along the solid line and before bending into shape, the metal was used as a pattern for the felt liner. When bending has been completed, the eight corners are then slightly rounded with a metal file. The elastic band is attached with the folded side toward the clip and the ½" metal strip on the outside using two soft aluminum rivets with the flat head on the inside. Cementing the felt in place with contact cement completes the assembly. The metal parts were painted with a flat black that appears to blend with any HT finish.

I used the 2 extra screws that came in the accessory package with the TR-2500 to attach the top portion of the band. When attaching the band on the Icom IC-2A, you may use the belt-hook attaching screws. (Caution: Do not use any screws longer than ¼".)

I have had this installation on my HT for some time and, even with gloves on, the slight pressure of the elastic increased the sense of "feel" in using the unit. Lastly, the face of the clip makes an ideal spot for inserting one's call letters (Photo C) without concern for defacing the transceiver.

While I am happy to share this idea and simple construction with readers for their own use, a patent is pending on the design described in this article and commercial application is prohibited. ■

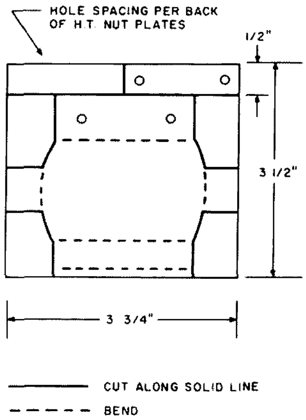

Fig. 1. Metal-cutting pattern.

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SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received at 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458.

GRAND JUNCTION CO
APR 2

The Grand Mesa Repeater Society will hold the fourth annual Western Slope Swapfest on Saturday, April 2, 1983, from 10:00 am to 4:00 pm, at the Plumbers and Steamfitters Union Hall, 2364 Highways 6 and 50, Grand Junction CO. Admission is free and swap tables are $5.00 each. Features will include an auction and refreshments. Talk-in on 146.22/.82. For further information, send an SASE to Bill Brown KØUK, 562 So. Maple Street, Fruita CO 81521, or call (303)-858-9661.

ROCHESTER MN
APR 9

The Rochester Amateur Radio Club and the Rochester Repeater Society will sponsor the 6th annual Rochester Area Hamfest on Saturday, April 9, 1983, beginning at 8:30 am, at the John Adams Junior High School, 1525 NW 31 Street, Rochester MN. There will be refreshments, plenty of free parking, and a large, indoor flea market for radio and electronic items. Talk-in on 146.22/.82. For further information, contact RARC, c/o WBØYEE, 2253 Nordic Ct. NW, Rochester MN 55901.

FLEMINGTON NJ
APR 9

The annual Flemington NJ hamfest will be held on Saturday, April 9, 1983, from 6:00 am to 4:00 pm, at the Hunterdon Central High School Field House. Flemington NJ, a tourist area, is located between NYC and Philadelphia at the intersection of routes 202 and 31, just 10 miles south of I-78. Admission is a $3.00 donation. There will be a gigantic flea market with 20,000 square feet of heated indoor area, 200 tables, major manufacturers, and more. Talk-in on 148.52, 147.375, 147.015, 224.12, and 224.54. For reservations or more information, call (201)-786-4080, or write Cherryville Repeater Association, c/o W2FCW, Box 76, Farview Drive, Annandale NJ 08801.

SOMERSWORTH NH
APR 9

The Great Bay Radio Association will hold its 3rd annual hamfest-flea market on Saturday, April 9, 1983, from 9:00 am to 3:00 pm, at the Somersworth Armory, Somersworth NH. The entrance fee is $1.00 per person. Food, refreshments, and free parking will be available. For advance registrations and further information, write Great Bay Radio Association, PO Box 911, Dover NH 03820.

KANSAS CITY MO
APR 9-10

The PHD Amateur Radio Association will sponsor the 1983 Missouri State ARRL Convention on April 9-10, 1983, from 9:00 am to 6:00 pm (both days), at the Trade Mart Building, at Kansas City MO's old airport. Registration is $4.00. Swap tables for both days are $10.00, which includes one registration with each table. The Saturday night banquet at the world-famous Gold Buffet is $19.00. Other features will be a complete program of forums, including DX by the Kansas City DX Club, ARRL by Dave Summers K1ZZ, ARRL General Manager, and 11-meter-to-10-meter conversions by Bob Heil K9EID. There will also be an oldtimers luncheon sponsored by the QCA, a YL luncheon, the Missouri-Kansas Amateur of the Year Award, and the Missouri-Kansas CW Contest Award. Unlimited free parking will be available as well as free space for RVs (no hookups). Talk-in on 146.34/.94. For more information and registrations, write PHD Amateur Radio Association, Inc., PO Box 11, Liberty MO 64068-0011, or phone (816)-781-7313. All preregistrations will be held at the door.

BEDFORD PA
APR 10

The Horseshoe RC, the Blue Knob Repeater Association, the Bedford County RC, the Mountain ARC, and the Somerset ARC will hold the first annual Southern Alleghany Hamfest on April 10, 1983, from 8:00 am to 4:00 pm, at the Bedford Fairgrounds, located at the intersection of Rt. 30 and the Rt. 220 bypass, Bedford PA. Admission is $3.00 per person and inside tables are $5.00. There will be computer demonstrations, food, dealers, displays, an ARRL booth, and plenty of parking. Tailgating space is $2.00 per unit and dealers will be able to set up displays the day before. Large, heated buildings will be available in case of foul weather. Talk-in on 145.49 and 146.52. For more information, contact Tom Gutshall W3BZN at (814)-942-7334.

DIXON IL
APR 10

The 17th annual Rock River ARC Hamfest will be held on Sunday, April 10, 1983, at the Lee County 4-H Center, one mile east of junction of Rtes. 52 and 30. A ticket donation is $2.00 in advance and $2.50 at the gate. Tables (6-foot) will be available for $5.00. Doors will open at 6:30 am for dealers and 7:30 am for the general public. Breakfast and dinner will be served. Talk-in on .37/.97. For more information and advance tickets, write to Ed Webb WD9CJB, 618 Orchard Street, Dixon IL 61021, or phone (815)-284-3811.

MADISON WI
APR 10

The Madison Area Repeater Association, Inc. (MARA), will hold its eleventh annual Madison Swapfest on Sunday, April 10, 1983, at the Dane County Exposition Center Forum Building, Madison WI. Doors will open at 8:00 am for commercial exhibitors and flea-market sellers, and at 9:00 am for the general public. Admission is $2.50 per person in advance and $3.00 at the door. Children twelve and under will be admitted free. Flea-market tables are $4.00 each in advance and $5.00 at the door. Features will include commercial exhibitors, a flea market, an all-you-can-eat pancake breakfast, and a barbecue lunch. Plenty of parking space and nearby hotel accommodations are available. Talk-in on 146.16/.76 (WR9ABT). For reservations (early ones are advised) or more information, write to MARA, PO Box 3403, Madison WI 53704.

FRAMINGHAM MA
APR 10

The Framingham Amateur Radio Association, Inc., will hold its 8th annual spring flea market on Sunday, April 10, 1983, at the Framingham Civic League Building, 214 Concord Street (Route 126), downtown Framingham MA. Admission is $2.00 and doors will be open at 10:00 am. Tables are $10.00 (pre-registration required) and sellers may set up beginning at 8:30 am. Radio equipment, computer gear, and food will be available. Talk-in on .75/.15 and .52. For more information, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701.

SOUTH SIOUX CITY NE
APR 15-17

The 39 Hundred Club will hold the 1983 Midwest ARRL Convention on Friday, Saturday, and Sunday, April 15-17, 1983, at the Marina Inn, South Sioux City NE, directly across the river from Sioux City. On Saturday, features will include a QCWA breakfast, a 3900 Club luncheon, an all-day ladies' program, and an evening banquet with entertainment. There will be seminars, displays, commercial exhibits, and a 66-table flea market, all indoors in the same building. Tables (8 ft. × 30 in.) are $5.00 for the 3 days, $4.00 for Friday night and Saturday. For table reservations, contact Al Smith WØPEX, 3529 Douglas Street, Sioux City IA 51104. Exhibitors should contact Jim Boise KAØGZY, 22 LaSalle Street, Sioux City IA 51104. Setup time is Friday afternoon, April 15th. Convention fees are $6.00 for the 3 days; advance banquet reservations are $10.00 (at the door, $12.00). For advance banquet tickets and motel reservations, write to Jerry Smith WØDUN, Akron IA 51001. For general information, contact Dick Pitner WØFZO, General Chairman, 2931 Pierce Street, Sioux City IA 51104.

WELLESLEY HILLS MA
APR 16

The Wellesley Amateur Radio Society will hold its annual auction on Saturday, April 16, 1983, at the First Congregational Church of Wellesley Hills, 207 Washington Street, Wellesley Hills MA (located at the intersection of Routes 9 and 16). Doors will open at 9:00 am and the auction will start at 10:00 am. Talk-in on .04/.64, .63/.03, and .52. For further information, contact Kevin P. Kelly WA1YHV, 7 Lawnwood Place, Charlestown MA 02129.

LEAGUE CITY TX
APR 16

The Tidelands Amateur Radio Society (TARS) will hold their 1983 Spring-Fest on Saturday, April 16, 1983, at the fairgrounds in League City TX. There will be free admission and plenty of parking. Breakfast will be served at 7:00 am and activities will begin at 9:00 am. Activities will include a flea market, a swapfest, an auction, dealers' displays, demonstrations, and lunch served between 11:00 am and 1:00 pm. For additional information, contact TARS, PO Box 73, Texas City TX 77590.

OAK RIDGE TN
APR 16

The Oak Ridge ARC will hold the fifth annual Oak Ridge Hamfest on April 16, 1983, from 8:00 am to 5:00 pm, at the Civic Center, Oak Ridge TN. Admission is $2.00 and accompanied children will be admitted free. There will be a large indoor dealer display, an electronics flea market, forums, concessions, and computers. Talk-in on 146.28/.88, 147.72/.12 (backup), and 146.52. For more information, send an SASE to ORARC Hamfest, PO Box 291, Oak Ridge TN 37830.

BRAINTREE MA
APR 17

The South Shore Amateur Radio Club of Braintree MA will hold an indoor flea market on Sunday, April 17, 1983, rain or shine, from 11:00 am to 4:00 pm, at the Viking Club, 410 Quincy Avenue, Braintree MA. The entrance fee is $1.00. Tables (8-foot) are $10.00 each, which includes one free admission. Vendors will be admitted at 10:00 am and there will be plenty of free parking. For advance table reservations, send a check payable to the South Shore Amateur Radio Club to Ed Doherty W1MPT, 236 Wildwood Avenue, Braintree MA 02184. A confirmation of check receipt will be sent and there will be no cancellation refund after April 14. For more information, call Ed at (617)-843-4431, evenings.

RALEIGH NC
APR 17

The Raleigh Amateur Radio Society will hold its 11th annual hamfest on Sunday, April 17, 1983, beginning at 8:00 am, at the Crabtree Valley Mall on US 70 west. Admission is $4.00, with no extra charge for tailgating in the covered flea market. Tables will be available for rental. Features will include a CW contest, a home-brew contest, and special-interest meetings. Talk-in on .04/.64 and .28/.88. For additional information, contact RARS Hamfest, PO Box 17124, Raleigh NC 27619.

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DAYTON OH
APRIL

The Washington University Amateur Radio Club will hold a reunion dinner at the Dayton Hamfest. All past members of the club are invited. For more information, contact Washington University ARC WØQEV, Box 1128, St. Louis MO 63130.

BEMIDJI MN
APR 23

The Bemidji Amateur Radio Club will hold its hamfest on April 23, 1983, at the Holiday Inn Convention Center, Highway 2 west, Bemidji MN. Swap tables will be available at the door. Talk-in on 146.13/.73. For more information, send an SASE to Jerry Pottratz WBØMSH, Rt. 8, Box 585, Bemidji MN 56601.

DAYTON OH
APR 29

The 14th annual B*A*S*H will be held on Friday night, April 29, 1983, at the Dayton Hamvention at the Convention Center, Main and Fifth Streets, Dayton OH. Admission is free and parking is available. For further information, contact the Miami Valley FM Association, PO Box 263, Dayton OH 45401.

DAYTON OH
APR 29-MAY 1

The first International VHF/UHF Conference will be held from April 29-May 1, 1983, as part of the Dayton Hamvention, Dayton OH. There will be technical talks and forums with recognized experts, noise-figure and antenna-gain measuring contests, and a hospitality suite get-together with refreshments. For further information, or to advise us of participation in the noise-figure and antenna contests, please contact Jim Stitt WA8ONQ, 311 N. Marshall Road, Middletown OH 45042, or phone (513)-475-4444 (business) or (513)-863-0820 (home).

DAYTON OH
APR 30-MAY 1

The Dayton Amateur Radio Association, Inc., will sponsor the Dayton Hamvention on April 30-May 1, 1983, at the Hara Arena and Exhibition Center, Dayton OH. Admission is $7.00 in advance and $9.00 at the door (valid for all 3 days). Flea-market space is $15.00 in advance and $16.00 at the door. Other features will include forums, new products, exhibits, women's activities, awards, and special group meetings. For special motel rates and reservations, write to Hamvention Housing, 1406 Third National Building, Dayton OH 45402 (no reservations will be accepted by telephone). For other information, write Box 44, Dayton OH 45401, or phone (513)-849-1720. Make checks payable to Dayton Hamvention, Box 2205, Dayton OH 45401.

GREENVILLE SC
APR 30-MAY 1

The Blue Ridge Amateur Radio Society will hold the Greenville Hamfest on Saturday and Sunday, April 30-May 1, 1983, at the American Legion Fairgrounds, White Horse Road, ½ mile north of I-85, Greenville SC. Admission will be $3.00. For advance sales, write Mrs. Sue Chism, Rt. 6, 203 Lanewood Drive, Greenville SC 29607. Talk-in on 146.01/.61 and 223.46/224.06. For further information, write Phil Mullins WD4KTG, Hamfest Chairman, PO Box 99, Simpsonville SC 29681.

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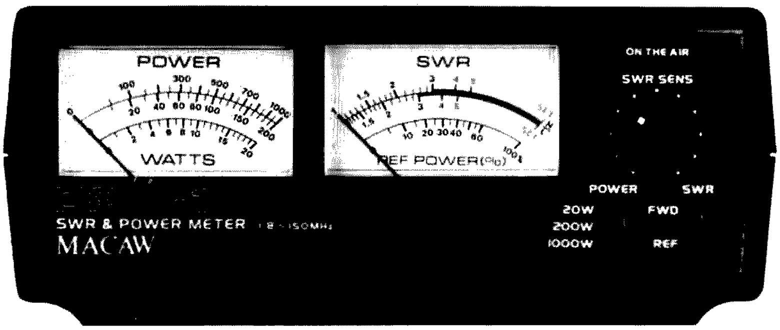

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SATELLITES

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If you are active in amateur satellite communications, it's time for you to share your knowledge with other hams by writing articles for *73*. We are looking for material on a wide variety of satellite topics.

Your fellow amateurs will be particularly interested in learning how to use the Phase IIIB satellite, now scheduled for launching on April 27. Topics in need of articles include antennas (especially for the 1269-MHz uplink), 1269-MHz transmitting systems, and power amplifiers, computer tracking techniques, orbital calculations, operating procedures, transverters and how to use them, interpretation of Phase III telemetry, and tips for getting on Phase III inexpensively.

The arrival of Phase III promises a big increase in satellite activity, but only if you do your part in bringing newcomers up to speed. It's easy to write for *73*, and we'll pay you for your efforts. Help make satellite communications a vital and growing part of our hobby. Send today for the *73* author's guide, or send your double-spaced, typewritten manuscripts to *73: Amateur Radio's Technical Journal*, Pine St., Peterborough NH 03458.

SATELLITE QSLS

The AMSAT QSL Bureau is now operated by WB8OTH at the following address: 1850 Lisle Avenue, Obetz OH 43207. If you're on the satellites, be sure to send Perry half a dozen SASEs so that he can forward cards to you. Hundreds of cards currently are awaiting envelopes.

RS-1 AND RS-2 AGAIN

These two Soviet amateur satellites appear to be coming back to life after a long silence. If their communications transponders become operational, *73* will begin publishing orbital data on these two birds.

Amateur Satellite Reference Orbits

		OSCAR 8		RS-5		RS-6		RS-7		RS-8		
Date		UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
Apr	1	0059	96	0037	174	0046	181	0033	175	0025	170	1
	2	0104	97	0032	174	0031	178	0024	174	0022	171	2
	3	0108	99	0027	175	0015	176	0014	173	0020	172	3
	4	0112	100	0021	175	0000	174	0004	172	0017	173	4
	5	0117	101	0016	175	0143	201	0154	201	0014	174	5
	6	0121	102	0011	175	0128	199	0144	281	0011	174	6
	7	0125	103	0005	175	0112	197	0134	200	0008	175	7
	8	0130	104	0000	176	0057	194	0125	199	0005	176	8
	9	0134	105	0154	206	0042	192	0115	198	0003	177	9
	10	0139	106	0149	206	0026	190	0105	197	0000	178	10
	11	0000	82	0143	206	0011	187	0056	196	0157	209	11
	12	0004	83	0138	206	0154	215	0046	195	0154	209	12
	13	0008	84	0133	207	0139	212	0036	194	0151	210	13
	14	0013	85	0127	207	0123	210	0027	193	0148	211	14
	15	0017	86	0122	207	0108	208	0017	192	0145	212	15
	16	0022	87	0117	207	0053	205	0007	192	0142	213	16
	17	0026	88	0111	287	0037	203	0157	221	0140	213	17
	18	0030	90	0106	207	0022	201	0147	220	0137	214	18
	19	0035	91	0101	208	0006	198	0138	219	0134	215	19
	20	0039	92	0055	208	0150	226	0128	218	0131	216	20
	21	0043	93	0050	208	0134	224	0118	217	0128	217	21
	22	0048	94	0045	208	0119	221	0109	216	0125	218	22
	23	0052	95	0039	208	0103	219	0059	215	0123	218	23
	24	0057	96	0034	209	0048	217	0049	214	0120	219	24
	25	0101	97	0029	209	0033	214	0040	213	0117	228	25
	26	0105	99	0023	209	0017	212	0030	213	0114	221	26
	27	0110	100	0018	209	0002	210	0020	212	0111	222	27
	28	0114	101	0013	209	0145	237	0011	211	0108	222	28
	29	0118	102	0007	210	0130	235	0001	210	0106	223	29
	30	0123	103	0002	210	0114	232	0151	239	0103	224	38
May	1	0127	104	0156	240	0059	230	0141	238	0100	225	1
	2	0131	105	0151	240	0043	228	0131	237	0057	226	2
	3	8136	106	0146	240	0028	225	0122	236	0054	227	3
	4	0140	108	0140	241	0013	223	0112	235	0051	227	4
	5	0001	83	0135	241	0156	251	0102	235	0049	228	5
	6	0006	84	0129	241	0141	248	0053	234	0046	229	6
	7	8010	85	0124	241	0125	246	0043	233	0043	230	7
	8	0015	86	0119	241	0110	244	0033	232	0040	231	8
	9	0019	87	0113	241	0054	241	0024	231	0037	231	9
	10	0023	89	0108	242	0039	239	0014	238	0034	232	18
	11	0028	90	0103	242	0024	237	0004	229	0032	233	11
	12	0032	91	0057	242	0008	234	0154	250	0029	234	12
	13	0036	92	0052	242	0151	262	0144	257	0026	235	13
	14	0041	93	0047	242	0136	259	0135	256	0023	235	14
	15	0045	94	0041	243	0121	257	0125	256	0020	236	15

LETTERS

WE NEED R & D

I am an electrical engineer who has kept up with the state of the art. I know from experience that what you say about a lack of qualified engineers is not true. The lack of research and development is the problem. It doesn't do any good to train more engineers if we don't have work for them to do.

I have always been an inventor and innovator. I started by writing computer programs to design crystal filters, then worked on other systems to design TCXOs (temperature-controlled crystal oscillators—AJ). When the layoff came, I got it because R & D is the first to be cut. My design programs made me unnecessary. I then went to work for a consulting firm. We developed a crystal measurement system. We quit consulting and went into manufacturing. I had a dispute over being forced into a management position and quit. The next company got bought out by Dale and they dropped my position in engineering. This time I tried management and failed. I am a very talented R & D engineer, but I get very bored pushing papers around.

I am 41 years old, have an MSEE, have several inventions, and have 4 years graduate studies past MSEE. Motorola GED rejected me because I had too many years experience and had not moved into management yet.

I now work for a small company named Southwest Microwave. I can design anything my boss can think of. We are leaders in intrusion sensors. Two of the engineers I work with are inventors. They started Omni-Spectra by inventing the OSM microwave connector. I hope this company doesn't decide to drop R & D. I now go on sales trips and do R & D and production engineering, but my skills are sharper in R & D.

We need more than just more skilled engineers. We need R & D and management which respects and rewards engineering.

James R. Fitzsimons W7ANF
Tempe AZ

With the recently passed Rudman bill . . . which we'll have more about soon . . . there should be a lot more money for R & D. I'm sure, James, that you're familiar with the tax situation which killed most R & D. And yes, killing off R & D is as stupid a way of saving money when things get tight as cutting back on advertising, but we still see firms doing it regularly . . . shortly before going under as this response escalates the problems. But if you have been reading any of the news magazines, you also know as well as I that the need for technical people is so desperate that our colleges have virtually been cleaned out of science and electronics teachers.—Wayne.

TOUCHDOWN!

If eliminating the code from the ham exams is such a great idea, I have an equally brilliant one. Why shouldn't the National Football League shorten the length of a football field from 100 to 25 yards? In that way they could eliminate spring training (which the players dislike very much) and thus enable the ball carrier to run from one goal line to another without much effort. In a like manner, baseball diamonds, basketball courts, hockey rinks, etc., could be reduced in size. Of course, it would ruin the games, but it would make it much easier on the players, and that is the object of the exercise, isn't it?

H. B. Savage, Jr. K4MD
Coconut Creek FL

Hey, Doc . . . beautiful example of an irrelevant, emotional, non-solution to our problems, mainly a dying hobby which is desperately needed to do what it is supposed to do: set up to provide emergency communications for our country, provide a source of trained people in case of war, invent and pioneer new techniques and modes of communications . . . and foster goodwill. You know, all of those good things mentioned in 97.1, but which old-time rag-chewers seem to conveniently forget as they get further out of touch with technology and fight to keep newcomers out of the hobby.—Wayne.

BASH ADS

I have enjoyed reading *73* and I honestly believe that *73* has the best articles on building of any of the amateur publications on the market. The columns are written by hams and even though I don't have the opportunity to build all that much, I usually read and enjoy the material very much . . . it is fun just to read it.

I read most of your editorials and must admit that you certainly put forth a great deal of effort to make for interesting reading. I guess you could say that you call the shots just like you see them. This makes one not put the book down until the reading is finished.

There is one thing I'm curious about, though. In many of your editorials, you have lashed out at the publications that publish and solicit the Bash material; there have been times where you have stated that perhaps ham radio retailers should chuck the Bash books, etc. Wayne, I am not writing this letter to promote Bash material or to criticize you for the stand that you take; however, *there are 73* magazines in the past 2 years where Bash Study Guides are listed and other Bash material is advertised. I guess my question is: Are you aware of this? By the tone of your comments, I presume that you are not! I would like to get an answer that will maybe clear things up in my mind. Thank you and keep up the good work.

Larry Benham KR9M
Mt. Carmel IL

Larry, we've tried to keep the Bash cheat books out of our magazine ads, but they do creep in here and there despite good intentions. However, after seeing that not one ham in the country really gives a damn . . . I'm obviously being an idiot in trying to stage a one-man movement and should go ahead like 100% of the hams and encourage outright cheating to pass the test. Why in hell should I pass up getting a hunk of the fortune Bash is making selling ham radio down the river? If no one else gives a damn, okay, I don't either.—Wayne.

TEST INADEQUATE

I am writing this out of guilt; I just rejoined the ARRL and feel I must do something to atone for it. You have a much better magazine than *QST* and have your head in the 1980s if not the early '90s, unlike those League fuddy-duddies who are still back in the 1920s, at least in terms of outlook. However, I do expect to get a lot of use out of their QSL bureaus now that I have a real moonraker up, and *QST* does a better job of covering the regulatory scene than you. Beef up your efforts in that area, Wayne, and *73* would make *QST* look like so much QRM.

Anyway, what I really wanted to talk about is the no-code license proposal. First some background so you will know where I am coming from: I'm 52, got my first license as a Tech in May, 1979, and upgraded to Advanced in September of that year. I had followed the hobby at a considerable distance since I was a kid in high school, but

1979 was the first time that the sum of my desire plus financial ability added up to enough to go for it. I have a degree in chemistry and almost enough units in math for a major (not bragging, just backgrounding).

My first reaction to a no-code license was "Hell with 'em; let 'em sweat to learn code the way I did!" That's even though I am primarily a phone operator. Then I thought about the day I went to San Francisco for the Advanced test. I'd been warned it was heavy, very technical, and strong on SSTV. Baloney! The most technical question was where they showed a parallel-resonant LC circuit, gave the values of coil and capacitor, and asked for the frequency. That one did take awhile, but only because this fool left his calculator on the breakfast table 50 miles away and had a bit of trouble with the square root of something-or-other times 10 to the minus 15. The only SSTV question had to do with permissible frequencies, a matter which any literate person can memorize.

I have come to feel that a no-code license would be OK on at least some bands *provided* the applicant had to pass a written test that showed some knowledge of electronics beyond Ohm's Law and two-component circuits. As it stands, I have a piece of paper from the FCC that supposedly puts me in about the upper quartile of American hams, knowledge-wise, but I feel miserably inadequate when it comes to such practical matters as what to do when the rig won't work. When I think of people like my friend, Bill K5UX, who not only knows all the theory but knows when, where, and how hard to hit the damn thing with a hammer, I feel like an absolute idiot.

The no-code test should be heavy on practical things such as troubleshooting techniques and should also go into at least the basics of digital logic circuits, because that is increasingly where it's going to be. Further, the FCC should prepare enough different tests that the cheat-sheet peddlers could not frustrate the exam's intent. (In this connection, the League is worse than Dick Bash. At least Bash is honest enough to admit that he is out to cheat the system and get licenses for technical nincompoops.)

I have some other radical ideas about amateur licensing but will save them for another time, because I have run on enough for now. Again, you have the best mag in the business, so keep up the good work.

Fritz Samuels N6BLG
Vallejo CA

NEED CHEAP GEAR

Having just been able to make my first trip to the nearest ham radio store (Seattle WA) in several years, I was able to pick up a copy of *73*. I haven't read any *73*s in many years since I live out in the boonies. I also sent in for a subscription since I liked the magazine so much.

I have been a ham since 1967 and started working 2 meters when it was neat to own a Gonset 2m AM rig; what was FM? I then graduated to an old Motorola 80D and thought that was really neat. Having been away from radio for some time, I have just started thinking about buying some new gear and am appalled at some of the prices I am finding for new gear.

Working as a dispatcher at a local police department and having a family, I find that I can't afford most of the gear that I see advertised at the stores and in magazines. I realize that ham radio has never had it so good, but it really does seem that it is becoming a rich man's hobby. Who can afford a KWM380, Icom 720A, or any of the other new gear on the market? Not I! I remember that I first started with a $50 station and really had a lot of fun. I didn't work all that DX stuff, but I had fun trying.

The reason I am writing is to ask if any manufacturer or radio store makes or carries a good supply of inexpensive radio gear for us poor peons. I really like all the new gear that is on the market, but with the high price, it may as well be on the moon. I remember the old tube rigs that used to be around, but I don't seem to be able to find any of this equipment in decent condition at any of the local ham stores.

How about someone asking the big radio makers of the world to build some good equipment at an affordable price. I don't care if the radio has 10 vfo's, no-tune finals, and digital readout, but it would be nice if it didn't cost an arm and a leg.

I know that there are many articles on building equipment, but I don't have the time or knowledge to do so. There are only 4 hams in this area (none active) and parts are next to impossible to find locally. Maybe you or some of your readers have some suggestions on how the newcomer or us poor folk can get back on the air. If there are no new radios to be had, I would like to find someone who has a good stock of used equipment for sale.

I am also looking for a Tempo VHF One-Plus if any reader has one in good condition he wants to sell. I know it's a little big and doesn't have the features of the new rigs, but it is a lot easier to operate as far as I am concerned. I am interested in RTTY, FM, and satellite operation and would like to hear from those having the same problems. I am also interested in just getting back on the air and upgrading my license. I have been a Tech since 1968 and it is about time I did something!

Raymon A. Quinn WA7KGE
Forks WA

SPEAKER AVAILABLE

Your mention in the December, 1982, issue concerning noted individuals as hamfest speakers seems a very logical and clever idea. Kicking off a plan like that may be difficult, however. I would like to offer my services/abilities to interested groups. I have eight published books and over 250 published articles (all amateur-radio-related); I've presented programs in many areas of the US on topics ranging from slow scan and satellites to DXing, new gear trends, 10 FM, and QRP... plus holographic video and future communications concepts. If a hamfest/convention would like my thoughts, I would be honored to oblige.

Dave Ingram K4TWJ
Birmingham AL

AUNTIE BEEB

We greatly appreciated Roger Peterson's piece on Auntie Beeb in the January issue. We used to listen to World Service news when we lived in Berlin; also, we were happy to find out where Margaret Howard was these days. She attended Indiana University in Bloomington IN in 1969; I was fortunate enough to be in one of the same graduate school journalism courses that she was, and so we became acquainted. WD9HDZ and I last saw Margaret in London in 1975 or so and had since lost touch.

The frequency list is also much appreciated. Thanks again, and a Happy New Year.

Susie Scott N8CGM
Cincinnati OH

GENERAL CLASS ONLY

This letter was prompted by the letters that I read in the January issue of *73*. I have a few comments that I think will rile up hamdom as quickly as your comments.

First, I like the ARRL regardless of what you say and I am assuming that you get your copy of *QST* each and every month, if you will level with us. Second, I think that your opinions on *QST* are fostered by word-of-mouth interpretations of the goings on of the *QST* staff. Don't you wish that you had the income that is "wasted" by *QST*? Anyway, I subscribe to *QST*, *CQ*, and *73* because of the controversy that arises immediately after the publication of one of your tirades. Now, this letter is to create some kind of balance.

I am going on record now, and have before, as advocating a General license class *only*—no Advanced or Extra licensees from now on. Let's have the whole band for *all* amateurs and spread out for more comfort. Let's have no common denominator when we want to QSY. I also think that the different classes of licensees are creating a terrific case of class distinction and some snobbishness on calls that are completely out of line. Get rid of the different classes.

The cost of amateur gear is a constant issue with newcomers. May I say that there are terrific prices on some good used gear on the market? Don't forget, ham gear is not subject to salt and slush; 95% of ham gear is put on the market each year as a ham upgrades to the new gear for the fast electronic improvements that seem to be running away with us. Does anyone remember the $500 and $600 cost of Golden Eagles and Trams and the big Johnsons—5 Watts instead of 100 out?

The last of my comments is about the indiscriminate use of linears. What a band 20 meters would be if all the linears were shut off for 1 week on a trial basis. If linears had a built-in splatter guard and would shut down immediately if overdriven, it would be great and the band would be operable. My contention is that linears beget linears and the only things the guys want to hear are 40 over nine reports, regardless of audio clarity or bandwidth.

I am one of the "older" hams and like to feel that we are the stabilizing factor in good conduct. The younger ones with their so-called new ideas and limited resources are in no position to dictate on hamming until they get enough air time to make it count. The young fellows do very well as long as they use good common sense in their operating practices, and we do need them.

About home brew—outside of small projects, this is fine, but just try to design or even build anything to match what is on the market today, with its phase-locked-loop circuits and terrific engineering. Yes, the fun is in getting it to work, but I'll bet that is as far as it goes.

Jack Golden KK2W
Portville NY

Jack, many hams like the ARRL. After being a member for over 40 years I don't like 'em... and I don't dislike 'em... any more than I like or dislike a lot of other bureaucrats. And, yes, I do draw conclusions about what is going on at the ARRL from things insiders tell me... something wrong with that? Perhaps it is a frugal Yankee background which makes me dislike seeing money wasted... and remember that I am an ARRL member and presumably thus have a vested interest in getting the best for my investment. Your one-class idea isn't new or novel, but does have much to recommend it. I've written editorials suggesting just such a licensing arrangement. Ham-gear costs? If you put the cost of a new rig into any perspective it has to be one of the best hobby investments in the world. I can buy a darned good allband rig for about the same price as a wind surfer, a good camera, a twentieth the cost of a good sports car, a good typewriter, a computer, less than a good hi-fi, less than a good TV set, and so on. Put things into perspective. Only hams who are not progressing and using their hard earned skills are short of money. The world is anxious to pay almost anything for repairs of electronic equipment, help in setting up security electronics, and many things for which a good ham is eminently qualified, even in his spare time. And now, linears on 20m... yes, the band would be a lot quieter without 'em... and the hams in Asia wouldn't hear many US stations much of the time. I suspect we would still have plenty of interference, but just a couple of S-units weaker.—Wayne.

LEGALIZE MDS

I have an idea. I don't know if it is new, but it might help overturn some of the recent court rulings against owners of "illegal" MDS receivers.

Install 450-to-2300 ATV repeaters. We have the 2300-2450 band and it can be used for ATV. It also can be tuned very easily by any of the MDS receivers on the market. Besides stirring up activity on this band, it would permit clubs or individuals to "broadcast" CW or training classes or even official bulletins. I think this is just as legal as W1AW and it would give anyone a reason for owning an MDS receiver. After all, you don't have to be licensed to own a shortwave receiver.

Maybe some of the 2-meter FM pioneers that are looking for some new challenges can do this. The technology is simple and I think somebody is already marketing a low-cost 2300-MHz transmitter.

With such a system in place, it ought to be damn easy to get these outrageous rulings overturned. If we don't do something now, cases like these involving our personal freedom are only going to get worse.

Fred Studenberg W4BF
Melbourne FL

BIG-FOOT GRINGO

So, Wayne, you and your wife survived an odyssey through Colombia and the "barracudas" who besieged you at the street corners that serve as terminals for inter-city buses in Barranquilla and Cartagena!

I have been to the same corners looking for the same bus services as you did and fully agree with you regarding the inexcusable conditions at and around those spots. However, I must address and comment on some of the other concepts expressed by you:

1) *Poverty*—Yes, Colombia is poor. However, not all of it is in disrepair. Inexcusable, too, and for that matter even more so, is the heartbreaking squalor in some areas of New York City, Boston, New Orleans, and Appalachia in this, the richest country of the world.

2) *The "Barracudas"*—This type is found almost everywhere, not only in the so-called Third World. At least in Barranquilla and Cartagena those poor people were eagerly trying to make a buck by rendering some service and were friendly. A great number of the poor in the USA try to make a buck by staying on welfare. And, how about the "friendly" muggers, pimps, and prostitutes that teem in New York's Times Square and

in Hollywood, California? They are "barracudas" of a worse kind.

3) *The Buses*—For a USA world traveller of your kind (if it's Tuesday this must be Belgium), loaded with Yankee gold, you chose the cheapest mode of transportation. Didn't it dawn on you to check if a private, air-conditioned limousine was available? It could have been. I travelled by bus, for my interests and values are different from yours, of course.

4) *The Language*—In trying to be smart, your subconscious betrays you and your biases surface all too clear. In the Caribbean area, old man, there are millions of black people. For your education, Spanish, not Swahili, is the language spoken by Colombians of the black race. I wonder if you have travelled within the USA. In case you will ever travel through Washington, DC, Alabama, Louisiana, the Carolinas, Virginia, New York, etc., don't be surprised if the blacks in those areas do not speak Swahili but English.

5) *Amenities*—Ah, there was an ice machine on your floor at the hotel in Cartagena! Had you asked for it, you could also have had ketchup to go with your steak!

Old Man, it seems that the *73* publication has in you an editorialist who travels and sees the world and writes about it with the sensibility of the typical big-foot gringo oblivious of the fact that the USA, for all its might and glory, also has many an eyesore, both physical and of the soul, that can be easily exposed.

And what is even more pathetic, you visited Cartagena, which is, so to speak, a banquet in history and Spanish colonial architecture, and you missed it all, it seems, since you found nothing loftier to comment on than a street corner and an ice machine in your hotel. What an input for your readers; what a shame!

The foregoing may be an overreaction, but I hope that it will at least serve for you to understand and learn that writing about other countries and peoples requires much tact and responsibility. I dare you to give this letter equal time in your columns. Long live *QST*!

Alvaro Guzman WA6WMN
Arleta CA

Alvaro, you seem to have your own problems. I enjoyed Colombia and most of the readers enjoyed reading about my short visit there. I'm sure there is some rationale for publishing your letter, but other than to present a distorted view of what I wrote, I'm not sure what it is.—Wayne.

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

THE YEAR THAT WAS—1964

Do you know what the Wireless Operators Memorial is? No, it's not a monument dedicated to those who died while waiting to make a contact off of a DX list. If you're ever in New York, you might want to make a trip to Battery Park to view one of the Big Apple's least-visited tourist attractions. A granite column with bronze plaques listing the names of 48 radio operators who went down with their ships while faithfully sending out distress signals, the monument was installed by a group called the Veteran Wireless Operators Association. If you have trouble finding the memorial, just remember that it's about halfway between a bust of John Wolfe Ambrose, known for his 40-year struggle to fulfill his lifelong dream of dredging New York Harbor, and a statue of John Ericsson, holding what looks like a scrub brush but is actually a scale model of his ironclad Civil War ship, the *Monitor*. Remember, you read about all of this in FUN!

Let's move on to more esoteric items. The other day, I was browsing through the on-line encyclopedia that's available on the Dow Jones News/Retrieval Service. Suddenly, I thought, "Gee, I wonder if they have anything on my favorite ham, Hiram Percy Maxim?" With that, I typed HPM's name into my TRS-80 and got the information that he invented the gun silencer, co-founded the American Radio Relay League, and did pioneering work on the automobile muffler. Nothing new there. What I did find fascinating, however, was Maxim's bibliography. According to DJNS, one of the primary sources of information about old Hiram is a nifty tome titled *Merchants of Death* (1934), edited by Clifton Johnson. Golly. The ARRL co-founded by a "merchant of death"? Something to think about.

Before we get to the puzzles, a few words about this month's topic. With this installment of FUN! we inaugurate a new feature—"The Year That Was." On an irregular basis, we'll be looking at specific years in ham-radio history; years that for one reason or another (usually several reasons) turned out to be pivotal times for our hobby. To kick off the series, we start with a look at 1964. Why 1964? Well, it really was a turning point in ham radio. Phone ops were finally making the big shift from AM to SSB in droves, the great incentive licensing debate was at a peak, and the ARRL was celebrating its 50th anniversary. On a more personal note, 1964 was the year I first came in contact with amateur radio. It happened at the 1964 New York World's Fair. The League had installed a station at one of the pavilions and was inviting the public to get a first-hand look at our hobby. I asked if I could twist the dials on one of the Collins rigs and was told—quite rudely, I remember—no. I later found out that the fellow who denied me access to the radio later became president of the ARRL. Psychologists, take note; I was 8 years old at the time.

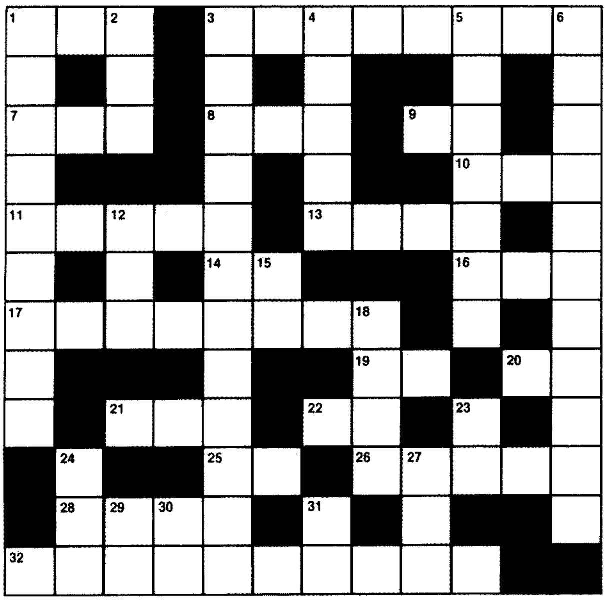


Illustration 1.

ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

Across

1) Ham slang for something nice
3) Lyndon . . .
7) Not 1 Down (abbr.)
8) World's radio board (abbr.)
9) Spain prefix
10) Month of ARRL's anniversary
11) Our globe
13) Little of this on 20 meters
14) Plate current
16) A personal listening apparatus
17) A primary goal of our service
19) Western city (abbr.)
20) Line power (abbr.)
21) Top DX frequency (abbr.)
22) Egypt prefix
25) An international organization (abbr.)
26) AC4-land
28) Threadbare
32) Big 1964-65 event (2 words)

Down

1) Ham who ran for president in 1964
2) Make a tape copy
3) Although HQ was built in 1962, ARRL still had this in 1964 (2 words)
4) Bird #3 was built in 1964
5) Where many jammers should be living
6) Site of 32 Across (3 words)
12) African broadcast company (abbr.)
15) The value of . . .
18) Abundance
23) Decibel (abbr.)
24) VHF band where activity was mostly AM in '64
27) Morse question mark
29) Digital gate
30) Radiolocation (abbr.)
31) Direction finding (abbr.)

ELEMENT 2—MULTIPLE CHOICE

1) As mentioned during the introduction, the ARRL had a ham station at the 1964 New York World's Fair. Pick the company that housed the station in their pavilion.
   1) Pepsi-Cola
   2) 7 Up
   3) Dr. Pepper
   4) Coca-Cola

S	C	Z	X	V	M	T	N	L	K	U	O	Q	X	H
A	W	A	A	A	A	A	A	E	A	A	A	A	Q	A
A	Z	A	A	A	A	A	A	A	L	A	A	A	W	L
A	H	A	N	A	X	A	M	A	A	L	A	A	U	L
A	Q	A	A	A	A	A	A	A	A	A	I	A	S	I
A	K	A	A	C	A	A	A	H	A	A	A	M	F	C
B	W	F	L	G	O	N	S	E	T	H	M	Y	P	R
T	G	U	E	W	B	K	R	N	H	L	T	X	Z	A
I	W	S	A	A	A	A	A	R	A	A	E	A	N	F
K	W	N	A	A	M	A	A	Y	A	A	L	A	X	T
H	I	I	A	A	A	E	A	A	A	A	R	A	D	E
T	M	L	A	A	G	A	C	A	A	A	E	A	T	R
A	T	L	A	A	A	A	A	O	A	A	X	A	L	S
E	R	O	H	E	W	O	Q	W	C	B	N	M	K	A
H	D	C	A	N	A	T	I	O	N	A	L	J	J	E

Illustration 2.

2) The son of which former president of the United States was president of the ARRL in 1964?
   1) Woodrow Wilson
   2) Herbert Hoover
   3) Franklin Roosevelt
   4) Warren Harding

3) What city played host to the 1964 ARRL National Convention?
   1) Des Moines, Iowa
   2) Lincoln, Nebraska
   3) Independence, Missouri
   4) New York, New York

4) Amateur radio played a vital role (some say it was ham radio's finest hour) during this 1964 earthquake. Pick the disaster's location.
   1) California
   2) Mexico
   3) Chile
   4) Alaska

5) During 1964, the FCC began charging amateur radio license fees. How much did it cost back then to take an examination or renew a ticket?
   1) $2.00
   2) $4.00
   3) $10.00
   4) $20.00

ELEMENT 3—TRUE-FALSE

	True	False
1) The callsign of the ARRL's fair station was K2WF.	___	___
2) By 1964, more than 6000 hams had responded to the FCC about the incentive licensing proposal.	___	___
3) The first-ever Field Day was held in 1964.	___	___
4) The 1964 "Goldwater Bill" provided for reciprocal operating agreements for amateurs.	___	___
5) It cost $20.00 to request a special callsign in 1964.	___	___
6) The FCC celebrated its 30th anniversary during 1964.	___	___
7) The US Government celebrated the ARRL's 50th anniversary by issuing a commemorative medallion.	___	___
8) In June, 1964, the FCC temporarily outlawed the use of semiautomatic keyers ("bugs").	___	___
9) 1964 was the peak of a solar cycle.	___	___
10) As a feature of its anniversary year, the ARRL sponsored a contest in which selected articles submitted to *QST* were awarded a $25 US Savings Bond.	___	___

ELEMENT 4—HIDDEN WORDS (Illustration 2)

Hidden in this puzzle are the names of ten amateur equipment manufacturers active during the year 1964. The names are formed in any direction—horizontally, vertically, or diagonally, forwards or backwards. As you find each word, circle it.

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1—4 Coke was it.
2—2 Herbert Hoover, Jr. W6ZH.
3—4 New York, New York. The town so nice they named it twice.
4—4 The famous "Good Friday" quake.
5—2 See? Not everything has gone up in price!

Element 3:
1—False K2US.
2—True No apathy then.
3—False Long-time tradition.
4—True Help for the traveling ham.
5—True Let's see. For a 1 × 2 call that was five bucks a character. Not bad.
6—True Didn't you ever hear of the Communications Act of 1934?
7—False A postage stamp.
8—False Come on!
9—False No. But things were looking up.
10—True Look, it's more than they pay now.

Element 4:
See Illustration 2A.

SCORING

Element 1:
Twenty-five points for the completed puzzle or ½ point for each question correctly answered.

Element 2:
Five points for each correct answer.

Element 3:
Two and one-half points for each correct answer.

Element 4:
Twenty-five points for the completed puzzle or two and one-half points for each name found.

Know your nostalgia?

1-20 points—Born in 1965
21-40 points—Amnesia victim
41-60 points—Out of the country during '64
61-80 points—Remembers it well
81-100+ points—Photographic memory

G	U	D		B	J	O	H	N	S	O	N
O		U		U		S			L		E
L	I	B		I	T	C		E	A		W
D				L		A			M	A	Y
W	O	R	L	D		R	O	O	M		O
A		S		I	P				E	A	R
T	R	A	I	N	I	N	G		R		K
E				G			L	A		A	C
R		M	U	F		S	U		D		I
	T			U	N		T	I	B	E	T
	W	O	R	N		D		M			Y
W	O	R	L	D	S	F	A	I	R		

Illustration 1A.

S	C	Z	X	V	M	T	N	L	K	U	O	Q	X	H
A	W	A	A	A	A	A	A	E	A	A	A	A	Q	A
A	Z	A	A	A	A	A	A	A	L	A	A	A	W	L
A	H	A	N	A	X	A	M	A	A	L	A	A	U	L
A	Q	A	A	A	A	A	A	A	A	A	I	A	S	I
A	K	A	A	C	A	A	A	H	A	A	A	M	F	C
B	W	F	L	G	O	N	S	E	T	H	M	Y	P	R
T	G	U	E	W	B	K	R	N	H	L	T	X	Z	A
I	W	S	A	A	A	A	A	R	A	A	E	A	N	F
K	W	N	A	A	M	A	A	Y	A	A	L	A	X	T
H	I	I	A	A	A	E	A	A	A	A	R	A	D	E
T	M	L	A	A	G	A	C	A	A	A	E	A	T	R
A	T	L	A	A	A	A	A	O	A	A	X	A	L	S
E	R	O	H	E	W	O	Q	W	C	B	N	M	K	A
H	D	C	A	N	A	T	I	O	N	A	L	J	J	E

Illustration 2A.

HAM HELP

Wanted: manuals or schematics for the Hallicrafters SX-99 and S-120 shortwave receivers; the RCA 7-band receiver, model 3-BX-671; the RCA WV97A volt-ohmmeter; the DAK Mark III 40-channel CB; the SCP SC100T-BIL amplifier; and the ECI Port-A-Lab swr meter. I am also looking for used code-practice cassette tapes at 13 wpm or more. I will pay for all postage and copying costs.

John D. Hudson
7045 Skytes Way T-2
Springfield VA 22151

I am looking for the name and address of the manufacturer that makes a radio called "Mr. Thin."

B. S. Pillay
PO Box 936
Port Elizabeth
South Africa

I need manuals and schematics for a Hammarlund SP-600. I will pay for them.

C. E. Darrah WA6JNF
304 N. Alvord St.
Ridgecrest CA 93555

REVIEW

LARSEN MOBILE MOUNT

Before I left my parents' home to go into the great wide world, my father took me by his side and offered sage advice from his years of experience.

"Son," he said, "never leave your mobile rig in the car overnight, or it will be stolen."

For years, I have followed his advice faithfully, disconnecting power leads, coax, and auxiliary speaker connections, fighting with jury-rig mounts made from rubber bands and plywood that substituted for a good, permanent installation. Though this nightly ritual quickly grew tiresome, it was not until recently that I discovered a different way that takes no time and little effort—the Larsen Quik-Change mounting system.

The Larsen mount comes in two pieces—one which is mounted in the car, with all of the connections permanently hooked up, and a lower half which is installed on the radio. A second set of permanent connections are made here, and the two halves slide together, completing the circuits and securely holding the radio.

Connections between the two halves are made via 4 pins and a specially-designed coax connector. All of the pin connections create a good electrical contact; I have had no interruptions due to poor contacts, although the unit has been tested over a period of several months, including driving on dirt roads with ruts that would dwarf the Grand Canyon.

Nor has the mount shaken loose. Larsen thoughtfully equipped the Quik-Change system with a plethora of mounting holes on the half which stays in the car. This makes it easy to install the unit across a wide range of automobile makes and models. The top half is composed of an impact-resistant plastic slide topped by a metal plate. Out of the back comes a short length of RG-58/U which ends in a female threaded coax connector; all other connections are made to a terminal located between the top plate and the lower plastic piece. When installing the mount, you must first make all of your connections, close the two pieces, then mount the top half under the dash or in another suitable place. If you pay attention to the routing of your wires and cables, once the top half has been secured, only about 3/4" of black plastic will show beneath the dash.

The bottom half sits on top of your radio like a saddle and is held in place by the standard side mounting holes. The width of the radio may vary from as narrow as the mount itself to about 9" wide. Again, all leads coming from the radio, with the exception of the antenna, are connected to a terminal on the back of the mount. Two leads come from the mount—a piece of coax and a connector which screws onto your radio's SO-239, and a dual-conductor wire which ends in a subminiature phono plug. This plug is for your radio's external speaker jack, and through the top half of the mount, it can be wired into any speaker configuration you desire.

Making the basic connections—power and antenna—do not use up all of the connecting pins, so this system leaves room for expansion if you want to add on any special features.

In use, the Larsen system has proved to be a boon to my mobile operating. When making a trip with frequent, short stops, it takes only seconds to pull the radio from the mount and swing it into the trunk. On my return, I slide the radio back into the mount, and it fastens with a satisfying click. The release mechanism has been designed for easy, one-hand operation so you can pull the radio and carry it without having to change your grip.

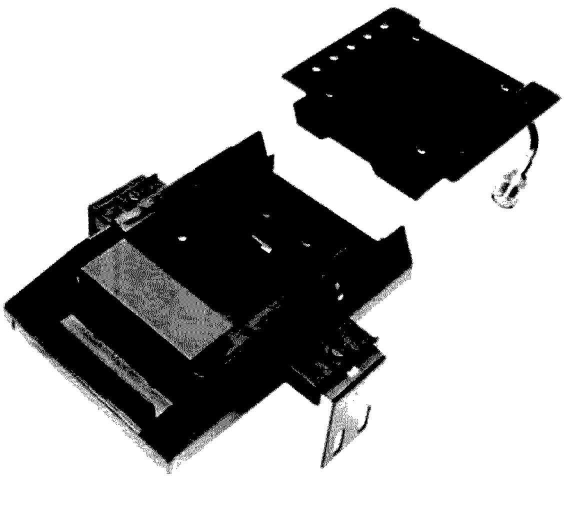
However, the advantages of the Larsen system don't stop there. If, like many hams, you own two cars and frequently find yourself driving the one without your rig, two Larsen mounts will solve the problem. With them, you can move your rig from one car to the other with ease. Or, if you have two rigs—for example, a 2-meter FM and a converted 10-meter rig—you can use the Larsen system in conjunction with a coaxial switch to easily change from one mobile rig to another.

The low profile and black plastic make the Larsen mount difficult to see once it is installed, and it will not interfere with passenger comfort in smaller automobiles. It has also been designed to be manufacturer-independent and will work equally well with almost all brands of radios.

Larsen also provides an optional key lock system which will lock the two halves together. That may be satisfactory for short hops, but this mounting system makes it so easy to remove the radio that there is no excuse for allowing your rig to become a sitting duck.

For additional information, contact *Larsen Electronics, Inc., 11611 NE 50th Ave., PO Box 1799, Vancouver WA 98668; (206)-573-2722.* Reader Service number 477.

Avery L. Jenkins WB8JLG
73 Staff



The Larsen Quik-Change mounting system.

RTTY AND MORSE FROM KANTRONICS AND COMMODORE

Computerized RTTY and Morse have been technically possible for a long time. Unfortunately, "technically possible" too often translates into "complex and expensive." Consequently, the number of amateurs enjoying this interesting mode remained, until recently, relatively small. The advent of low-cost microcomputers was bound to change that situation. Enter the Commodore VIC-20, the Kantronics Hamsoft communications software, and The Interface terminal unit (TU), also from Kantronics.

A Three-Part System

In addition to your station transceiver, there are three main components to a computerized amateur communications system: a computer, software which causes the computer to behave as a communications terminal, and interface hardware to connect the computer to the transceiver. Let's examine each item.

The VIC-20 is an extremely popular computer. According to its manufacturer, several hundred thousand VICs are now in the field. For amateur radio use, this computer has two advantages. First, the VIC possesses a full-size keyboard; many other low-cost computers do not. A real keyboard is a must for comfortable typing, and believe me, you'll be doing a lot of typing when you get hooked on RTTY. A second reason for choosing the VIC is the Kantronics hardware and software, which is designed specifically for use with the VIC-20. This feature greatly simplifies the task of getting on the air. The retail price of the VIC is $299.95, but it is often discounted to well under $200.

A computer without software is like a stereo system without records—useless. Kantronics' Hamsoft program enables the VIC-20 to function as a communications terminal for RTTY and Morse transmission and reception. Such a terminal is sometimes called a "glass teletype" with some justification. Together, the computer and software comprise a substitute for a mechanical teleprinter, such as the venerable Model 15. The main disadvantage of the mechanical method is that the speed, mode, and other operating parameters are fixed. Changing speeds, for instance, requires changing parts inside the machine. By contrast, changing speeds in a computer-based system can be as simple as pushing a button. Switching from Baudot to ASCII or Morse is equally simple. Try that on your Model 15! Flexibility—that's the main advantage of going to a computer. This flexibility is illustrated by Table 1, which lists the features of the Hamsoft program.

Incidentally, Hamsoft is supplied, not on cassette tape or floppy disk, but as a small circuit board that plugs into the game cartridge slot of the VIC-20. The program resides in a read-only memory (ROM) on the board—very convenient. Hamsoft for the VIC-20 is priced at $49.50. The program is also available for the Apple II, the TRS-80 Color Computer, and the Atari 400 and 800.

Although Hamsoft may work with many different terminal units, Kantronics warrants it to perform correctly only with The Interface, Kantronics' own TU. The Interface is a small plastic box full of hardware that goes between the terminal (the computer) and your transceiver. It measures just 5" × 2.5" × 5.25". Under control of the Hamsoft program, The Interface keys your rig, converts received audio into TTL levels that the computer can accept, and converts computer-generated TTL levels into audio tones for RTTY transmission or into on-off keying for CW. The rear panel of The Interface is loaded with jacks for connection to the transceiver and computer. The front panel contains the power switch, a RTTY/CW selector, an LED tuning eye, and a 10-segment LED bar-graph tuning aid. The Interface contains active filters for both RTTY and CW. The Interface retails for $189.95.

Connections

Putting it all together is mainly a matter of wiring cables to connect your station transceiver to The Interface. Kantronics provides plugs to fit the jacks on the rear of The Interface, but you must supply connectors for your transceiver's mike, CW key, and external speaker jacks. The VIC-20/Hamsoft/Interface hookup requires five cables.

Using the System

With this system, the VIC-20 executes the Hamsoft program as soon as you turn the computer on. When all parts of the system are powered up, a short series of questions appear on the VIC's video display, allowing you to tell Hamsoft what type of terminal unit you are using, select a mode, enter a message into one of 10 buffers, or set the internal clock. If you select RTTY, the system goes directly into the 60-word-per-minute (wpm) Baudot mode. From there, however, you can choose other speeds and modes (ASCII and Morse) with a few simple keystrokes. The system is not quite as easy to use as some others, but once learned, works fine.

At this point, it's time to tune in a signal and see what prints on the video display. The tuning eye and bar graph on The Interface are valuable aids here, but it still requires careful tuning to get good copy. I found the best results when I followed the Kantronics tuning procedure. This involves beginning the tuning with the signal at a low pitch, then slowly increasing the pitch of the signal until the tuning indicators respond and good copy shows on the video display. It works that way most of the time, but there are the inevitable exceptions. Sometimes I tried several speeds before finding the correct one. At other times,

Morse Code
- 5-99 words per minute
- automatic speed tracking

RTTY
- Baudot: 60, 67, 75, 100 wpm
- ASCII: 100, 300 baud
- automatic CW ID

General
- split screen display
- 1024-character transmit buffer
- 10 255-character message buffers
- printer compatibility for hard copy

Table 1. Features of the Hamsoft RTTY/CW software.

copy was possible only by switching to the opposite sideband on the transceiver's mode switch. Of course, there were some instances where the filters in The Interface were not selective enough to separate two closely spaced signals.

I was disappointed in the manuals for the Kantronics products; neither was very well organized. In addition, the Hamsoft instructions were much too brief, lacking even one example of how to use the system. Examples are absolutely essential, especially for newcomers.

Conclusions

Buying a computer for RTTY and CW may seem like a big investment. It's important to remember, however, that that same microcomputer is also available for myriad other uses, limited only by your imagination. In addition, some ham dealers offer a low package price when you purchase the computer, software, and interface at the same time.

I have used the system for many successful contacts on both RTTY and CW, including DX CW QSOs and local 300-baud ASCII contacts. In comparison with other computerized CW/RTTY setups I've used (all more expensive than this one), the overall performance of the Commodore/Kantronics combo rates better than average on CW, a bit below average on RTTY. On a price/performance basis, however, the VIC-20, the Hamsoft program, and The Interface are hard to beat.

For more information, contact *Kantronics, 1202 E. 23rd, Lawrence KS 66044; Commodore International, 487 Devon Park Drive, Wayne PA 19087.* Reader Service number 488.

Jeff DeTray WB8BTH
***73* Staff**

FIST FIGHTER

Think you're a pretty good CW man, eh? How are you with a hand key? Do those B's and V's leave a little to be desired? What about F's and Y's? Well, maybe you are pretty good at that, but I'll bet you that this little gem from the Blacksburg Group can make you better!

The boys at Blacksburg figured that you *can* teach an old dog new tricks, and it's even easier to teach a young dog new tricks, so they came up with a neat idea for creating the kind of fist you've always wished you could have. They designed a circuit that would have a built-in memory for perfectly-formed characters at any speed. They also programmed it so that the proper space between characters would be remembered. Now comes the neat part: Fist Fighter doesn't send code—you do, but it forces you to send it in accordance with the built-in memory. If your fist tries to do its own broken rhythm and jagged little dance on the key, you're in for a big surprise—nothing comes out of the box!

Well, you say, you can get around that easy enough by fooling the circuit, right? Nope, won't work. The only way you're going to fool the circuit is to send CW the way it wants you to send CW, not the way you want to. Dad-blamed thing is frustrating, believe me. First time I tried it, I got mad and left it in frustration and anger. No danged machine is gonna tell *me* how to send code, nossir.

I came back and tried setting it to different speeds . . . must be some speed I could have my way with it. Wrong again! More anger and frustration. Well, I did get even with the little critter in the end (heh,heh). I plugged it into the power supply with reversed polarity! Served the little demon right!

Well, I sent it back to the Blacksburg boys, and they fixed it . . . for good. They changed the circuit a bit and made it so that no matter which polarity you use when you connect it to your little 12-volt-dc supply, you won't hurt it.

Round three. At last, I was beginning to get the hang of it. So that's the way a Y oughta sound? Hmmm . . . lemme see, now a O. Not bad. That little machine is learning from me after all, says I, soothing my own ego a bit. Might not have to throw it out, after all!

Round four. Showed the little jewel to my buddy, Ken, who is learning to become a ham. He's been working on the code right along. Boy, bet this will fool him! Here, Ken, try this little machine . . . see if you can make it work. (Boy, this is gonna be fun, thought I . . . let's watch him sweat like I did.)

What's that—code, nice and easy and regular coming out? Can't be! Well, so as not to bore you any more, I'll make it short. That little Fist Fighter got along just fine with Ken; they *both* had nice fists.

Later, I said to Ken, "How do you figger that. Ol' Buddy? How come you can make that little rascal sit up and beg, while it just sits there and fights me? Heck, I been CWin' for 32 years and you haven't been CWin' for 32 hours yet!"

Well, Ken kinda sat back and smiled and said so quietly I could barely hear him; "Well, Jim, maybe you just have more to unlearn than I do."

Now, I'm not going to say that the Fist Fighter is for everybody, because it isn't! If you've got a short fuse and you hate to learn new tricks, stay away from it, because you're not going to get along. On the other hand, if you are willing to improve yourself or if you're just starting out and want to learn to send some of that machine-perfect code with a hand key, stick with the Fist Fighter. It's a better teacher than most, because you teach yourself. A little patience and discipline is all you need. Feller like myself, of course, goes back to his old ways and his friends say, "There's Ol' Jim . . . always can recognize that fist of his!"

If you want a little workout and think you're a better fighter than the Fist Fighter, why don't you prove it by sending your $59.95 to the boys in Ol' Virginny? Write *Blacksburg Group, Box 242, Blacksburg VA 24060, (703)-951-9030.* Reader Service number 476.

Jim Gray W1XU
***73* Staff**

GALFO'S APPLE II AMATEUR RADIO COMMUNICATIONS PACKAGE

Without a doubt, the computer has entered into the amateur radio shack to perform a wide variety of functions. Perhaps one of the most established and growing areas involves RTTY communications. Mr. Galfo has provided the amateur community with a fine software package for RTTY, Morse, and ASCII purposes. The inexpensive software provides a flexible medium for communications and is very simple to operate. The Amateur Radio Communications Package for the Apple II computer is a versatile one indeed. It provides for transmission and reception of Morse, Baudot, or ASCII codes. The speed range is variable with buffering and memory capacity which is quite large.

The Morse portion of the program provides for transmitting rates between 2 and 125 words per minute. The speed which is selected for transmission also selects the optimum receiving speed. The actual speed of reception will adapt to within a 3 to 1 range of the sending speed. The dot to dash radio is set up at 1 to 3 with character and word spacing also included. The RTTY and ASCII portion uses the 5-bit Baudot or 8-bit ASCII codes with a continuous speed range of 32 to 300 baud. The usual control characters are quite easily accessed. Transmit/receive switching is available from the keyboard (ESC) or from the software (control C). Morse characters such as end of message, end of QSO, end of work, go ahead, end of line, wait, and break are included. CW ID followed by a carriage return, line feed, and letter sequences are also available with one command. An interesting feature involves an end of text marker in the transmit buffer. When this signal is encountered in the text, the transmission is terminated, followed by CW ID. One is then ready to receive or continue the same or another memory.

The program's *transmit buffer is large.* For an 8K Apple, there are 500 bytes available; for a 48K Apple, there are 20.5 kilobytes available for the transmit buffer. With the use of the end of text marker in the transmission buffer, this allows for extended type ahead usage. The stored message texts range from 2 kilobytes in the 8K Apple to 22 kilobytes in the 48K Apple.

The message text can be formatted in a variety of ways but basically consists of using a key word in the text to bring up any one of a variety of messages which can be created and entered into the software program itself.

One example is typing into the buffer "okay, control A TNX control A." The output would be transmitted as "okay, thanks for the call" provided that you had previously entered the key word and message into memory. For those individuals not familiar with programming, it only involves two steps to create a memory such as this:

```
DIM TNX $ (20)
TNX $ = "thanks for the call"
```

There is a 255-character limit in each message memory. In using the key words, one only needs to enter "control A" before and after the key word to identify it as a key word for memory recognition. With 22,000 bits of information available for message storage, one can readily see the flexibility of having a wide variety of subjects covered for use without having to resort to changing programs, whether it be contesting, DXing, or rag-chewing with the usual crowd. The ID key word is specific in that it will send the proper Morse identification prior to the receive mode.

The type of receiver, transmitter, transceiver, terminal unit, frequency shift key circuit, and CW threshold detector are all independent of the program. A simple and reliable schematic is available with the software ("Got an Apple? Want RTTY?", Constantine Papas, *73*, October, 1982). One or two evenings should normally be more than adequate to build and interconnect the Apple II computer with the terminal unit, transmitter, and receiver. A store-bought terminal unit with AFSK only takes a few minutes to plug in.

The program itself is in two parts. A set of machine-language routines handles the real-time task and code conversions, while Basic is used to execute the conversion between user and computer. The software is available from tape or diskette. The diskette programs are always more easily used, but even loading the program from cassette is quick and non-traumatic. After loading the program, the package is set into motion by entering "run" as a basic command. Buffer and memory allocations are automatically set according to the memory space available. The program begins by requesting several types of information, basically whether or not one is to use Morse, Baudot, or ASCII. The word or character mode is determined next. When in the word mode, the transmitter will not transmit the last word until it is complete and a space has been typed. In the character mode, each character is sent and is released from the text buffer one by one. The transmission speed is determined next. The 2- to 125-word-per-minute Morse and 32- to 300-baud RTTY speeds are all available. A fill character is requested, should the transmit buffer empty; one or two non-printable characters or no characters at all may be chosen, in which case a steady mark is maintained when the buffer is empty.

Following the initial setup, the program will go into its receive mode to copy signals present on the input line. The screen is now divided into three separate fields. The top 16 lines are the received text. A single center field is the field showing the character being sent, as well as the next 38 characters to follow. The last five lines on the bottom of the screen show the text that is being placed into the transmit buffer. The fields grow individually as text is added to each. Word wraparound is automatically adjusted for a 40-character line on receive.

When ready to transmit, the escape key will allow you to toggle between transmit and receive. Entry into the transmit buffer may be made during transmit or receive from the keyboard. If the transmitter buffer empties, the characters will stop until you once again enter information to be transmitted. The escape key may be used to return the state to receive or, at the end of a transmission, one may enter a "control C." When the "control C" is encountered, the program will go into its receive mode automatically following a CW ID.

The text you prepare does not require carriage returns or line feeds. They are generated automatically to give a standard 72-character line that does not split short words when operating RTTY. The carriage return, line feed, letter sequence is placed at the beginning of each transmission automatically. CW transmission is a continuous stream, as one would normally find. Character spacing is three dots with word spacing of five dots on transmit.

Another item included in the software is

HAMEG OSCILLOSCOPE

● 20 MHz Dual Trace
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● 2 x 20 MHz, Max. 2 mV/cm
● Timebase 40 ns ~ 0.2 s/cm
● Trigger Bandwidth 30 Mhz

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✓See List of Advertisers on page 114

"control B" which clears the text buffer, clears the entire screen, and returns the system to the receive mode. With the ability to use the forward and backspace cursor movements, modifications can be easily made to the transmit text prior to it being transmitted. Should a speed change be required, a simple "control S" returns the system to the interactive mode for a speed change or other control change.

All interconnections to the Apple computer are made through the game port. The RTTY input signal, RTTY output signal, Morse input signal, transmit/receive control, and Morse output signal are the only five connections other than a common ground required.

There are no provisions for received message storage or the ability to print out the received text. There is also no provision for "WRU" (who are you?). It is quite simple to load the program, answer a few questions, and begin receiving or transmitting. The combination of simultaneous reception with the ability to use the extensive buffer and memory storage space makes for a relaxed communication program, providing an enjoyable means of operating.

For more information, contact *C. H. Galto WB4JMD, 6252 Camino Verde Drive, San Jose CA 95119.* Reader Service number 486.

E. Benson Scott II AE5V
West Monroe LA

The Rest of Ham Radio
Dan Fox W2IQD

Foundation Publishing
PO Box 805
Merrimack NH 03054
173 pages, $13.95

The generic fad has overtaken amateur radio. We have generic callbooks and logs. Who knows, before the year is out someone may introduce a generic rig. It will come in a white cardboard box and bear the label "Transceiver." With this in mind, I was not surprised to find a generic operating manual in my mailbox. But once you look beyond *The Rest of Ham Radio*'s plain wrapper, you'll be pleasantly surprised by its contents.

Readers familiar with Dan Fox W2IQD's earlier effort, *The Apartment Dweller's Handbook*, can attest to his ability to get to the heart of a subject and present practical solutions to everyday problems. In *The Apartment Dweller's Handbook* it was solving the problem of limited resources, whether it be money, room for antennas, or ways to beat TVI. Now, with the task of assembling a station out of the way, W2IQD focuses quite literally on "the rest of ham radio." Acknowledging that newcomers to ham radio have plenty of literature to get them through their first QSOs and that old-timers probably don't need a new book, *The Rest of Ham Radio* is aimed at the advanced beginner.

Two chapters are devoted to DX, another two cover contest operation, there is a section on awards, a chapter on repeaters, and so on. Pastimes like QRP operation, satellites, RTTY, and SSTV are the final four chapters. Purists may criticize the lack of coverage of such topics as hang-gliding mobile or coherent CW, but the author, wisely remembering that a book cannot be all things to all people, decided to stick to amateur radio's most popular haunts.

Unlike many of amateur radio's traditional tomes, *The Rest of Ham Radio* doesn't rest on an ivory tower view of what the author thinks amateur radio should be. Instead, W2IQD combines his twenty-five years of operating experience with advice from acknowledged experts and a lot of research. The book that results is a lot like a smorgasbord: You might not like everything that is offered, but you're sure to find something that will satisfy your appetite. And if the information on such subjects as satellite operation or SSTV doesn't appeal today, then it might next year.

Perhaps it is nitpicking, but I was just a tad uncomfortable about paying $13.95 for a book that has a homemade appearance. After realizing that everything costs more these days and that you really can't judge a book by its cover or the typewriter-style print and amateurish drawings, I've concluded that we need more books like *The Rest of Ham Radio*. In remembering the experienced beginner or General/Technician class licensee just starting out, W2IQD has given the "forgotten ham" something to cheer about.

The Rest of Ham Radio is distributed by *Birch Hill Sales, PO Box 234, Peterborough NH 03458.* Reader Service number 487.

Timothy Daniel N8RK
Oxford OH

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

I promised a tip of the hat to Al Jolson last month, so here we go. Though April showers bring May flowers, the columnist's mailman brings letters, and do we have a bunch this month!

Let's start with a topic I don't think we have touched upon ever in this column. Francis Surovec WD9HPA of Fort Wayne, Indiana, writes that he is using a "clean" Teletype® Model 28 in his RTTY station, but would like to quiet it down. He lives on the second floor of a duplex, and despite the open-mindedness of his neighbor, he is still concerned about the amount of noise, particularly the hum of the running motor.

Well, when I lived in an apartment (also on the second floor) with a Model 15, I faced much the same problem. I remember the day that a new family moved in downstairs and the man of the house came upstairs to see us. It seems that he was an old Navy communications man and "could have sworn he heard a Teletype machine," but couldn't believe his ears. When he saw the Model 15 in my bedroom, well, you can imagine his face. The racks of old equipment didn't hurt, either. Nonetheless, I did what I could to soundproof the machine, and here are a few tips.

Go to a well-stocked hardware store and look for a "fatigue mat." These are thick (one to two cm), dense foam mats that are used at counters for people to stand on. Cut one to size and use it *between* the machine and table, if possible. Another mat may be used under the table, between legs and floor. Building an acoustic enclosure of lumber and lining it with ceiling tile also helps to cut down on transmitted kerchunking. You can often get slightly damaged two-by-four-foot ceiling tiles for the asking at building supply houses. They are ideal to line such a cabinet. Finally, experiment with where in the room you put the machine. Random resonance in the floor may magnify the sound quite a bit in one area, attenuate it to almost nothing a few inches away. It's kind of like swr! Try these ideas out and let me know what happens.

Regards to another medical colleague, Dr. G. Bescher F6ADX, from Plerin, France. His letter relates his use of a TRS-80 for both computing and amateur radio and the acquisition of a Dataproduct T-1602 printer. He is in need of technical information for this printer. Anyone with a manual or such can write to him at 64 Rue du Roselier, Plerin, France 22190. I'm sure he would appreciate the help.

Richard Flink WB2SOU in Hillsdale, New Jersey, is another individual looking for frequencies of commercial stations broadcasting with RTTY. We have described several sources for such information here in the past; I just found another! Now this is going to get a bit off the track, but bear with me.

Universal Software Systems, Inc., has put together a RTTY program for the Apple II computer. Called "Super-RATT," this combination of machine language and Basic sends, receives, saves to disk, or sends from disk on an Apple II and almost any demodulator. It is user-modifiable and may be backed up or copied for personal use without problems. RTTY is supported at all common speeds, and CW from five to 100 words per minute. Several unique features include the ability to decode bit-inversion ciphers, such as used in various press signals, a file transfer system for interstation exchange of data, and video or hard-copy output. As if that is not enough, a full Radio Bulletin Board system is built into the software, allowing your computer to become a central focus in a communications system.

As part of the ongoing support for users of Super-RATT, USS is publishing a newsletter, *The RATT's Nest*. In its premier issue, a listing of RTTY press stations logged by users is given. Also included is news of new products and updates, as well as user modifications passed along but not guaranteed by the management. Looks like a nice package, available from Universal Software Systems, Inc., 9 Shield's Land, Ridgefield CT 06877. Be sure to tell them RTTY Loop sent ya! As I said, the story was a bit convoluted, but it all comes out okay in the end, right?

Steve Stout KA5CRI sends along a few circuits that will interest quite a few of you. Fig. 1 shows a low-voltage loop supply that Steve uses to run his Model 15. His terminal unit requires an external loop, as do many of the newer solid-state units, and using this low-voltage, current-limited supply has a side benefit of preserving the terminal unit's output transistor's life.

Fig. 2 is a circuit Steve put together to "expand" the loop to add another pair of selector magnets, which happened to be encased in a reperforator. In the old days, a power supply of 200 volts or so was used to run two or more RTTY machines in series. Stringing them together formed a "loop," thus the name, local loop (and, by extension, RTTY Loop!). But these days, with low-voltage transistorized outputs, putting two or more sets of selector magnets in series loads down the output to the point where the system will not operate; thus, this circuit. The optoisolator basically keys the second loop, and several of these circuits may be chained together to expand the loops *ad nauseum*. Thanks to Steve for passing these ideas along.

For the past several months, this columnist has been looking into a RTTY terminal program for a 6800-type computer. I have been told that such a program would interest maybe six people worldwide. Is that true? I may change my mind and pursue the 6800, but I am beginning to think that that may be a dead system for wide circulation. Mine is far from moribund, but is it a dinosaur at age seven? My current plans are to complete the "block diagram" discussion, which is processor independent, then look into program development for a 6502-based system, very possibly the Atari. As I said last month, the membrane keyboard is "feh," but I hope to acquire an upgraded Atari with a real keyboard and disk which would lend itself to developing such a program on it. The sound generation system in the Atari may also lead to AFSK without much bother; I don't know. Let me know what you think. Is the 6800 dead as far as you all are concerned? Would you rather see an Atari version? What features are important, which others are nice, fluff, or useless? Drop me a card to voice an opinion. It will count.

Next month some more on the above, and more from out there, all from in here, the old-fashioned, high-voltage RTTY Loop.

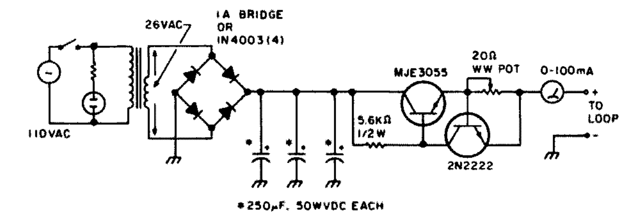


Fig. 1. Low-voltage loop supply.

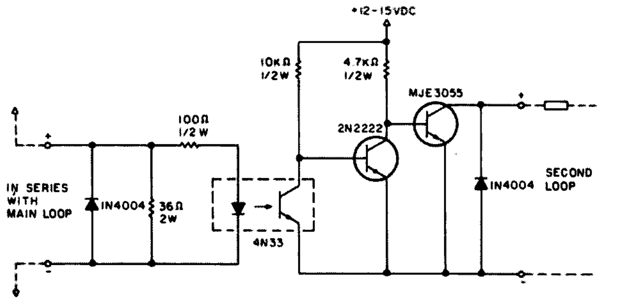
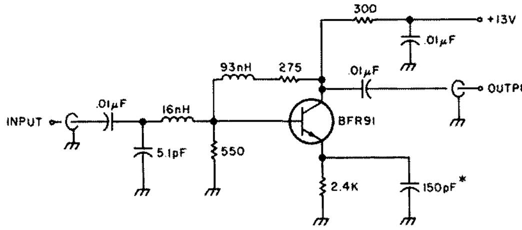


Fig. 2. Loop expander.

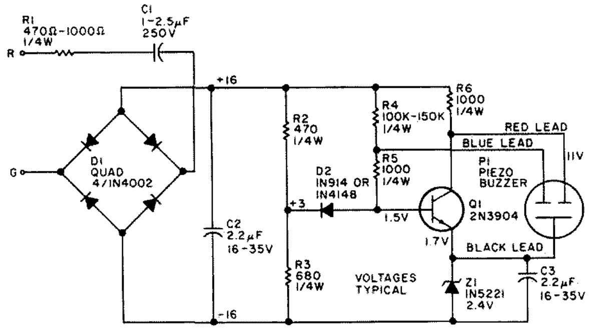
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

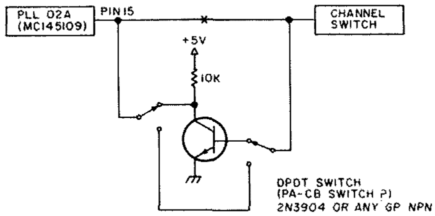
In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



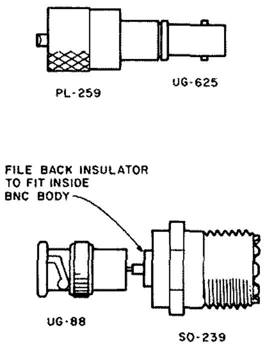
COMPUTER-OPTIMIZED LOW-NOISE BROADBAND AMPLIFIER: Used as a preamp for your tired receiver or to boost levels anywhere in a home-brew project, this amplifier provides 10 dB of gain from 10-600 MHz, and has a 1.5-to-1 match at 50 Ohms. The BFR91 has a 1.5-dB noise figure at 500 MHz, and the circuit requires 13.5 V dc at about 13 mA. The only construction caution is to keep the leads on the 150-pF emitter bypass capacitor as short as possible. I used a chip capacitor with excellent results. The 16-nH coil is 2.5 turns of #26 enamel wire on the shank of a #40 drill. The 93-nH inductor is 10 turns of the same material.—Rick Ferranti WA6NCX/1, Cambridge MA.



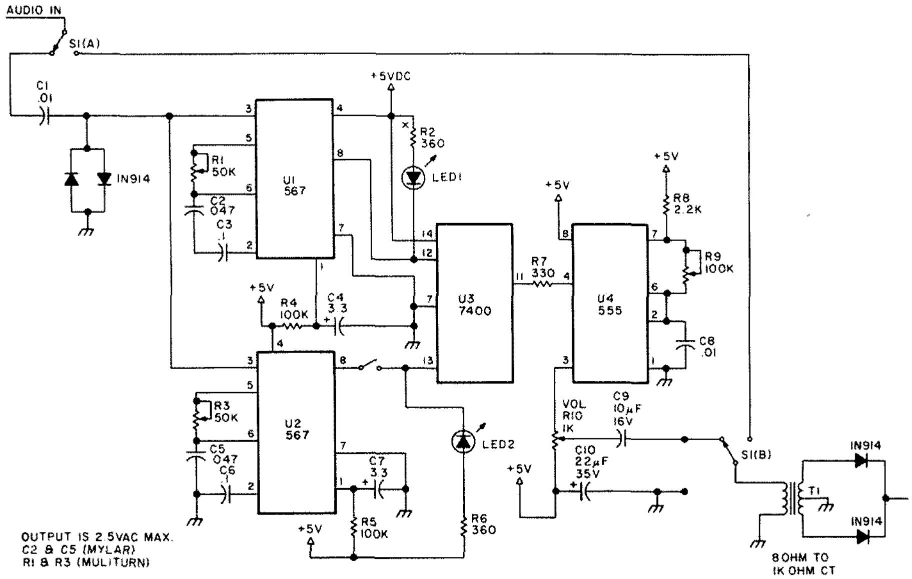
DING-A-LING: This electronic bell needs no power supply. The layout and most of the resistors are not critical, although C2, R2, and R3 work best at the values given. Leaving out R1 will make the unit ring louder. The piezo buzzer may vary from store to store, so if it has two leads, connect the red lead to the collector and the black lead to the emitter of Q1. If a third (blue) lead is present, connect it to the base of Q1.—E. C. Sherrill W5TPP, Fort Worth TX.



USE THOSE MISSING CB CHANNELS: Add more frequencies to your PLL CB-to-10 conversion by adding a switch and a transistor to invert the least significant bit going to the PLL chip. With the switch as shown, you can get 10 kHz above channels 3, 11, and 19, as well as 10 kHz below channels 8 and 16.—Bob Raker WB8ZFF, Cincinnati OH.



BETWEEN-CONNECTOR SERIES ADAPTER: A BNC female (UG-625) fits nicely in a UHF male (PL-259). Just solder a wire to the BNC center and insert it in the body of the PL-259. Solder the center conductor and the seam between the bodies. With just a little more difficulty, an SO-239 can be attached to a BNC male (UG-88). An "F"-type female will thread directly into a BNC male. SMA to BNC (both ways) can be done just as easily.—Bob Raker WB8ZFF, Cincinnati OH.



QRM ELIMINATOR FOR COMPUTER CW: Here is a dandy circuit which will filter out a substantial amount of QRM, enabling a computer to copy CW with ease. The LED on the output could be used to help the hearing-impaired to copy CW. The heart of the circuit is a pair of decoders tuned to slightly different tones which overlap each other. The outputs are fed to a NAND gate, which will key whenever a tone is detected by either detector. The operating bandwidth is now 200 Hz. This circuit will enable you to read CW in bad QRM and with low signal level. The bypass switch is used to check the band without the filter in place. A volume control connected to the output through a headphone or speaker will enable you to monitor the output.—Bill Buckingham WA3LIL, Osceola PA.

HAM HELP

Can anyone provide me with a manual for the Heath model O-10 laboratory oscilloscope? The manual is no longer available from Heath. I will pay all costs or copy and return.

Robert Ross VE3LPJ
4 Meadowland Dr.
Brampton L6W 2R4
Ontario, Canada

Wanted: 220- and 440-MHz boards for a UV-3 transceiver. I will pay a reasonable price for them.

Johnny E. Carr WA4FCC
Route #2
Rockmart GA 30153

Does anyone have a noise-blanker circuit that will work in a National HRO 500?

Bill Blackwell K8LO
180 Woodmere
Detroit MI 48209

I am looking for a new QSL service for outgoing QSL cards. Can anyone help me find one?

Paul Desharnais WA1IPD
22 Cote St.
Somersworth NH 03878

I would like to get a program for Oscars 8 and 9, as well as the RS satellites, for the VIC-20 with 8K. I am also looking for a hook-up to use a Model 33 printer with the computer. I will pay for tapes.

Jim Fyles WB0CZI
820 El Paso Blvd.
Denver CO 80221

I am compiling a list of amateur frequency use, including DX nets, special interest nets, calling frequencies, and band/mode limits. I need details or nets with their designated frequency as well as band limits from 1.8 MHz to 54 MHz.

Ash Nallawalla ZL4LM/VK3CIT
RAAF Academy
Point Cook VIC 3029
Australia

I need the original manual for the Johnson Viking Valiant—no copies, please.

Russ Lawson K1MOU
124 South Grand St.
West Suffield CT 06093

I need schematics and service information for the Knight KG-635 and Precision EG-550B oscilloscopes and the Digicom 800 2-meter radio.

Robert Ball KL7AH
PO Box 74645
Fairbanks AK 99707

I would like to find the manual for a DuMont model 304-A oscilloscope. I am willing to buy the manual or copy and return it.

Gordon Fulp W6FBH
4740 Scotch Pine Lane
Placerville CA 95667

I have a small dc motor that has good ball bearings. I want to use it as a drill motor for PC boards. How do I make a chuck to hold a drill bit with a 3/16" shaft?

Patrick Chirington
1478 Grace Ave.
Lakewood OH 44107

I am looking for an early-production-run Kenwood R-1000, preferably pre-1980.

Victor Barz
Rm. 3305 Cross-Baits II
Ann Arbor MI 48109

I need a schematic for the Tennelec model TN 800 scanner. I will pay for any copies.

Chuck McGinty
RR 11 Box 451
London KY 40741

I have a Pace model CB 144 CB radio which I converted to 10 meters. It receives on 10, but transmits on 21.269 MHz. Can anyone tell me how to get it to transmit on 10 meters?

Joe Oden WD0HVM
4129 South Wichita
Wichita KS 67217

I am seeking the schematic and owner's manual for a National NC-303 receiver. I will pay all postage and copying costs.

Jim Pemberton
7324 Oxmoor Dr.
Rt. 20
Knoxville TN 37921

Does anyone know where I can buy or how to make solid-state replacements for the 6X4 and 12AV7/12AX7 tubes?

Kevin Neal
Route A Box 221A
Flippin AR 72634

Can anybody tell me how to take incoming signals for a Motorola teleprinter and convert them to a format usable by a TRS-80 Model I? Any help or suggestions would be appreciated.

David Youngs
519 N. Pine Way
Anaheim CA 92805

CORRECTIONS

An incorrect drawing accompanied "Ni-cad Charger With Current and Voltage Limiting," which appeared in the "Circuits" feature on page 99 of February's issue. The two bottom diodes in the bridge rectifier should be reversed in order for the circuit to operate properly.

Avery L. Jenkins WB8JLG
73 Staff

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100 ft. RG8U with PL-259 on each end	**$19.95**
BELDEN Coax in 100 ft. rolls	
RG58U #9201	**$11.95**
Grounding strap, heavy duty tubular braid	
3/16 in. tinned copper	**10¢/ft.**
3/8 in. tinned copper	**30¢/ft.**

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RG11U 96% shield, 75-ohm mil spec	25¢/ft.
RG8U 96% shield, mil spec **$27.95/100 ft. or**	31¢/ft.
RG6A/U double shield, 75-ohm	25¢/ft.
RG58AU stranded mil spec	12¢/ft.
RG58 mil spec. 96% shield	11¢/ft

LOW LOSS FOAM DIELECTRIC

RG8X 95% shield (black, white or gray) **$14.95/100 ft.**	17¢/ft.
RG8U 80% shield	18¢/ft.
RG58U 80% shield	07¢/ft.
RG58U 95% shield	10¢/ft.
RG59U 100% foil shield, TV type **$7/100 ft.**	10¢/ft.
RG8U 97% shield 11 ga. (equiv. Belden 8214)	31¢/ft.
Rotor Cable 8-con. 2-18 ga. 6-22 ga.	19¢/ft.

CONNECTORS MADE IN USA

Amphenol PL-259	79¢
PL-259 push-on adapter shell	10/$3.89
PL-259 & SO-239	10/$5.89
Double Male Connector	$1.79
PL-258 Double Female Connector	98¢
1 ft. patch cord w/RCA type plugs each end	3/$1.00
Reducer UG-175 or 176	10/$1.99
UG-255 (PL-259 to BNC)	$3.50
Elbow (M359)	$1.79
F59A (TV type)	10/$2.15
UG 21D/U Amphenol Type N Male for RG8	$3.00
BNC UG88C/U, male	$1.25
3/16 inch Mike Plug for Collins etc.	$1.25
UG273 BNC to PL-259	$3.00

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NEW PRODUCTS

BATTERY ELIMINATORS FOR HAND-HELDS

Handi-Tek has announced its line of battery eliminators for a variety of hand-held radios. These voltage regulators allow continuous operation of handie-talkies without nicad drain or radio modification.

The eliminators plug into an automobile cigarette lighter and provide a regulated voltage supply for Icom, Kenwood, Yaesu, Wilson, Tempo, and other brands.

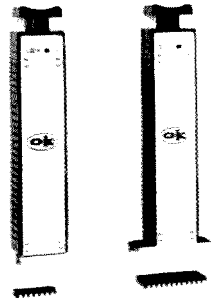
Constructed on glass-epoxy circuit boards from high-quality components, Handi-Tek regulators sport ample heat sinking and a sturdy plastic case.

The six models of eliminators supply a regulated voltage from 8.4 to 10.8 V and, in some cases, may be substituted for the radio's battery pack.

For more information, contact *Handi-Tek, PO Box 2205, La Puente CA 91746.* Reader Service number 485.

IC INSERTERS FOR PC BOARDS

OK Industries, Inc., has just introduced a new series of IC-insertion tools with dimensions optimized for direct insertion into PC boards without sockets. Special long body style facilitates firm grip and thumb action for accurate and comfortable one-hand operation. Rugged nickle-plated steel guides ensure durability and provide static safety, important when using MOS and CMOS ICs. Designed for 14-16-pin ICs (model BBI-1416) and 24-28-pin ICs (model BI-2428). These new inserters are available from stock at local electronics retailers and distributors nationwide, or directly from *OK Industries, Inc., 3455 Conner Street, Bronx NY 10475.* Reader Service number 479.



IC inserters for PC boards from OK Industries.

650-MHZ FREQUENCY COUNTERS

The new Models 6000 and 6500 650-MHz Frequency Counters, introduced by Global Specialties Corporation, offer outstanding performance and ease of operation. The 6000 features a trimlined front panel with optimally accessible controls, push-button operation, bright LED display, and extremely accurate frequency measurement from less than 5 Hz to more than 650 MHz. The standard Model 6000 Frequency Counter has a 3.579545-MHz temperature-compensated crystal oscillator time base. An optional crystal oven oscillator time base is available on the Model 6500.

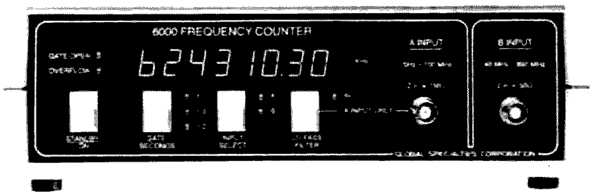
These frequency counters feature two front-panel-mounted BNC input connectors which allow greater flexibility in frequency measurement. The A input accepts signals from 5 Hz to 1 MHz with an input impedance of 1 megohm @ 25 pF. A switchable low-pass filter, with an LED indicator light, provides a 3 dB per octave rolloff at 60 kHz to facilitate audio and ultrasonic measurements. The B input is used for signals from less than 40 MHz to over 650 MHz with an input impedance of 50 Ohms @ 10 pF. Selection of A or B input is via a simple push-button control with LED indicators.

The 6000 and 6500 also feature three switch-selectable gate times, with simple push-button operation and LED indicators. This enables the user to choose gate times of 0.1 second with 10 MHz resolution, 1 second with 1 Hz resolution or 10 seconds with 1/10 Hz resolution. LED indicators for GATE OPEN and OVERFLOW provide additional user convenience.

The easy-to-read 8-digit LED display features leading-zero blanking, bright 0.43-inch characters, a decimal point in the kilohertz position, and a contrast-enhancement filter to ensure legibility in high ambient light.

The clean, well-designed front panels of the 6000 and 6500 allow ready access to controls and efficient operation. The easy-touch push-button controls include: Standby/on switch, Gate time selector, A/B input selector, and Low-pass filter in/out control. A flip-up leg provides added flexibility for benchtop use.

The 6000 and 6500 650-MHz Frequency Counters measure 3 × 10 × 7 inches (H × W × D), weigh 3.5 lbs., and come with a comprehensive instruction manual. For additional information, contact *Global Specialties Corp., 70 Fulton Terrace, PO Box 1942, New Haven CT 06509; (203)-624-3103.*



Global Specialties' Model 6000 Frequency Counter.

Kenwood's TS-430S HF transceiver.

TS-430S HF TRANSCEIVER

The TS-430S, a recent addition to Kenwood's line of high-frequency transceivers, is an all solid-state SSB, CW, and AM transceiver, with FM optional. Designed to cover the 160-10-meter amateur bands, including the new WARC bands, it also incorporates a 150-kHz-30-MHz general-coverage receiver having an exceptionally wide dynamic range. Other features include dual digital vfo's, eight memories, memory scan, programmable band scan, fluorescent tube digital display, all-mode squelch, VOX, speech processor, i-f shift, notch, and a NARROW-WIDE filter-selector switch for use with various optional filter combinations. For additional information, contact your local Kenwood amateur radio dealer, or write to: *Trio-Kenwood Communications, 1111 West Walnut St., Compton CA 90220.*

TC25G ELECTRIC GENERATOR

Thermax Corporation has just released the efficient new TC25G small-scale electric generator. The generator is designed to produce electricity at low rpm's.

The specially designed TC25G is ideal for battery charging in boats, in recreational vehicles, or at remote sites such as Field-Day or repeater locations. It will charge in any system from 6 to 36 V dc. A detailed manual is included with each generator. With each generator sold, Thermax offers free plans to build a wind, water, or pedal-power generating system.

For more information, contact *Thermax Corporation, One Mill St., Burlington VT 05401.* Reader Service number 478.

The TC25G generator from Thermax Corporation.

225-400-MHZ SCANNER CONVERTER

An improved 225-400-MHz scanner converter has been announced by Grove Enterprises. The new CVR-1B Scanverter includes a built-in preamplifier for increased sensitivity and allows complete coverage of the 225-400-MHz military/federal government aircraft band when used with a standard aircraft band scanner.

The unique Scanverter makes it possible for scanner listeners to hear NASA space shuttle support, military tactical communications, Coast Guard missions, federal government agencies in flight, and more.

An exclusive Grove Enterprises development called "bandstacking" allows the entire 175-MHz-wide UHF aircraft band to be compressed into the 118-136-MHz range, tunable on any scanner capable of standard aircraft reception. No tuning or adjustments are necessary with the fully automatic converter.

Reception for hundreds of miles is possible with the use of an outside antenna. Additional features of the Scanverter include:

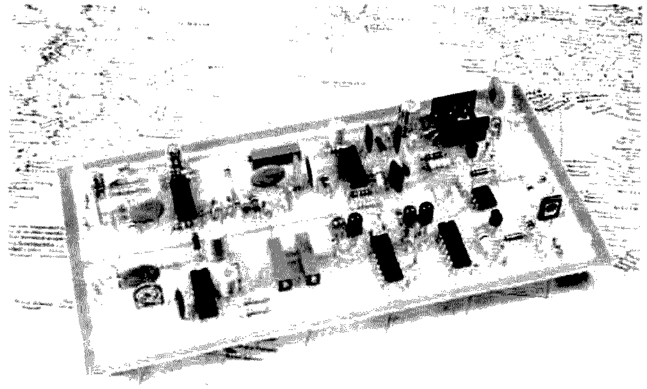
- high-sensitivity, low-noise microstripline circuit
- all metal cabinet for superior shielding
- double-balanced mixer for reducing images
- nine-pole filter for suppressing out-of-band interferences
- crystal oscillator for providing high stability
- zener diode voltage regulation to limit drift
- powered by convenient 12 V dc

A handy list of active nationwide UHF aircraft channels is included. The Scanverter comes complete with power cord, interconnect cable, and full instructions.

For additional information, contact *Grove Enterprises, 140 Dog Branch Road, Brasstown NC 28902; (800)-438-8155 (except NC). All others call (704)-837-2216.* Reader Service number 480.

RADIOTELETYPE AFSK MOD/DEMOD

Now available from GFS Electronic Imports of Mitcham, Victoria, Australia, is the MDK-17 RTTY mod/demod terminal unit. It is designed for HF and VHF amateur radio and/or commercial use at baud rates of 45 to 50 with a shift of 170 Hz. Other baud rates and shifts may be accommodated, but some component changes are necessary. The MDK-17's unique design makes for simple hookup to transceiver, Teletype*, and/or computer terminal. Its 10 ports provide for all combinations of TTL and high-



RTTY AFSK mod/demod terminal unit from GFS Electronic Imports.

voltage 20-60-mA send-receive systems. An open collector output allows direct keying of HF transceivers.

State-of-the-art circuitry is used throughout its design including the XR2211 IC which combines both limiter and active bandpass filter in the one package. The tone generator uses an XR2206 IC which allows for excellent temperature stability. Accurate setting of tone frequencies and demodulator center frequency is provided for by using 15-turn trimpots in these critical areas.

Other features include the provision to invert the signal sense in both the send and/or receive modes. LEDs are used to indicate transmitted tone and correct receiver tuning. An auto start output is available for driving TTL circuitry. Only a single +12-volt supply is required as the power source.

The kit is supplied with comprehensive easy-to-follow assembly instructions. Approximately two hours is required to assemble and test it.

For further information, contact *GFS Electronic Imports, 15 McKeon Road, Mitcham, Victoria 3132, Australia; (03)-873-3939. Reader Service number 481.*

HT POWER AMPLIFIERS

Mirage Communications' pocket-size B23 (2-meter) and C22 (220-MHz) power amplifiers, ever-popular with HT users and experimenters, have been upgraded for even greater versatility. A new power switch permits selection of full amplifier power on a non-energized bypass mode when only HT power is desired. The FM/SSB switch controls choice of rapid or delayed relay action. Power amplification is linear in either mode. The B23 produces 30 Watts (minimum) for 2 Watts in, 15 Watts for 1 Watt, etc. The C22 produces 20 Watts (minimum) for 2 Watts in, 10 Watts for 1 Watt, etc. Duty cycle of both amps is continuous. The B23 and C22 are made in the US and carry a 5-year general warranty with 1 year for power transistors.

For further information, contact *KLM Electronics, Inc., PO Box 816, Morgan Hill CA 95037; (408)-779-7363.*

HI-RIZER ANTENNA

Com-Rad Industries is introducing an even lower profile version of their popular Hi-Rizer restricted-space antenna. The height has been reduced from 20 to 15 inches to enable the portable/fixed antenna to be operated mobile! 40 through 10 meters are obtainable by the use of a 5-inch-diameter magnetic connection base or a vice-grip connection base with large metal surfaces such as automobiles, balcony rails, etc. A portable cylinder ground-plane system is available for use where metal surfaces don't exist. Construction consists of 3/8-inch-diameter aluminum tubing and stainless steel hardware throughout. For more information, contact *Com-Rad Industries, 1635 West River Parkway, Grand Island NY 14072; (716)-773-1445.* Reader Service number 484.

MULTI-MODE CODE RECEIVER

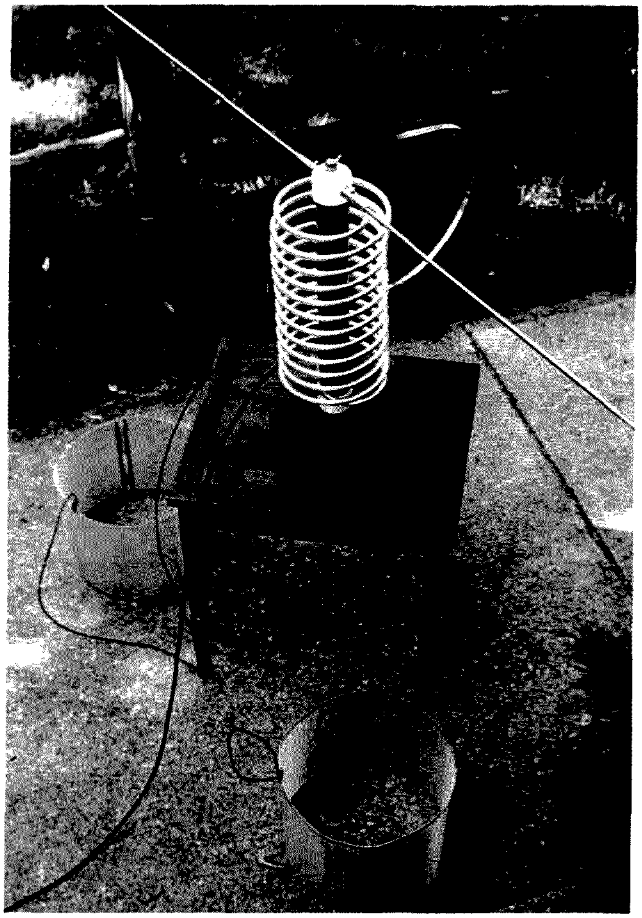
Universal Electronics has announced the new Universal M-600 multi-mode code receiver. The M-600 receives RTTY sent with bit inversion, TOR, SITOR, and nonstandard shifts. It also will be capable of copying AMTOR as soon as that mode is approved.

The M-600 also can receive all speeds of Baudot, ASCII, and Morse-code transmissions. Special features include an automatic speed search for ASCII and Baudot which will automatically find and lock onto the speed of the received signal.

The video output includes a 64-character ASCII set, a 5 × 7 dot-matrix display, and four formats. The cursor may be turned on or off, and the display also has automatic scrolling capability.

The printer interface includes a 2K buffer which allows downconverting and printer handshaking. An optional 60-mA/20-mA auto-adjusting loop supply is also available for the M-600.

For additional information, contact *Universal Electronics, Inc., 1280 Aida Dr., Reynoldsburg OH 43068; (614)-866-4605.*



Hi-Rizer restricted-space antenna from Com-Rad Industries.

CATV CONVERTER

Tayco's new Magnavox FV-25 CATV converter includes a 25-channel capacity and a remote control for easy use.

The FV-25 consists of the push-button remote control unit (housed in a high-impact plastic enclosure) and the con-

Upgraded B23 power amplifier.

The M-600 multi-mode code receiver from Universal Electronics.

verter, which is designed to be easily mounted near the television.

The converter provides up to 9 dB of gain, enabling distant location of the unit from the TV receiver. It has been designed to avoid interference from direct pickup of strong local signals. Input and output terminals are threaded, coaxial 75-Ohm F-type.

The remote control is connected by a 25-foot, two-wire shielded extension cable. The 13 push-button switches select the appropriate channel within either band, and the fine-tuning control permits minute picture adjustments.

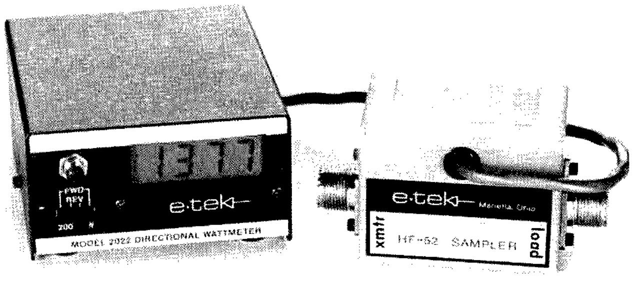
For additional information, contact *Tayco Communications, R3-146A Narrows Ck. Rd., Corning NY 14830; (607)-962-7313.* Reader Service number 482.

DIGITAL WATTMETER

E-tek, manufacturer of digital frequency readouts, has announced the introduction of a new digital directional wattmeter. The Model 2022 HF Directional Wattmeter features a high-contrast LCD readout of both forward and reflected power from 5 to 1999 Watts. Both the 199.9- and 1999-Watt scales provide an impressive improvement in resolution and readability when compared with conventional analog wattmeters. A new diode pre-biasing technique enhances accuracy over the entire 1.5-to-30-MHz frequency range.

Connected by an unpluggable cable to a remote rf sampler, the attractive readout unit measures only 3.6" W × 2.1" H × 4.0" D. The heavy 20-gauge steel cabinet is protected by a black, multiple coat, polyurethane finish accented by the brushed aluminum and black photo-anodized front panel. The high-contrast 0.5-inch black LCD digits are easily read from across the room.

Power for the Model 2022 HF Directional Wattmeter is provided by a standard 9-volt transistor radio battery rated for at least six months under normal use. Battery life is maximized by the use of a unique new low-power multiplier circuit and further enhanced by an rf-detecting automatic disconnect circuit.



Digital wattmeter and remote rf sampler from e-tek.

For further information, contact *e-tek, PO Box 625, Marietta OH 45750; (614)-374-2280.* Reader Service number 483.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

CARF PHONE COMMONWEALTH CONTEST

Starts: 1200 GMT April 9
Ends: 1200 GMT April 10

This contest is open to amateurs in all countries of the Commonwealth of Nations. Entrants may work other amateurs in the Commonwealth using SSB only, on 80- through 10-meter bands. Work only stations outside your own call area. Each station may be worked once on each band. There is one entry class for single-operator stations in all- or single-band classes.

EXCHANGE:

RS report and a consecutive serial number, starting with 001.

FREQUENCIES:

3600, 3760, 7080, 14130, 21200, 28480 plus or minus 20 kHz.

SCORING:

Each completed contact will score 5 points. In addition, a bonus of 20 points may be claimed for the first, second, and third contacts with each Commonwealth call area on each band.

AWARDS:

A plaque will be awarded to the top scoring allband entry. Certificates will be awarded to top scorers in each class in each Commonwealth call area.

ENTRIES:

A valid entry must include log sheets, dupe sheets, a checklist of Commonwealth call areas worked on each band, and a summary sheet showing claimed QSO and bonus points as well as final claimed score calculations. Summary and call-area checklist sheets are available for an SASE. Entries should be mailed within one month of the contest to: CARF, PO Box 2172, Station D, Ottawa, Ontario, K1P 5W4 Canada. Results will appear in *TCA*, the Canadian amateur radio journal. Nonmembers of CARF may wish to include an SASE with their entries for a copy of the results.

CALENDAR

Apr 9-10	CARF Phone Commonwealth Contest
Apr 9-10	ARRL QSO Party—CW
Apr 18	Holiday in Dixie QSO Party
Apr 16-17	ARRL QSO Party—Phone
Apr 22-25	Arbor Day Celebration
Apr 23-24	QRP ARCI Spring QSO Party
May 21-22	Armed Forces Day Communications Tests
Jun 11-12	ARRL VHF QSO Party
Jun 25-26	ARRL Field Day
Jul 9-10	IARU Radiosport Championship
Jul 15-17	*A5 Magazine* SSTV DX Contest
Aug 6-7	ARRL UHF Contest
Aug 19-21	*A5 Magazine* UHF FSTV DX Contest
Aug 20-21	SARTG Worldwide RTTY Contest
Sep 10-11	ARRL VHF QSO Party
Oct 8-9	ARRL QSO Party—CW
Oct 9-10	ARRL QSO Party—Phone
Oct 15-16	ARRL Simulated Emergency Test
Nov 5-6	ARRL Sweepstakes—CW
Nov 19-20	ARRL Sweepstakes—Phone
Dec 3-4	ARRL 160-Meter Contest
Dec 10-11	ARRL 10-Meter Contest

HOLIDAY IN DIXIE QSO PARTY

1800 to 2300 GMT April 16

Holiday in Dixie is an annual 10-day celebration held in Shreveport, Louisiana, commemorating the Louisiana Purchase. The event was first organized in 1947 and the QSO party event began in 1978. The radio amateurs set up stations at Hamel's Amusement Park on the Red River in Shreveport and operate 40 through 10 meters. For CW, look around the lower 60 kHz of each band. For SSB, check 7240, 14280, 21380, 28580.

Holiday in Dixie provides commemorative certificates to hams establishing 2-way contact with one of the HID stations. All that is required is sending a QSL card verifying the contact to Holiday in Dixie QSO Party, PO Box 1485, Shreveport LA 71164. Be sure to include signal report and the name and call of the HID operator you contacted. Don't forget an SASE!

In addition to the certificate, a commemorative doubloon will be sent to the first 100 stations. These doubloons are thrown out at the Classic Parade by HID vice presidents in downtown Shreveport.

ARBOR DAY CELEBRATION

Starts: 2400 GMT April 22
Ends: 0600 GMT April 25

A special events station will be operating from the Nebraska State Arbor Lodge, former home of J. Sterling Morton, founder of Arbor Day, in Nebraska City, Nebraska, during the annual Arbor Day Celebration. This station, in addition to other club member stations, will be operating in the general portion of the phone and CW bands on 80 through 10 meters. All amateurs contacting this station or any other club member station during this time will be eligible to receive an Arbor Day commemorative certificate from the Nebraska City Amateur Radio Club. Please send one dollar and a business size SAE to: Nebraska City Amateur Radio Club, Box 8, Nebraska City NE 68410.

QRP ARCI SPRING QSO PARTY

Starts: 1200 GMT April 23
Ends: 2400 GMT April 24

Stations may be worked once per band and mode for QSO multiplier credits. Participants may operate a maximum of 24 hours during the contest period.

EXCHANGE:

Members—RS(T), state-province-country, and QRP ARCI membership number.

Nonmembers—RS(T), state-province-country, and power output.

SCORING:

Each member QSO counts 5 points regardless of location. Nonmember QSOs are 2 points with US and Canadian stations; others, 4 points each. Multipliers are as follows: 4-5 Watts CW or 8-10 Watts PEP. . . ×2, 3-4 Watts CW or 6-8 Watts

RESULTS

1982 SARTG WORLDWIDE RTTY CONTEST

SINGLE OPERATOR TOP EIGHT CLASS A

ON4UN	455,655
OH2NP/OH0	179,280
DJ6JC	173,160
DK8NG	173,130
YU2CDS	165,900
YUZ5DL	156,390
WB5HBR	135,415
KB2VO	117,180

MULTI-OPERATOR TOP FIVE CLASS B

OH2AA	187,920
Y21BB/a	74,025
OK1OAZ	60,300
OK3KGI	44,345
HA6KVD	14,580

SHORTWAVE LISTENERS TOP FIVE CLASS C

DE4TTY	208,350
OZDR-2135	157,465
Y2-2814/M	117,375
OK1-12880	79,040
OK1-23185	73,710

RESULTS

1982 OHIO QSO PARTY

OUT-OF-STATE WINNERS

AE3Y	MD/DC	26,904
K9GDF	WI	6,286
WA4ZSN	NC	4,394
KA4RVA	GA	3,892
KC0CP	IA	3,575
KS8Q	MI	3,135
W5WG	LA	2,976
KG9Z	IL	2,800
W8VEN	W. VA	2,772
KJ9R	OK	2,430
WB2IPX	W. NY	1,962
WA3JXW	E. PA	1,746
WA8GKH/4	TN	1,725
VE3KK	ONT	1,722
K4DDB	N. FL	1,622
W8IEC	MI	1,440
N0CLV	KS	1,300
WB5EUC	S. TX	1,240
N3CDV	DE	923
WA0DXZ/5	MS	532
WB2DND	N. NJ	506
WB1GLH	MA	460
WA4PGM	VA	301
W5PWG	N. TX	176
KC0UM	ND	150
WB3IFF	W. PA	144
AK7J	AZ	126
KD4PP	TN	112
KN7L	WA	109
N9DIJ	WI	48
W5EYF	S. TX	32
KA7GXO	NV	10

OHIO WINNERS

WD8MZZ	1,393,704
KJ3O/8	1,042,808
KW8N	1,009,296
KC8JH	532,060
KA8HXX	346,053
KR8M	255,432
KT8I	112,230
W8DXT	89,523
KA8NIE	64,944
WD8OYF	42,692
N8AKF	38,275
WB8CXL	31,444
K8IP	28,444
WA8WFX	12,180
KC8SD	10,703
WD8MGO	9,702
KC8YL	2,100
WB8YEW	1,952
W8EAD	539
KC8QK	352

Club Station Score

W8VPV	153,164

The Minuteman

NEWSLETTER OF THE MONTH

From an area rich in Revolutionary War history comes this month's newsletter contest winner—*The Minuteman*, bulletin of the Minuteman Repeater Association, based in Lexington, Massachusetts.

This is a jam-packed newsletter for a vigorous and versatile club. The MMRA operates several repeaters in eastern Massachusetts, runs an active public service system, and involves itself in the technical education of its members. And there is a space for all of these activities in *The Minuteman*.

It is not unusual for *The Minuteman* to run 10 to 12 pages long, and little space is wasted. The reporting in the newsletter is succinct and informative. One recent issue contained an article on the care and feeding of nicads as well as an in-depth look at the status of MMRA's newest repeater. This article included not only what was done to the repeater and why, but it also contained oscilloscope-generated graphics illustrating key points of the machine's operation.

The issue also included an up-to-date listing of the middle-eastern New England repeaters and news of upcoming and past public service activities.

But all is not stuffed-shirt. One-liners are judiciously sprinkled throughout the newsletter, and the comments of the columnists are evidence that this club does not let business interfere with levity.

Congratulations to *Minuteman* Editor Bill Shaughnessy WB1GVA for his fine work.

To enter your club's newsletter in *73's* contest, just send it to *73*, Pine Street, Peterborough NH 03458.

PEP . . . × 4, 2-3 Watts CW or 4-6 Watts PEP . . . × 6, 1-2 Watts CW or 2-4 Watts PEP . . . × 8, less than 1 Watt CW or 2 Watts PEP . . . × 10. Entries from stations running more than 5 Watts output CW or 10 Watts output PEP will count as check logs only. Stations are eligible for the following bonus multipliers: if 100% natural power (solar, wind, etc.) with no storage, × 2; if 100% battery power, × 1.5. Final score is total QSO points times total number of states-provinces-countries per band times the power multiplier times the bonus multiplier (if any).

FREQUENCIES:

CW—1810, 3560, 7040, 14060, 21060, 28060, 50360.

SSB—1810, 3985, 7285, 14285, 21385, 28885, 50385.

Novice/Tech—3710, 7110, 21110, 28110.

All frequencies plus/minus to clear QRM. No 30-meter contacts will be counted!

AWARDS:

Certificates to the highest scoring station in each state, province, or country with 2 or more entries. Entries automatically considered for annual Triple Crown of QRP Award.

LOGS AND ENTRIES:

Separate log sheets are suggested for each band for ease of scoring. Send full log data, including full name, address, and bands used plus work sheet showing details and time(s) off air. No log copies will be returned. All entries desiring results and scores please enclose a business size envelope with return postage for one ounce or an IRC. It is a condition of entry that the decision of the QRP ARCI Contest Chairman is final in case of dispute. Logs must be received by May 21st to qualify. Send all logs and data to: QRP ARCI contest chairman William W. Dickerson WA2JOC, 230 Mill Street, Danville PA 17821.

TSRAC SCAVENGER HUNT CONTEST

Starts: 0000 GMT April 23
Ends: 2359 GMT April 24

Sponsored by the Triple States Radio Amateur Club, this contest is based on the old-fashioned scavenger hunt in which each person was given a list of items to find and the person who found all or most of the items was declared the winner. CW and phone contacts are both allowed.

EXCHANGE:

Normal QSOs or "CQ TSHT TEST."

FREQUENCIES:

20 kHz above the bottom of any General or Novice band.

SCORING:

The scoring is the unique part of the contest. You make points by finding and making contacts in specified geographic areas. Contact with 7 of the 10 call areas is worth 10 points, with 1 point for a duplicate area contact and a 15-point bonus for making contact with all 10 call areas. One QSO with a Canadian station is worth 5 points, with 1 more point given for each additional Canadian contact. A contact with a 1 × 2 or 2 × 1 callsign is worth 5 points, and 1 point is given for each additional QSO. The first contact with a 2 × 2, 1 × 3, or 2 × 3 US callsign is worth 5 points, with an extra point for each additional contact. A QSO with any DX station except Canada nets 10 points and a 2-point bonus for subsequent contacts. The first QSO with a TSRAC member is worth 5 points, and there is a 2-point bonus for each subsequent contact. One contact on each band from 80-10 meters (except 20 and 30) gets 10 points, and the first QSO with a YL is worth 15 points, with 3 points given for each subsequent contact. 100 bonus points are given if the contestant scores on all 10 items.

ENTRIES:

Send your entry no later than May 25 to contest chairman David M. Kinney KC8YR, RD #1, Mingo Junction OH 43938.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

THE WAVO AWARD

WAVO (Worked All VO) is available to any amateur not a resident of Newfoundland or Labrador, operating from one call area, who can show proof of two-way contact with forty different stations operating fixed, portable, or mobile in the province. One of these stations must be using a VO2 Labrador prefix.

WAVO is also available to all VO, VO mobile, or VO portable stations operating either VO1 or VO2 (not both in one application) that can show proof of two-way contact with sixty different stations operating fixed, portable, or mobile within the province. Two of the stations worked must be using a VO2 Labrador prefix.

WAVO VHF is available to amateurs who show proof of contact with twenty stations using a simplex mode of operation. Repeater operation is not permitted. All contacts must be later than June 1, 1946. No endorsements are available.

QSL cards are not needed as proof of contact. The log-book entries must be certified by an executive of a recognized club or two other amateur operators. The submitted list of log-book entries must include the call of the station worked, date, time, band, mode, signal report given to the VO station, and the signed report received from the VO station.

WAVO applications should be sent to: VO1FG Awards Chairman, PO Box 501, Carbonear, Newfoundland, Canada.

WORKED ATLANTIC PROVINCES AWARD

To qualify for this award, eleven VE1 amateurs must work eight different counties of Nova Scotia, eight different counties of New Brunswick, two different counties of Prince Edward Island, and five different counties of Newfoundland. All other stations must work four different counties of Nova Scotia, four different counties of New Brunswick, one station in Prince Edward Island and three different Newfoundland stations.

QSLs must be in the applicant's possession. To apply, send log data and 50 cents or 5 IRCs to: Walt Jones VE1AMR, 79 Waverley, Moncton, New Brunswick, Canada E1G 7T8.

WORKED ONTARIO COUNTIES AWARD

The Worked Ontario Counties contest is intended as an operating challenge to radio amateurs and to encourage the working of Ontario stations by those located beyond as well as within the province.

Two Worked Ontario Counties certificates are offered. The first, WOC-30, will be awarded to each operator submitting QSL cards representing thirty of the counties in Ontario. The second, WOC-50, will be awarded to an operator submitting an additional twenty cards representing an additional twenty counties. It is not necessary to obtain the WOC-30 before applying for the WOC-50.

The Province of Ontario consists of 54 counties and districts. The word county, as used in connection with the WOC contest,

will be understood to mean county and/or district.

For the purpose of these awards, Lennox and Addington (though politically merged into a single county) will be scored as two counties. The four townships in the southwest corner will be considered Lennox and the balance of the county Addington. The Lennox townships are Richmond, North Fredericksburgh, South Fredericksburgh, and Adolphustown. Napanee is in Lennox; Odessa, Camden East, and Cloyne are in Addington.

Also, Patricia will be considered to be all that part of Kenora situated along or north of the CNR main line from Cochrane to Winnipeg and will score as a separate county. Red Lake, Pickle Lake, and Sioux Lookout are eligible in Patricia.

Contacts must be made, using your own equipment, from the home location or from within twenty miles from the home location. Contacts made from outside the home county will not count for the operator of the mobile but may be scored by the other operator in the QSO as a contact for the county in which the mobile is located. Each QSL card must show the county in which the issuing station was located at the time of the QSO. Each station must work the other directly with no relaying of information by way of intermediate stations.

Contacts may be made on any band, and any mode or combination of modes may be used. Any contact made on or after January 1, 1957, may be included. There is no deadline unless otherwise announced at some time in the future.

All regulations enforced by the Department of Communications applying to amateur radio stations shall be observed by Canadian stations. Similarly, stations in other countries must observe the regulations of their respective governments.

Cards for judging should be mailed to the awards manager. Although the club will endeavor to return all cards safely, no responsibility can be assumed for cards which may be lost in transit. Sufficient postage must be included for the return of your cards by the method you specify.

In case of dispute on any matter relating to the WOC contest, the Executive Committee of the Metro Amateur Radio Club will decide the issue and their decision shall be final. Mail applications to: Awards Manager, Al Brown VE3AB, 360 Manor Road East, Toronto, Ontario, Canada M4S 1S2.

FRASER VALLEY DX CLUB AWARD

To apply for this distinctive award, Canadian and American stations must contact fifteen club members. DX stations contact five. All contacts must be after May 1, 1978.

To apply, typical log information is required. Canada and USA stations forward $1.00 with your log data and DX stations may send five IRCs. Mail them to: Fraser Valley DX Club Awards Manager, Howard Martin VE7AFY, 45-9960 Wilson Road, Ruskin, British Columbia, Canada V0M 1R0.

THE WINNIPEG DX CLUB AWARD

The award consists of a personalized presentation case containing a genuine new Canadian silver dollar issued by the Royal Canadian Mint.

Amateurs throughout the world are eligible but American and Canadian applicants must be members of the DXCC and must submit the number and date of the DXCC certificate. Amateurs in other countries of the world do not have to be DXCC holders in order to qualify for the award.

All contacts must be made after January 1, 1970. Thirty-one are necessary, representing five from each one of the continents of Africa, Asia, Europe, North America, South America, and Oceania; also necessary is one contact from any Antarctic station. The five contacts from each continent may be from different countries on that continent, but the five North American contacts must be with members of the Winnipeg DX Club. Members of the club include: VE4s: AA, AE, AH, AS, AT, BJ, CJ, EW, MP, RP, SA, SK, SL, SW, XJ, and SN.

QSLs for all contacts must be in the applicant's possession. To apply for this award, send certified log data and fifteen IRCs or $3.00 to: Sandy Wohl WE4SW, 33 Cherryhill Road, Winnipeg, Manitoba, Canada R2V 2L1.

SKI CANADA AWARD

Eric Walden VE3HLL advises us that he is award manager for the Ski Canada Award. To qualify for this certificate, all amateurs must work two stations from each of the major skiing provinces: British Columbia, Alberta, Ontario, and Quebec. A total of eight contacts is required. All contacts, to be valid, must be made on or after January 1, 1978. There are no band or mode limitations.

The major ski areas from each province are: for British Columbia: Vancouver, Vernon, Kamloops, Penticton, Kelown, Kimberley, Princeton, Revelstoke, Nelson, Prince George, and Port Alberni; for Quebec: Montreal, Quebec City, Saint Jerome, Saint Adele, Saint Jovite, and Sutton; for Ontario: Collingwood, Thunder Bay, Ottawa, London, Barrie, Kitchner-Waterloo, Huntsville, Orillia, Brace Bridge, Own Sound, Flesherton, Sault Saint Marie, and Meaford; for Alberta: Calgary, Edmonton, and Banff.

Applicants are asked to send all log data and $2.00 to: Eric Walden VE3HLL, Rural Route 1, Gowanstown, Ontario, Canada N0G 1Y0.

FRAMINGHAM AMATEUR RADIO ASSOCIATION

The Framingham Amateur Radio Association, Framingham, Massachusetts, will commemorate its 50th anniversary by awarding certificates throughout 1983 to any station contacting the club station, W1FY, or three club members.

Send a large SASE and log information to FARA, PO Box 3005, Framingham MA 01701.

W1FY will operate on Saturday mornings from 1400Z to 1600Z on phone, 14.280-14.290.

ALAMO VILLAGE DXPEDITION

Members of the Border Amateur Radio Society and the Uvalde Radio Club are offering an award to stations who work the clubs' annual Alamo Village DXpedition.

A handsome certificate depicting the main street of this replica of the famous Texas shrine will be sent to all stations that work the DXpedition and send an 8 × 10 SASE.

The Alamo Village station will be operating from 1800 UT April 16 to 1800 UT April 17 on the phone and CW portions of 40-10 meters.

SASEs should be sent to the Border Amateur Radio Society, PO Box CQ, Brackettville TX 78832.

READING RAILROAD 150th ANNIVERSARY

To celebrate the Reading Railroad 150th Anniversary, WB3AAL will operate on April 1, 2, and 3 from 1300Z until 2330Z, daily. Frequencies: 7.250, 14.300, and 21.375, plus or minus 5 kHz, starting on 7.250 at 1300Z and working on up in frequency every one and a half hours; Novice—21.150 daily from 1600Z until 1730Z. The first 150 contacts will receive a certificate; after that, contacts will receive a special QSL card celebrating this anniversary. To receive the certificate or QSL card, please send your QSL card with one US dollar to: Ronald J. Polityka WB3AAL, 1046 Weiser St., Reading PA 19601.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

SUITLAND ISLAND —A NEW ONE?

In late September last year, a station signing KJ6DO/KH7S appeared on the bands, claiming to represent a new country. Almost 2000 amateurs fought their way through the pileups to work the station, in the hopes of catching this "new country." Within a few hours, however, the word was out: KJ6DO/KH7S was a pirate, a bootleg station, and contacts with the station had no DXCC value.

The Suitland saga had started earlier that month when the various DX bulletins received a letter purportedly from an amateur radio club on Johnston Island in the North Pacific. The letter included a copy of a map labeled Suitland Island, a thousand miles north of Hawaii. Also enclosed was a news release draft suggesting Suitland was a top-secret military base being returned to civilian control and a copy of a letter to Don Search W3AZD at ARRL headquarters, requesting separate-country status for the previously unknown island.

Fig. 1. DXers taken in by the Suitland hoax last fall will get this reminder of their eagerness from their QSL bureau.

Since one of the requirements for new-country status is a successful operation from the island, the radio club stated that they would be on the air from Suitland in a matter of weeks with the call KJ6DO/KH7S. All the DX bulletins dutifully shared the information with their readers.

On the announced day a station with that call did indeed come on the air and began working the pileups. As the operation continued, a few amateurs began to notice some strange facts. The KJ6DO/KH7S signal was weak and fluttery in California, as though the station were located on the West Coast and not the Pacific. W5 stations beat out the W6 stations to "Suitland"—not likely if the station were really in the North Pacific. Then Lee Wical KH6BZF took a careful beam heading on the station, using the sharp null on the side of the antenna pattern. The heading was 60°, or directly toward the States, and not north or northwest as the advertised location of Suitland would suggest.

These irregularities prompted listeners to ask questions about location, permission, etc. The KJ6DO/KH7S operator gave evasive replies. After a while, KH6BZF relayed the information that the Suitland operator was giving his QSL manager as HØAX. Eventually the station shut down, the fun over.

The Suitland hoax was not a typical pirate operation. Not many amateurs provide advance information on their hoaxes. Should the DX bulletins have been more skeptical about the letter? The letter to the DX bulletins with maps and background information looked, on the surface, to be legitimate. But a close examination of the information reveals numerous clues for the skeptical DXer. The mere fact that there is no public record of the island should have been warning enough; in these days of satellite photography and the Freedom of Information Act, anyone can obtain detailed maps of the area, including the ocean floor. Not only do such maps show no island in the area, but there also are no seamounts or undersea mountains. Did the US military forge every undersea map to hide their secret island? Unlikely!

The map contains other clues suggesting a hoax. The magnetic deviation on the compass rose puts the map on the east coast of the US. The park, cemetery, railroads, and churches are not typical of a top-secret military base. The airport runway is a mere 3000' long, totally inadequate for the stated purpose.

The letter announcing the "DXpedition" also might have aroused the suspicions of a careful observer. The group specifically requested *no* contributions and *no* SASEs

Photo A. Martti Laine OH2BH (right) led a group of 60 hams to Aland Islands for the CQ WW contests.

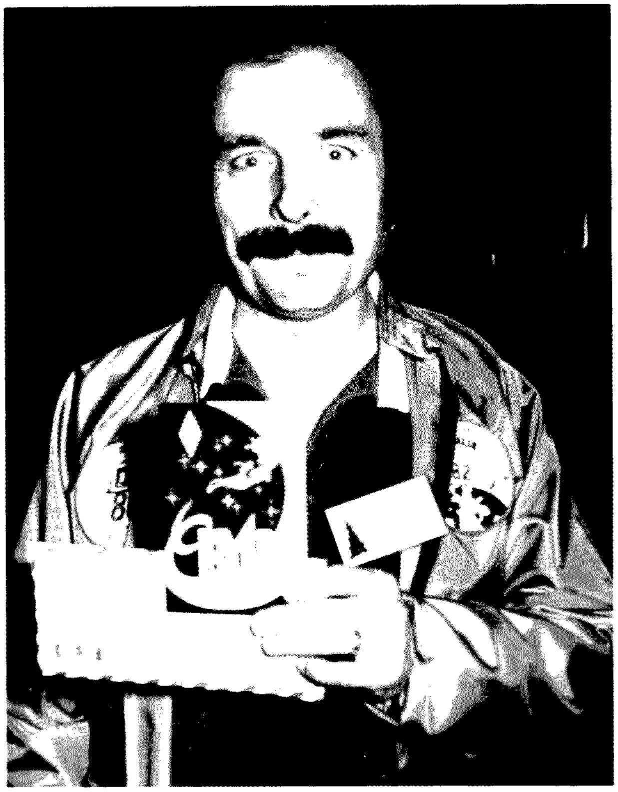


Photo B. "I can't believe I worked the real thing!" Redwood Empire DXer, Len Geraldi K6ANP, flashes his BY1 QSL, his first real QSL after five contacts with pirate BY1AAs.

with the QSLs. The QSL address was an APO box with no stateside manager. It would be hard to imagine a legitimate DXpedition setting up such a strange QSL route.

But this analysis has been made with the benefit of hindsight. It does not surprise me that the bulletin editors were taken in by the documentation; so seldom do they get such good information far enough in advance to be useful that they eagerly published the data.

The Suitland hoax did not end with the last contact, as most such operations do. A couple of months after the operation, QSL cards (see Fig. 1) began to appear in bureau shipments. If you were among those hams who worked Suitland, keep an eye out for your card.

Suitland was not the only amateur radio hoax of 1982. Dozens of amateurs worked a station signing BY1AA (see this column, July, 1982) last year. Unfortunately, this station was *not* located in China. Bootleg BY1AA stations made far more contacts than did the real China reporter.

Any amateur working a station signing BY1AA would immediately shoot off a QSL card with an SASE and hope for the best. Most of these amateurs received a nice postcard in return, but no QSL card. The card says, "Sorry, your QSO not in log. You must have contacted a bootleg station. Better luck next time." And most of these hams honestly thought they worked BY1AA. A station signing that callsign acknowledged their call. Unfortunately for the stateside amateur, the station signing BY1AA was not the legitimate one, and the contact does not count for DXCC.

While bootleg BY1AA stations worked dozens of stations, some other unusual callsigns attracted considerable attention. Every April 1st, dozens of strange calls appear on the bands, and many attract sizable pileups. Long-time DXers have learned to ignore the CQ DX of such stations as APR1L, F0OL, and that famous Russian RG8U!

Such antics are by no means limited to April Fool's Day. Hardly a day passes without some bogus station making a handful of contacts, then quickly disappearing. Many of these stations sound legitimate and reasonable, often using names and QSL addresses of active DXpeditioners.

Your DX editor's callsign has been taken in vain by several phony operations. I was supposed to be in Macao, operating CR9, one week. Another bootleg operation using my call as QSL manager was a European station signing an HI9 call who worked dozens of fellow Europeans on 80 meters. Many of those European stations thought they had snagged a rare one on 80 meters, only to receive word that the operation was bootleg and the contacts valueless.

Why would otherwise skeptical amateurs line up to work RG8U? The answer is "Work 'em first; worry later!" Too many DXCC countries have appeared on the bands suddenly, without warning. Perhaps a well-traveled DXer in the country managed to talk a government official into permitting a short operation session. In any case, the stateside DXer might get only one chance at a contact before the rare station disappears again. Rather than waste valuable operating time discussing the legitimacy of the station, the stateside DXer jumps into the pileup with both feet to make a contact, just in case.

This attitude prevails especially among the DXers with 250 or more countries. These amateurs have worked almost every country with active amateurs. Now they must await a DXpedition, or reactivation of a long-quiet country. Small wonder that these operators jump at any new or different callsign, especially when the magic phrase "new one" is bandied about. Whenever a new country or even an unknown callsign appears on the band, those DXers striving for the Honor Roll feel they must "get in the log," on the chance that it might count for DXCC. This group of avid and undiscriminating DXers provides an inexhaustible pool of contacts for hoaxers and bootleggers.

The motivation on the other end, although I cannot condone it, is easier to understand. What amateur, after years of fighting DX pileups from the States, Europe, or Japan, wouldn't enjoy being on the receiving end of a pileup for a change? But this means going to a rare country, getting permission to operate, setting up a station, and then answering all those QSL cards. Too much work. It's so much easier just to use the rare callsign!

How can you recognize a bootleg operation? No infallible rules can separate legitimate contacts from bogus ones—one reason why there are so many bootleg operations. You have to look for a pattern of behavior to recognize the culprits. First, almost all bogus operations are conducted on CW. It is so much more difficult to ask penetrating questions on CW as opposed to phone, and those questions are easier to ignore on CW as well. Bootleg stations tend to omit such data as name, QTH, or operating schedule. A notorious bootlegger used the name "Slim," and that name has since come to mean any illegitimate operation, as in, "I think that BY is a Slim." Another possible clue is the QSL information. If a very rare station suggests QSLing via the bureau, you should beware. The QSL bureau is seldom the preferred means of exchanging cards, especially among the more impatient DXers. A station requesting cards *only* via the bureau might be pulling your leg.

Some hoaxes have been less than pleasant. Don Miller once claimed he operated from Maria Teresa reef in the Pacific. Satellite photographs eliminated any chance that an unknown island might still exist. This and other frauds eventually forced the ARRL to disallow DXCC credit for many of Don's claimed DXpeditions. A lawsuit against the League followed, but Don's word was discredited and one of the longest and most widespread DX hoaxes came to an end.

Fun it may be, but hoaxing is also illegal. FCC regulations specifically prohibit transmission of "false or deceptive signals." Also, using another callsign without proper permission is prohibited. The perpetrators of the hoax probably avoided mail fraud by specifically *discouraging* contributions and SASEs, but the federal government has a lousy sense of humor in these matters.

The reaction of the DX bulletins to being taken in by the Suitland hoax reflects the different attitudes of DXers toward such shenanigans. *The Long Island DX Bulletin* cried foul, mentioned a "full-scale federal investigation," and ended, "We're sure you agree that this sort of thing just *ain't funny*!"

On the other hand, *QRZ DX* called the hoax "a good afternoon of late summer's fun and excitement." The Texas-based newsletter even congratulated the perpetrators of the hoax, "who reminded us once again that this really is just a hobby and just for fun."

This writer tends toward the *QRZ DX* viewpoint. After all, DXing is only a game, and one shouldn't take the whole thing too seriously. But this does not suggest that amateur radio needs more such hoaxes. As long as the joke is done in the spirit of good fun and money stays out of it, a good hoax once in a while livens up the bands. But it would be very easy to have too much of this good thing. In short, a little fun goes a long way on the DX bands.

So the first time you discover you worked a pirate, don't be disappointed or discouraged. After all, you are in good company. Every DXer has worked Slim many dozens of times. If you find yourself on the list for RG8U, discover your BY1AA contact was a pirate, or find a black QSL with a skull and crossbones in your bureau shipment, remember that you're not alone.

HEARD ON THE LONG HAUL

Tahiti—FO8 Ross Forbes WB6GFJ passes on word of the new address for the Tahiti QSL bureau. Send your FO8 cards to: Radio Club of French Polynesia, B. P 5006, Pirae, Island of Tahiti, French Polynesia, South Pacific Ocean. Don't send cards for FO0 calls, as these are usually visitors to the islands and will not receive cards sent to Tahiti. Find a stateside manager or QSL address.

Philippines—DU Rick Todd N8CWX offers CW contacts from the Philippines. Drop him a line via PSC#2 Box 12956, APO San Francisco CA 96311. QSL via N2BCF.

Abu Ali—/A Lloyd and Iris Colvin (W6KG and W6QL) stopped at this small rock in the Red Sea long enough to make 4000 contacts, with the help of F0ECV and F6GBQ. QSL via Yasme, Box 2025, Castro Valley CA 94546.

Aland Islands—OH0 Martti Laine OH2BH (see Photo A) and 60 other Finns put OH0W on the air for the CQ WW contests last fall. The group gave out 30,000 contacts from the islands, which lie between Sweden and Finland in the Baltic Sea. QSL your OH0W contacts via OH2BAZ, Patolantie 10A10, 00640 Helsinki 64, Finland.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

nese and you'll see the difference. Our ZL friend finds he has to glue decals back on, straighten screws, and in some cases respray the cabinets. Sloppy workmanship and little, if any, quality control.

The Japanese are almost fanatics when it comes to both workmanship and quality control. Indeed, I'd like at this time to ask *what few American manufacturers there* are left if they will take a pledge to see that their products are quality perfect. This means a final test of every unit and meticulous inspection. It also means after-sale support with information and replacement parts.

In order to help all of the firms in our ham industry, I'm asking readers, readers anywhere in the world, to let me know which firms you've found put out the best products and support them the best and which you've been disappointed in or have given you a hassle when you've had a problem. You can be sure that I'll pass the word along to the appropriate people in the firms involved. Those with strong recommendations will get a listing in my column.

EARPHONE JACKS

One of the conveniences starting to show up on car stereo radios is an earphone jack. Just in case you are not a stereo fan, let me explain that no loudspeaker system can be quite as good as a good earphone system for hearing sound. Oh, with some good speakers, high-power amplifiers, and so on, you can do a pretty good job. . .but it won't be better than phones.

I put in a pair of Ads speakers and an Ads amplifier in my 280Z and the sound was superb. Then I tried to duplicate the installation with the Jaguar and the sound came out terrible, despite an awesome investment. Someone swiped the 280Z speakers but forgot the matching amplifier (ha), so I wasn't able to duplicate exactly the winner I had in the 280Z. Woulds't that the radio in the Jaguar had stereo phone jacks.

Since one of the more serious problems with most amateur radio mobile installations is the crummy voice quality which results from low audio power, a cheap little speaker, and often the speaker not being aimed at the driver, what would it hurt to put in one or two phone jacks? Two, I recommend, so the passenger can be in on the conversation. It would be a lot easier to hear and the quality would be enormously better.

Yes, I know that there are some states where it is illegal to wear headphones in the car. The law doesn't make a lot of sense to me, but then there are a lot of laws which fit that category. Sure, I know that if you are listening to loud music with earphones you might not hear a car hooting at you, but if the radio is up to the usual rock and roll volume, you aren't going to hear anything either. . .and your hearing is probably well on the way to being ruined for life.

But instead of arguing the point, why not just come up with a solution which is better? *Here it is: How about an outside mike* to pick up loud traffic noises and override the music? Any of you who have Walkman stereo players know there is a little mike built in and an override switch in case you want to talk over the music. Well, with an outside mike and an electronic override switch, you'd get the car hoots better than you might if you had no earphones. The circuit is simple and would add little in expense to the radio. . .but a lot in value.

Just in case any car radio people are reading this, what is the matter with you turkeys? You finally, grudgingly, have given us FM in our car radios, but you're still behind. Many of the new Japanese cars are coming through with AM/FM/TV sound now. . .yep, an audio tuner for the television channels so you can at least hear the audio portion of shows. And many require not much more than that. Let's start seeing some three-band car radios with two earphone jacks.

One more thing. With the newest in earphones, no one is going to know you're using 'em in the car. These are tiny phones which are in a wad of soft foam plastic, but with no headband. You just stick the foam into your ear and it holds fine with the thin wires hanging down. These are the latest for the Walkman radios and also are used for the wrist-radios.

SEE YOU AT DAYTON?

The conditions under which I tried to talk last year were so frustrating that I didn't really want to do that again. It was hot and stuffy and the noise from adjacent sessions was so bad that it was almost impossible to talk. The Dayton people suggested a Friday talk, where there would be no nearby sessions, thus keeping the noise down. Well, I'll give it a try.

They always want to know ahead of time what my subject is going to be so that they can put it into the program. I unkindly point out to them that as far as I know, no one ever consults the program, during or after the Hamvention. But that doesn't stop the need for an answer.

I'll put it up to you. Presumably, a fair percentage of you will be coming to Dayton this year, so what would you like to hear about? Drop me a line and give me some ideas, if you will.

1. Packet radio. I can explain what this is, how it works, and why I see a big future for it in amateur radio. This is a computer-oriented communications system which can be made high-speed and error-free. It can work with a single channel repeater, thus taking up less spectrum space. This is an area where an enterprising experimenter could come up with a good commercial system which could then be manufactured and be quite profitable. Certainly, there is going to be a growing market for ham packet-radio equipment.

2. No code. . .if anyone really wants to hear about that any more. It's been about beaten to death. . .without any sign that the FCC is going to slow down in moving toward a no-code license. Is it possible that we might even see more interest and enthusiasm for the code if it were not dictated by the government? I can also give some hints on just how the FCC is going about getting rid of the code.

3. What is the future of emergency communications and what part will amateur radio play in it? Will our country be able to get prepared to provide dependable communications in time of nuclear war? What is the role of the new FCC Long-Range Planning Committee and what has happened to the many NIAC groups which we have had for years and which have recently been completely reorganized? Where does amateur radio fit into the picture?

4. How possible are the rumored plans for routine amateur communications via commercial satellites? How could this be organized and what commercial hay can be made from the needs for equipment?

5. What role do computers have now in amateur radio and where is this going? Are we headed toward ham communications which will be largely digital, with automatic error-free relaying of messages anywhere in the world? How practical is it to get in on computers and amateur radio right now?

6. Should amateur radio be considered a total failure and disbanded as an almost total waste of radio spectrum?

7. How can you use your ham skills to start a small business at home and build it up to where you are independent?

8. What are the prospects for getting amateur-radio clubs started in schools and thus getting amateur radio into a strong growth mode. . .with the possibility for providing our high-tech firms with enthusiastic technicians and engineers so that they can start competing with Japan? Or has America lost its high-tech lead forever?

9. Should anyone really care that ham licenses can now be gotten by people with absolutely no knowledge of code, theory, or rules via the Bash materials? We already have a code-free license, for that matter, so why the fuss about Morse code?

10. We try to make *73* reflect your interests. . .yet when we mail out letters to non-subscribers we often get only a few percent response. What, if anything, can be done to arouse the interest of the majority of licensed amateurs in *73*? Should we just capitulate and put out a rag-chewers magazine and forget editorials, computers, repeaters, slow-scan, RTTY, packet radio, and so on? Is the interest in small construction projects dead?

Well, there are some ideas. I can also hold forth at great length on the ways to get in there and make millions of dollars via some of the new small computers which are on the market. . .but I get the impression that hams in general prefer to remain poor, complain about subscription rates, go on social security, and not be really interested in getting rich. Pity, for through some of my magazines I've helped to make hundreds upon hundreds of new millionaires. . .and I probably could help do it for you, if you weren't so set on being poor. And with some of the opportunities in communications just ahead, the door is opening for enterprising hams to get some of the action.

Please do drop me a QSL card or a note and let me know what you'd prefer to hear at Dayton. Pick one subject, okay? This isn't going to be a speaking marathon like I pulled when I visited South Africa.

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AUSTRALIA	21	14A	14	14	7B	7B	7B	14	14	14	21A	21A
CANAL ZONE	21	14A	14	7	7	7	14	21	21A	21A	21A	21A
ENGLAND	7	7	7	7	7	7A	14	21	21A	21	14A	14
HAWAII	21A	14A	14	7	7B	7B	7	7	14A	21	21A	21A
INDIA	14A	14	7B	7B	7B	7B	14	14A	21	14A	14	14
JAPAN	21	14	14	7B	7B	7B	7B	7	7	14	14	21
MEXICO	21	14	14	7	7	7	14	14A	21	21	21A	21A
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PUERTO RICO	14	7A	7	7	7	7	14	21	21	21A	21A	21
SOUTH AFRICA	21	14	7	7B	7A	14	21	21A	21A	21A	21A	21
U.S.S.R.	7A	7	7	7	7B	14	14	21	21	21	14	14
WEST COAST	21A	14A	14	7A	7	7	7A	14	21	21A	21A	21A

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AUSTRALIA	21A	21	14	14	7B	7B	7B	14	14	14	21A	21A
CANAL ZONE	21	14A	14	7	7	7	14	21	21A	21A	21A	21A
ENGLAND	7	7	7	7	7	7	14	14	14A	14A	14	14
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MEXICO	14A	14	7A	7	7	7	7	14	14	14A	21	21
PHILIPPINES	21	14A	14	7B	7B	7B	7B	7B	14	14	14	21
PUERTO RICO	21	14	14	14	7	7	14	21	21A	21A	21A	21A
SOUTH AFRICA	21	14	7	7B	7B	14	14A	21A	21A	21A	21A	21
U.S.S.R.	7B	7	7	7	7B	7B	14B	14	14	21	14	14

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B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
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10 F/G	11 G/G	12 G/G	13 F/F*	14 P/F*	15 P/F*	16 F/G
17 F/G	18 P/F*	19 F/G*	20 F/G	21 F/F*	22 F/F*	23 F/G
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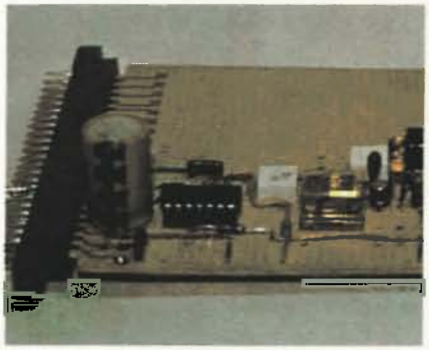

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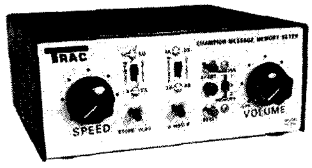

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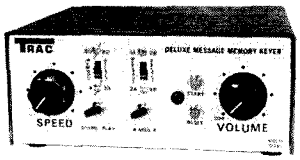

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- Three choices of Message Storage
  - A. Two (50 character each) message storage
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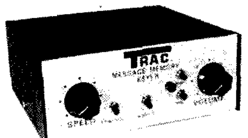
  - C. One 50 character and two 25 character message storage
- Records at any speed-plays at any speed
- Memory operating LED
- Use for daily QSO or contests

PLUS:
- Self-completing dots and dashes
- Both dot and dash memory
- Iambic Keying with any squeeze paddle
- 5-50 w.p.m.
- Speed, volume, tone, tune and weight controls
- Sidetone and speaker
- Low current drain CMOS battery operation-portable
- Deluxe quarter-inch jacks for keying and output
- Keys grid block and solid state rigs
- WIRED AND TESTED FULLY GUARANTEED—LESS BATTERY



Features:
- Advanced CMOS message memory
- Two (50 char. each) message storage
- Repeat function
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- Longer message capacity Example: send CQ CQ CQ DX de WB2YJM WB2YJM K—then play second message on contact—de WB2YJM QSL NY NY 579 579 Paul Paul K
- Use for daily QSOs or contests

PLUS:
- State-of-the-art CMOS keyer
- Self completing dots and dashes
- Both dot and dash memory
- Iambic keying with any squeeze paddle
- 5-50 wpm
- Speed, volume, tone, tune and weight controls
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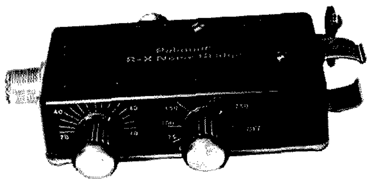

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W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

BREAKING LOOSE

One of the difficulties about trying to explain amateur radio to friends is the wide variety of hobbies which make it up. The general public, if it has any image of amateur radio at all, tends to think of it as a bunch of kids talking to people around the world from their attic or cellar ham stations. In some respects, this isn't far short of the mark... we *are* kids, having one hell of a lot of fun. And a fair percentage of us are in there working DX.

Not so well known to the public are the tens of thousands of us talking with each other through repeaters from our mobile stations or hand-held rigs. And virtually unknown are the thousands of us who are mixing computers and amateur radio over the air, working via ASCII, packet radio, and RTTY, or are into such fascinating aspects as SSTV, facsimile, satellite communications, low-band DXing, VHF DXing, meteor bounce, aurora bounce, and so on.

Indeed, I'd venture to guess that there are tens of thousands of hams who are missing out on much of the fun and value of amateur radio just because they are off stuck in some corner, perhaps spending the remaining days of their lives rag-chewing on 75m or being alternate net control on some nightly net.

The monthly infusion of excitement from *73* helps to break up these gradually hardening patterns of life. By publishing articles on the fun of some new aspect, it gets dozens more broken loose every month. You can help with this process, making amateur radio more fun and of more value to both hams and our country. You can do this by writing articles on an activity you are involved with which you think should be enjoyed by more amateurs. You can do it by trying out some new aspect of the hobby and talking to your friends about it... talking it up at the ham club.

Building some new gadget is a ball. Not only is it a challenge to do, but when you get through you have something to show to your family and ham friends. No, you don't want to try to build a synthesized sideband transceiver from scratch. But you might want to try your hand at something easier, such as one of the small construction projects in *73* each month.

Over 60,000 hams have expanded their interest in amateur radio to include computers, with the result that a growing number are getting on the air and making high-speed computer-aided CW contacts, computer-run RTTY contacts, and so on. Further, a surprising number have taken their newfound computer interest and escalated it into a small business... with many going from tiny part-time efforts to million-dollar-size businesses.

The world is heading toward a major communications change. This means that amateurs have an opportunity to be in the vanguard of the change... or, as for the last twenty years, they can hang back, keeping alive the spirit of the 30s more than the 80s. It is surprising, and disappointing to some, how few real changes have been made in the last fifty years of hamming. Oh, the time was when new modes of communications were invented and pioneered by hams. We did a pretty good job of this with sideband thirty years ago and with FM and repeaters fifteen years ago. But even these technology changes have made little impact on the old-time ham... so far. Indeed, a ham going through time from 1933 to 1983 and tuning the ham bands would find it difficult to tell that 50 years has passed.

When one looks at the possibilities which we have with the technology already at our command and then looks ahead a few years to see what we might be able to develop, the prospects are exciting. Repeaters are okay, buy why not start linking them up via remote controls so they can relay, probably via 450 MHz or even 1200 MHz, so longer-range contacts can be made easily? And how about setting up some low-band links via repeaters? Now that the FCC says they are going to stop restricting our experimenting, it is time for us to get cracking.

The day isn't far off, if we get moving, when we will be able to have local repeaters route contacts via other central repeaters, then up via a satellite such as Telstar using space commercial channels and back down again anywhere in the country, again routing from a central satellite link to a local repeater, and out. Granted, we won't be able to do a lot of voice communicating via such links, but once we get the hang of RTTY and ASCII communications, we'll be able to zip messages around almost anywhere in the world.

The new message-boy satellite will get us used to sending messages up to a repeater, having them stored there for drop as the satellite circles to some other part of the world... picking up traffic for us perhaps over Bangkok and dumping the message as the satellite goes over North America again a few hours later.

Sure, you're going to have to start getting some new equipment. You're going to have to start building some of it, too. And the secret to all of this is in your monthly magazine, which will keep you in touch with the other people experimenting with new techniques and services. I really feel sorry for the ham who is so dead that he doesn't get *any* ham magazines... and would you believe that over half of the licensed hams read no ham magazines at all? If you know someone like this, try to get an issue of *73* into his hands, even if only overnight. Let him see the wide variety of simple construction projects which he could have fun with... the excitement of getting onto RTTY or slow scan. A brain without stimulation turns to garbage... check the bands and see if I'm not right.

Talk up the magazines over the air; get fellow hams into reading 'em. Sure, the magazines seem expensive at $25 per year, but put that into perspective. Remember that deluxe cars were only $500 a few years ago. Modern presses have kept the cost of magazines down substantially, with the main cost these days being the postage, which has gone up beyond belief.

As a continuing source of state-of-the-art information, there is no substitute for magazines such as *73*. If you want a lot of club news with a few technical articles, you've got *QST*. If you want contest info, you've got *CQ*. If you're hot for super-complicated contruction projects, there's *HR*. For articles on lots of gadgets you can build, info on the latest in RTTY, ASCII, SSTV, and other new developments, thorough coverage of FM and repeaters, and also the best international coverage, there's *73*. The main aim of *73* is to make amateur radio more fun.

THE ASCII INRUSH?

Considering the growing number of contraptions to interface computers and ham rigs, we may be able to get some interest in joining the ham ranks by computerists. Now, with computers costing under $50 (the Timex TS-1000 is reported to be $59.95 at Osco Drugs, less a $15 Timex rebate) and with a projected sale of well over two million computers for 1983, we may be developing a large untapped source of hams who will go for a digital communications system.

Tell you what, if you'll start writing some articles on the amateur radio use of computers and submitting them for publication, I think I can get our computer magazine editors to give this movement a push. Articles on using the TRS-80 systems will obviously be routed into *80 Micro*. Those which are Apple-based will go to *inCider*, our new Apple magazine. Those which are based on other systems will probably be aimed at *Microcomputing*.

By the way, in case you're interested, *inCider* got off to a fine start with the January issue and has, so far, been growing even faster than *80 Micro* did when we launched it back in 1980. *80* is running 400-500 pages a month these days and is still growing nicely, with around 300,000 regular readers. By the time we add the readers of the three magazines together, we reach about 700,000 computerists each month. If we only interest 10% of them in trying amateur radio, that'll be the biggest jump in new hams in over twenty years.

Mind you, I'm not looking for a one-shot promotion. When we started pushing FM and repeaters, we didn't get that moving with one or two articles. It took hundreds of them, backed up with books, FM symposiums, a monthly repeater newsletter, and so on. So we'll be needing articles on the fun of ASCII communications, articles on the use of all of the gadgets now on the market, construction projects for rolling your own, words on how to do digital via OSCAR, and info on how to set up repeaters so they can handle a second digital channel as well as voice relaying, how packet radio works, how to use the coming messenger-boy satellite, and so on.

We need articles on using all of the low-end computers for ham communications. There's the VIC, the T. I. 99/2, 99/4A, and 40, the Timex TS-1000 and new 2000, the Atari 400, 800, 1200, and coming 600, the Jupiter

QSL OF THE MONTH

This month's winning QSL comes from Jim Kirkreit K7YLM in Tacoma WA. The munchkin curled up on top of the radio is a caricature of Jim, and it was originally a pen-and-ink drawing by an inmate incarcerated at the federal prison where Jim worked. The drawing depicts "what he thought I looked like when I was transmitting," Jim said. But, "I must be honest," he added, "I usually don't operate while sitting on top of the rig."

If you think your QSL card is a winner, put it in an envelope with your choice of a book from *73*'s Radio Bookshop and send it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries without an envelope or book choice will not be considered.

Ace, the Panasonic JR-200, the two new Sanyo computers, and so on. Experimenters will undoubtedly make improvements on the commercially-available interfaces, which means more articles.

Then we need to get cracking on 1200 baud and higher speeds, working out the kinks of high-speed digital communications through QRM, QRN, fading, and so on. We need to seriously tackle the problem of error-correcting. If we are going to do any relaying of digital communications, each step in the relay must be error-corrected before the relay is continued. And we're looking at developing systems which will perhaps relay from a transceiving keyboard to a repeater direct to a second party, or perhaps via a relaying system through several more repeaters, or even a satellite or a low-band link. . . each step with error-correcting. Yes, we need a lot of experimenting. I think we're going to have more fun with all of this than anything else we've ever done in amateur radio.

In the meantime, let's start with what we've got and get going. Get your computers communicating over the air and write articles. . . which in turn will get more people playing around and incite manufacturers to turn out more interfaces for us. The secret to getting anything moving is to get the word spread around. Remember that FM and repeaters were being enjoyed by only a few hundred hams until I started making a big deal about it in *73*, and after that we managed to develop a whole industry around this activity. With computers and amateur radio I think we can get new blood into our hobby and have more fun than we have had in years.

WHAT COMPUTER?

A recent poll of *73* readers showed that over 37% already have some sort of microcomputer and about 80% are interested in 'em. The question which gets asked several times a day of any computer owner by friends is, "What computer should I get?"

With almost 300 different makes of desktop computers, one would think that a truly objective answer to that question would be impossible. After all, with over 400 different computer models being made, how can any one person know what really is best. . . and from what viewpoint?

Fortunately, the answer isn't anywhere near as complex as it would at first appear. Oh, I suppose if someone was interested in buying a small computer for one specific application and was absolutely positive that it wouldn't be used for anything else, the choice could get complicated. But the facts of life are clear: No matter what application someone has in mind when they get a computer, it isn't long before the uses of the system are expanding almost beyond control.

Perhaps I can state one basic rule of the computer field: Whatever you buy, it will merely be the beginning of a long string of purchases as you expand your system. There is no known limit to this.

But to get back to an attempt to answer the question of what computer system it would be best for you to buy. Before I name names, which I will, I've been around the darned things ever since they were invented, so I have a fair perspective on 'em. . . one which is not particularly colored by self-interest, though it may not give that impression.

The value of a computer system lies in three factors. Each of the three, I regret to say, appears to be of equal importance. They are, simply, the hardware, the software, and the instructions. Well, big deal, you may say. Yep, it is, and you'd better read on before chalking that up to just one more platitude.

To give a horrible example before I go into details on what I'm writing about, a very nice little portable computer arrived a few weeks ago for review by our staff. We got it out to a reviewer and after he had finished with his report, I asked to have the computer brought to my office so I might have a chance to work with it. It looked great and came with some powerful programs ready to use.

A couple of hours later I was almost screaming in frustration. I couldn't get *anything* to run on the damned thing. Oh, the disks would start up and the prompt appear on the screen, but nothing I could discover would get a program into operation. And, yes, I tried to use the instruction book. What a terror that was! I've been around microcomputers for seven years now and I couldn't make anything out of the instructions. Nothing anywhere in the manual explained how to put in a disk and get a program running.

Experienced computerists will be provoked with me for my anger. . . pointing out that *most* computers come with these big fat, almost useless books of instructions. The manuals are filled with computer scientist jargon, not simple how-to-do-it information. The sorry fact is that few equipment manufacturers provide much of value in the way of operating instructions for their gear. . . and that goes for software firms, too. This may help to explain why system-specific magazines such as our *80 Micro* grow so rapidly in circulation and size when they are announced.

Let me put this bluntly: If you opt for a computer system which is *not* supported by a magazine, you are going to lose much of the value of having a computer. The system-specific magazines serve several purposes, all of importance to you. First, they provide you with a continuing source of information from other users on how to get the most from your computer. In that respect, the magazine is like an enormous users group. Until you start getting one of these magazines, you may find it difficult to understand how much there is to be learned about your computer and how important it is for you to get this constant update.

A second value of such magazines lies in their use as a medium for the manufacturers of accessories, the publishers of programs, and the publishers of information about the system to reach you with their wares. Many of these firms are small and, without such a magazine, they would never even have a chance to get started since the several thousand computer stores have no way to seriously deal with hundreds upon hundreds of small suppliers. Being small, you'll often find some remarkable bargains via these firms.

A third benefit of your system-specific magazines lies in the wealth of programs which are published in each issue. *80 Micro* often has 20-40 programs listed in an issue, ranging from home programs to business, educational, simulations, scientific, and so on. These are available from some magazines in machine-readable form so you don't even have to sit there for two weeks typing in the listings. We have *Load 80* for *80 Micro* readers, either on cassette or disk.

Another benefit, and not a little one, lies in the discounts you'll find in these magazines. The buyer of a Radio Shack TRS-80 Model III system can often save up to $1,000 on a complete system by buying through some of the discount houses advertising in *80 Micro*. Even on one of the color computers, you may be able to save around $400 on a system, according to the editors of our new magazine, *HOT CoCo*, due out soon.

If you do decide to get a system which is not supported by a healthy system-specific magazine, you are going to have to make do with a minimum of help, support products, software, and discounts. Good luck, buddy. It's a route I would never recommend to anyone.

Okay, what systems are supported by such magazines? Well, there are several magazines for the TRS-80 computers, with *80 Micro* being the largest and best read by a wide margin, running from 400-600 pages a month. The Apple system is supported by several magazines, with our new one, *inCider*, already having the largest paid circulation in the field. That's self-serving, granted, but it is also the plain truth.

The IBM system is supported by a growing number of magazines, starting with *PC*. This is almost entirely a business-oriented system, so I'm not sure how much you may want to horse around with it. The Apple and TRS-80 have turned out to be of much greater interest to hobbyists, and so we are seeing a wider range of interesting uses. Still, the IBM does have strong magazine support. Beyond that you are in shallow waters. Commodore has effectively discouraged third-party publishers from doing anything for their computers by putting out their own in-house magazines, but these are so self-serving that they are of little value. Ditto most of the other such efforts. Osborne announced his own magazine supporting his system, but I've seen nothing beyond the first issue, so perhaps that fell through. They would do better to encourage a third-party publisher than to do it themselves. Apple has their own magazine, but slick as it is, it doesn't do much to help the Apple owner. Ditto the Radio Shack in-house magazine, which seldom has anything of much interest or value, or much material, and positively no discount ads.

Are you beginning to get the idea that this is coming down to a recommendation that newcomers to computers can expect to get into a lot of trouble if they go any route other than Apple or the TRS-80? Well, that's the way it seems to me. Remember, too, that because we have had these magazines providing communications between small firms and the users, we've had an incredible number of good programs developed. Firms don't put a lot of money into writing and publishing programs for systems where it is hard to reach the users.

The Timex-1000 computer is so cheap it is ridiculous. . . and it *is* a good computer. But the instructions which come with it will drive you up the wall, and good luck getting any help from any other source. With the system selling through a nearby drug chain for $59 and a factory $15 rebate, one could hardly find a cheaper computer. It's a marvel at that price, but only if you know what you are doing and don't mind the lack of instructions.

The VIC-20 is down to $150 via mail order, I see, though I think the firm selling it at that price may be connected with Commodore in some way. But even at that price, and considering the value of the computer, unless Commodore decides to get out of the publishing business and work with a third-

Continued on page 106

ARTICLES WANTED

For *73*, we need articles on: RTTY/ASCII construction projects, mods of commercial RTTY/ ASCII interfaces, computer ham applications, error-correcting developments, packet radio equipment and activities, digital communications via ham satellites, advanced repeater services and equipment. For our computer magazines, we need articles on the use of ham bands for computer communications.

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(1)

Construct This Classic Transmitter

From the era of the tube comes this ageless design, runner-up in 73's Home-Brew II Contest. It's perfect for a first project or as a backup rig.

There are only two reasons you'll want to copy this little rig: It won't cost much and it's a lot of fun to build and use. This one-tube, crystal-controlled, 15-Watt oscillator is a copy of the type of transmitter built by thousands of hams in the post-WWII years as a first rig. Operating on 80 and 40 meters, it will load into practically anything and can provide solid contacts over distances of up to several hundred miles and even an occasional bit of real DX.

Collecting the parts and building the unit is half the fun. As can be seen in the photographs, the construction technique (true to the nature of the originals) could best be called free-style breadboard! With the exception of the tube and two old-style broadcast receiver tuning capacitors, most of the parts came from a discarded black and white TV chassis. While it's conceivable that all of the parts could be purchased new (for about $30), you'd be making a mistake if you did so. This is a low-pressure, easygoing junk box project, a strictly-for-fun test of ingenuity. Rummage around in the basement, ask your neighbors about their attics, visit your fellow hams—and above all, enjoy yourself!

Parts are cheap at Joe Ham's Curbside Parts Emporium! This TV chassis provided 80% of the transmitter's components.

A Touch of History

In the 1950s, it was much more common than it is today for a ham to build some major piece of station equipment. One reason is that the surplus market was flooded with inexpensive radio parts. Another is that up-to-date ham equipment, particularly for transmitting, was a lot simpler then. Crystal frequency control was common, and a CW transmitter, even one in the several-hundred-Watt class, was often just an oscillator driving one or maybe two paralleled output tubes. With no vfo, mixers, gang tuning, or even bandswitching (use plug-in coils!), the transmitter could be a pretty simple affair.

When the Novice license was created in 1951, it required the use of a crystal-controlled transmitter of less than 75 Watts input power and consequently the one-stage power oscillator became a popular home-brew item. The output obtainable from a crystal oscillator is limited primarily by the power sensitivity of the tube used and the amount of rf current the crystal can handle before fracturing. Some of those war-surplus crystals were pretty rugged, but even the smaller FT-243 quartz blanks worked fine with the sensitive tubes being developed for the postwar radio and TV boom. Single-tube oscillators soon were common on the 80- and 40-meter Novice bands, and gradually some really memorable designs emerged from the crowd.

One of the cheapest ham transmitters ever sold came out in 1960—the Ameco ATC-1, a one-tube 6V6 oscillator selling in kit form for less than $20. It was rated at a full 15 Watts input on 80 and 40 and came complete with all tubes, a crystal, and even a punched chassis! Perhaps the cleverest example of cheap and simple transmitter construction is a design from the 1950 *ARRL Handbook* which takes full advantage of a feature then common in commercial receivers. Perhaps as a holdover from the days when vacuum tubes were very expensive, many of the receivers of that time had the audio for driving headphones taken from a low-level stage so that the big

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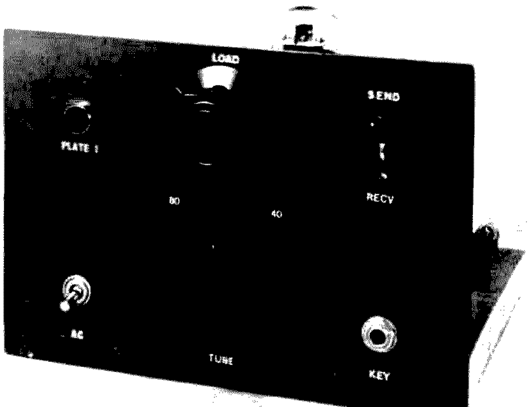
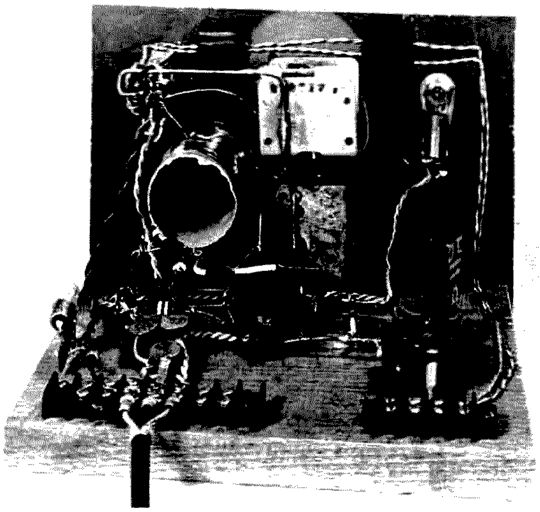


The front panel is dominated by the tune and load controls. The wide-range-output circuit will load power into practically anything.



Behind the attractive front panel the layout is true breadboard. Not pretty, but simple and effective. The single tube plugs into the center socket; the two on the right are for crystals. Wires taped across the top of the panel are receiver antenna and power leads.

audio-output amplifier was really used only with the speaker.

Once resigned to using the headphones only, the amateur could unplug the unused audio tube and build his transmitter around it —perhaps using some handy orange-crate slats for a chassis. A short cable and an octal plug fashioned from the base of a carefully-broken tube would then allow the transmitter to draw its filament and B+ power from the receiver's power supply: out of the same socket that previously held the output tube! No whining in those days about the high cost of ham equipment!

Noncritical Circuit— Easy To Copy

The "1950s Special" described here runs between 10 and 30 Watts input depending upon the tube type and power-supply voltage used. Output power ranges from 3 to 15 Watts, and that's plenty for making lots of solid contacts, particularly if a good antenna system is used. The circuit shown in Fig. 1 will work with a 6L6, 6V6, or 6K6 tube. While those tube types are common (they were popular for use in the audio stages of TVs, radios, and phonographs), the circuit is so noncritical that just about any power pentode in the 10-to-20-Watt class will work if the socket wiring is arranged to suit the tube pinout.

The oscillator itself is the grid-plate circuit familiar to anyone who has studied for the FCC amateur exam. The output circuit is a pi-network chosen for its ability to match a wide range of loads and simultaneously provide a high amount of harmonic rejection. Unlike the modern "no tune-up," solid-state equipment, this transmitter will load up into almost anything—even the proverbial damp string. A single-pole double-position slide switch adjusts the pi-net for either

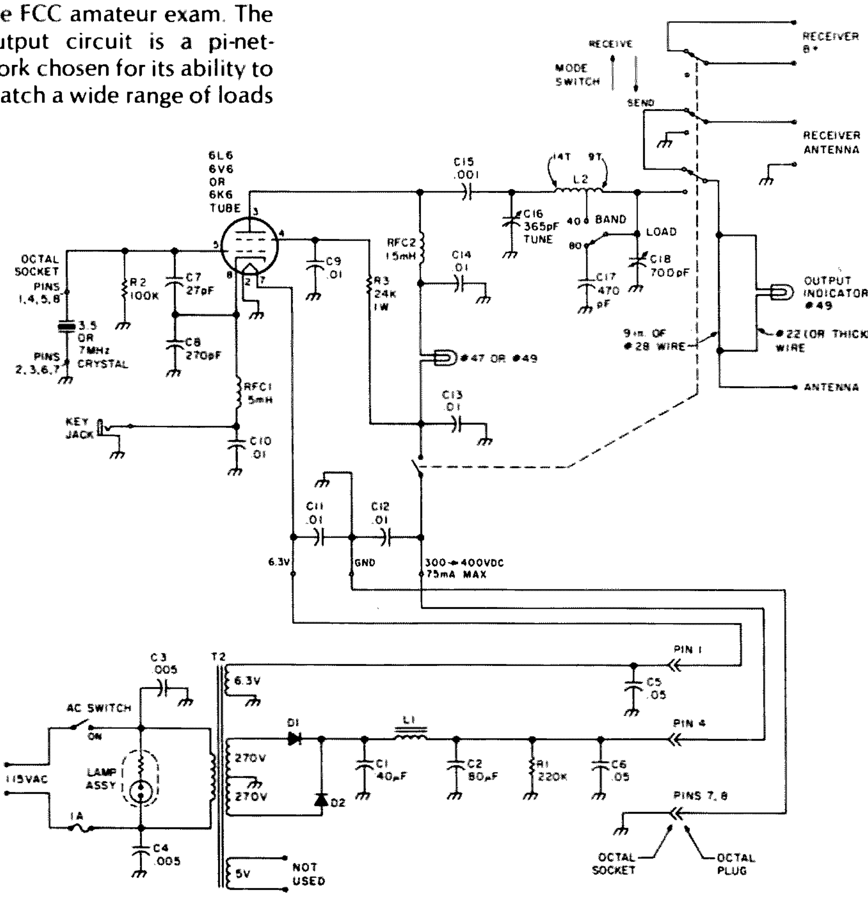
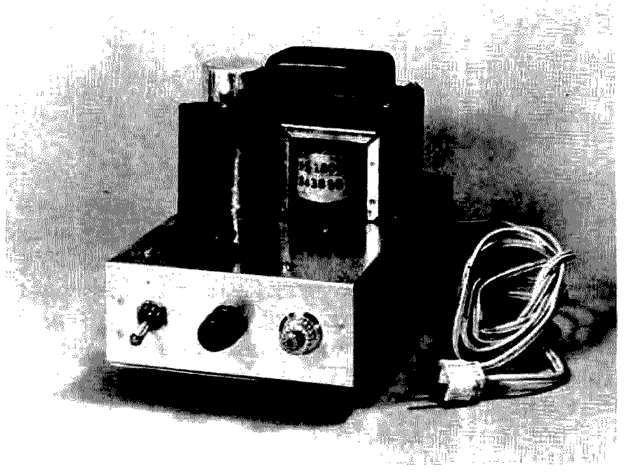


Fig. 1. Schematic of the one-tube transmitter and its power supply.

(3)



The separate power supply is built almost completely from TV-set components. Neatly built, it doubles as a useful general-purpose power supply.

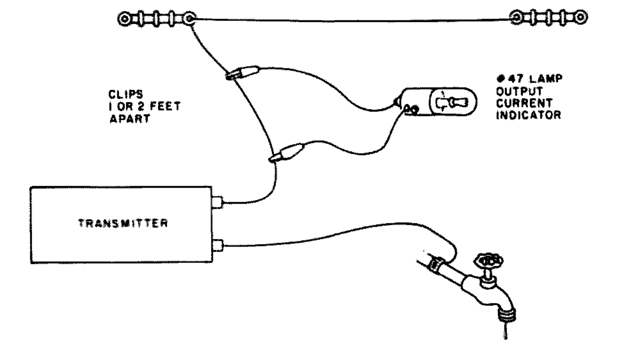


Fig. 2. Poor ham's variable rf ammeter as used with endfed antenna system.

80- or 40-meter operation, and a panel lamp in series with the plate power lead makes a cheap and effective replacement for the usual milliammeter.

In a similar vein, a second lamp is used as an output-power indicator in a version of the "Poor Ham's Variable Rf Ammeter" (see Fig. 2). This circuit is a real classic—the bulb is shunted across a portion of the antenna lead with the distance between clips determining the drive to the light. This surprisingly sensitive indicator is thus easily adjustable for a wide range of impedance and power levels. The dimensions given in Fig. 1 are suitable for loads of around 50 Ohms, and the more flexible arrangement shown in Fig. 2 can be used if necessary with random-length endfed antennas.

The only unnecessary frill added to the circuit is a 4PDT lever switch used to control the transmit-receive switching of the transmitter and its companion one-tube receiver (more on that later). The ac switch on the front panel is not used, for reasons explained shortly.

The power supply is built as a separate unit. This isn't strictly necessary, but I wanted to build the transmitter on a real breadboard, and for safety's sake an enclosed metal chassis is required for the power supply. Another important consideration is that the supply can then be used on other projects in the future.

One nice feature of the older TV receivers is that they usually have a power transformer instead of the series filament string "ac-dc" type of setup. These transformers provide for 6-volt filaments and about 275 volts on either side of a center tap—perfect for a small transmitter. If you have a choice, look for a black and white set because of its smaller (and lighter) transformer. Some of the older color sets have power transformers more suitable for 500-Watt linears than 15-Watt oscillators! In any case, the power transformer and filter components of my supply all came from Joe Ham's Curbside Parts Emporium (see photograph).

Real historical honesty would require the use of a vacuum rectifier tube, but I cheated slightly and used a more modern pair of TV-set silicon diodes; they are smaller and cooler than the tube. Feel free to use whatever you have or can get the easiest, however. After all, that's what this project is all about.

What About TVI?

Old-timers who remember breadboard-style transmitter construction also will remember the TVI problems which contributed to the use of the metal chassis, pi-networks, and coaxial cable. There are two reasons why TVI is not a big problem with this transmitter: (1) Its low input power keeps any harmonics that much weaker to begin with, and (2) the pi-network does an excellent job of filtering the antenna output. While the signal reaching the antenna is pretty clean, the grid circuit of the oscillator is rich in harmonics and direct radiation from the transmitter wiring may be a problem. In my case, the transmitter, when operating on 40 meters with the 6L6, produces noticeable cross-hatching on channel 5 when the TV and transmitter are in the same room. The sets next door are completely unaffected, as is my own TV when it's moved to the garage 75 feet behind the house.

Operation on 80 meters is TVI-free, and several simple precautions can reduce the local 40-meter problem. Using the lower-power 6V6 or 6K6 tubes helps considerably. A proper balanced dipole is better than a random-length endfed wire antenna since less rf gets accidentally coupled into the house wiring, plumbing, etc. Harmonic generation and radiation also are reduced significantly if the plate-tuning control is adjusted slightly to the low-frequency side of the peak-output point.

TVI is an unsavory subject to bring up in a transmitter construction article, but the issue should be faced. Interference is not a real problem with my set, and I took no particular precautions against it during construction. If you live in a crowded apartment complex, however, it might be wise to build the transmitter on a metal chassis. Placing all the grid-circuit components under the chassis and then screwing on a metal bottom plate will go a long way towards preventing even the minor TVI I observed.

Construction Tips

I built my transmitter on a 7" × 8¼" pine board which is ⅞" thick. A 6" × 8½" piece of 1/16" aluminum serves as the front panel and mounting support for many of the components. The several tube sockets are screwed to the board using ¼"-long wood, plastic, or metal spacers as standoffs. Newer hams may not know the trick of using an octal socket for crystals: The popular FT-243 holders will plug in nicely. I wired my socket as shown in Fig. 1 so that a crystal can be plugged in any pair of holes and still make proper electrical contact. Some of my crystals are real old-timers and have oddly-sized pins. To accommodate these, I also added the

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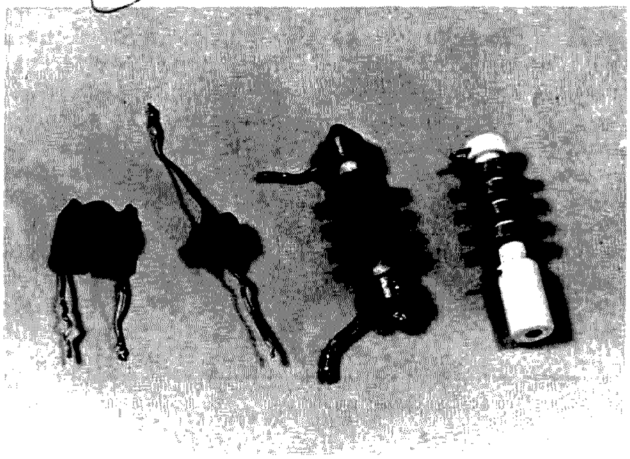
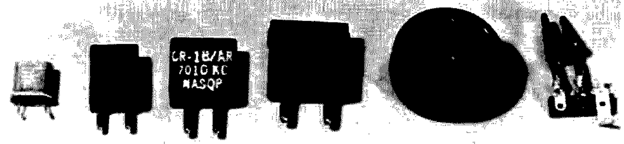


The standard 2.5-mH rf chokes (the right-hand pair) are nice to use if you can get them. Several TV-style chokes (left-hand pair) in series will work just as well in this low-power circuit.



Second-hand crystals come in many sizes—all of them useful! Many hams prefer the standard FT-243 holders (second from left) which means that the others are cheaper to buy. The "universal crystal pin-grabber" (far right) will hold any of them.

old-style 6-pin tube socket visible in the photograph. In a pinch, even a *real* crystal socket would work!

Much of the rf circuit and ground wiring is done with thick copper house wire with the insulation stripped off. Many of the smaller components are supported simply by soldering them to these heavier bus wires. Use insulated wire for the high-voltage-dc circuits though, and make an effort to minimize the amount of exposed conductor in the plate and screen circuits. *Be careful to choose a socket for the panel lamp which has both contacts insulated from ground.* Some sockets automatically ground one side of the bulb—a real health risk in this application. My lamp socket has a pretty red jewel, but, to be honest, I usually look at the bulb by peeking over the top of the panel.

The power and antenna wires connect to the transmitter through an old-style barrier strip mounted on the rear of the board. Those wires could just as well be soldered to several salvaged TV terminal strips if you don't have the screw-type connector. My transmitter has a panel-mounted ac-power switch to control the external power supply. This isn't a good idea because the 115 volts gets exposed on the rear terminal strip. I never used the switch for anything, and the front-panel space would have been better utilized as a mounting place for the crystal socket. That also would remove the temptation to reach behind the panel and change crystals while the B+ is applied.

For the sake of historical authenticity, the plate-circuit pi-network coil is wound on a cardboard tube salvaged from a roll of toilet paper. These tubes aren't as sturdy as they used to be, and it was necessary to give this one several heavy coats of varnish before it was stiff enough to take the winding tension of the wire without collapsing. The coil requires about 12 feet of #20 wire. Solid hookup wire is ideal, but wire salvaged from the secondary of an audio-output transformer or deflection yoke will work fine, too. Of course, just about any of the commercial air-wound coil stock could be used, but there is a lot to be said for the thrill of building as much as possible of this rig with your own hands!

To wind the coil, first punch several small holes about ¼" apart near each end of a 3" section of the cardboard tube. Clamp one end of the length of wire in a vise and stretch the copper out by pulling on the far end to get it straight and kink-free. Thread the end through one pair of holes on the form leaving a 6" tail for the coil lead and then wind the 23 turns on the form as you walk towards the vise. If the coil is wound too loosely it will not hold its shape; too tightly, and the cardboard tube will collapse. After winding, thread the end wire through the other pair of holes and then spread the turns out to evenly cover about two inches of the form. When it looks as neat as possible, the turns can be fixed in place by running several beads of model cement down the length of the wiring. At first, I mounted the coil in the transmitter using only the leads for support. That wasn't stiff enough with the soft wire I had used, so I added a few drops of glue to steady it against the back of the front panel.

The plate- and load-tuning capacitors were salvaged from old broadcast receivers. The tuning capacitor is a single 365-pF section while the loading capacitor has two sections in parallel to total about 700 pF. When the bandswitch is in the 80-meter position, an additional 470 pF is added to the loading capacitor. That won't be necessary if you can scare up a tuning capacitor with three or more sections totaling 1000 pF or more.

Old-fashioned pi-wound rf chokes are a rare item these days, but fortunately a suitable substitute can be found in many old TV sets. The TV chassis I salvaged for parts had four small single-section chokes in it. Their inductance values ranged from .5 to .8 mH, so several placed in series make a good replacement for the old 2.5-mH standard. The transmitter requires two chokes, and at first I used two 2.5-mH units from my junk box. That worked fine, but I found by experiment that the transmitter worked just as well if a single TV choke was used in the cathode circuit and the three remaining units were series connected in the plate circuit.

The biggest problem in collecting parts for this little transmitter is finding some crystals, and the only economical solution is to get them from other hams. It's been years since low-band crystal control was popular, but hams rarely throw anything away. Any amateur flea market is likely to turn up someone with a box full of ham-band crystals priced at not more than fifty cents apiece. Twenty-five cents is a good price, but try offering the fellow a buck and a half for the whole box. If the flea market doesn't pan out, talk to some of the older fellows in the local club. Don't be afraid to buy old-style crystals in odd-looking holders (see photograph); they work

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fine and make interesting additions to your collection of rocks.

No sockets for them? Try old-style tube sockets or—as a last resort—use a couple of alligator clips on the end of some stiff pieces of wire and build a "universal crystal pin-grabber" into your transmitter. As a final solution to the crystal procurement problem, you can always use the 3.579-MHz burst crystal from a junked color TV set. The biggest trouble there is that every color set in the neighborhood is radiating energy on that frequency and you may have to put up with a lot of unnecessary interference in your receiver.

I built this transmitter for use with the one-tube regenerative receiver described in "The Tube Returns" (*73*, December, 1982). To make combined operation easier, the transmitter send-receive switch incorporates some features which aren't strictly necessary. The minimum requirement is for a transmit-standby switch which opens the transmitter B+ line on standby. Having an old 4PDT lever switch, I wired it so that, in addition, it (1) connects the antenna to the receiver on Receive, (2) shorts the receiver antenna input on Transmit, and (3) opens the receiver B+ line on Transmit. Depending upon your needs and resources, you can add any or all of those extra functions.

The front panel was finished off with gray paint and press-on lettering—very unauthentic for a 1955 replica. My excuse is that the salvaged panel was already painted and scratched up from its previous use. Don't feel that you have to apologize to anyone if your version features unfinished aluminum and penciled-on control labels. Many of the original one-tubers didn't even *have* a front-panel—just parts mounted on a board or inverted cake-pan chassis!

The separate power supply is pretty conventional in circuit and layout. My collection of parts fits nicely on a 5″×9″×2″ chassis. The power transformer, filter capacitors, choke, bypass capacitors, and miscellaneous hardware were all salvaged from the TV chassis shown in the photograph. A full-wave rectifier using two TV power-supply diodes is mounted on a terminal strip under the chassis. Any diodes rated at more than 800 volts and 1 Amp will work fine, as will any of the common rectifier tubes (5Y3, 5Z3, 5V4, 5U4, 5R4, etc.). A bottom plate covers the under-chassis wiring for safety and neatness.

If you have trouble finding a real chassis, you can always use an inverted baking pan—the bread-pan size should be about right. For a bottom cover use a piece of board cut to fit tightly just

Parts List

Preferred values are shown on the schematic; a usable range of substitute values is given here.

C1, C2	20 or more uF at 350 or more working volts
C3, C4	.001 to .01 uF, 400 V or more
C5, C6	.001 to .1 uF, 400 V or more
C7	10 to 56 pF
C8	220 to 390 pF
C9-C14	.001 to .05 uF, 400 V or more
C15	.001 to .01, 600 V or more
C16	Single section of broadcast variable, 365 pF
C17	390 to 680 pF
C18	2 or more paralleled sections of broadcast variable, 700 pF or more total
D1, D2	1 Amp or more, 800 or more piv (TV rectifier diodes)
R1	220k to 470k, 1/2 Watt
R2	100k to 470k, 1/2 Watt
R3	22k to 39k, 1 Watt (may be 2 parallel 1/2-Watt resistors)
L1	TV power-supply choke (Typically 1 H at 350 mA) or any choke rated 1 H or more at 75 mA or more
L2	23 turns, 2″ long, 1-5/8″ diameter, #24 or heavier wire, tapped at 9 turns. Turns and dimensions may vary by +/− 20%
RFC1	.5 to 2.5 mH, TV set rf chokes in series
RFC2	1.5 to 2.5 mH, TV set rf chokes in series
T1	TV power-supply transformer. 220 to 325 volts ac on each side of center tap at 50 mA or more, and 6.3 volts at 1 Amp or more

BUYING PARTS

Readers living in truly remote parts of the US or on isolated Pacific atolls may genuinely not be able to scrounge parts, so here is a list of mail-order suppliers for the major transmitter components:

- **Fair Radio Sales, 1016 E. Eureka St., Lima OH 45802 (1982 Catalog).**

Power transformer	cat. no. TB1RX03LB/FGC-29	$5.95
Filter choke	cat. no. TF1RX04LB/FGC-29	3.95
6L6 tube (unused! but not new)		3.00
Octal sockets (2-hole mounting, 3@35¢)		1.05
		$13.95

- **John Meshna and Sons, Inc., PO Box 62, East Lynn MA 01904 (Catalog #23, Spring 1982).**

3 broadcast tuning caps (ask for AM style)	cat. no. SP-117	$1.00
40-meter crystal (choose 1 freq: 7.025, 7.050, 7.075)		1.00
10 1-mH rf chokes		1.00
Filter capacitor	cat. no. MC-6	.25
6 slide switches (SPDT)	cat. no. SW-103	1.00
10 ceramic disc caps (ask for eight .015 1 kV, one 22 pF, and one 270 pF)		1.00
3 key jacks	cat. no. H-38	1.00
3-Amp, 1000-piv diodes (2@45¢ each)		.90
3 indicating fuseholders	cat. no. SP-30-21	1.00
		$8.15

Meshna has a $10 minimum order; you might want to write for their catalog first and see what else looks good.

- **Radio Shack (1982 catalog).**

Barrier strip	274-670	$1.39
Knobs (2)	274-407	1.29
Alligator clips	270-380	1.19
1.5-A fuses (3)	270-1274	.59
470k, 1/2-W resistors	271-042	.19
47k, 1/2-W resistors (parallel for R3)	271-042	.19
#47 lamps (2)	272-1110	.69
6-V, 60-mA lamps	272-1144	.99
		$6.52

Total project cost: $13.95 + 8.15 + 6.52 = $28.62. With a little effort put into scrounging parts, the actual cost should be something under five dollars. If your immediate circle of friends fails to produce a suitable TV set, remember that many supermarkets have bulletin boards where "want" notices can be posted at no cost. And don't overlook the possibility of putting a want ad in the local newspaper. Something like this should produce results: Old TV??—I'll Haul it Away Free! Experimenter desires donations of old working or nonworking TVs and radios for educational project. Let me help clean your cellar!

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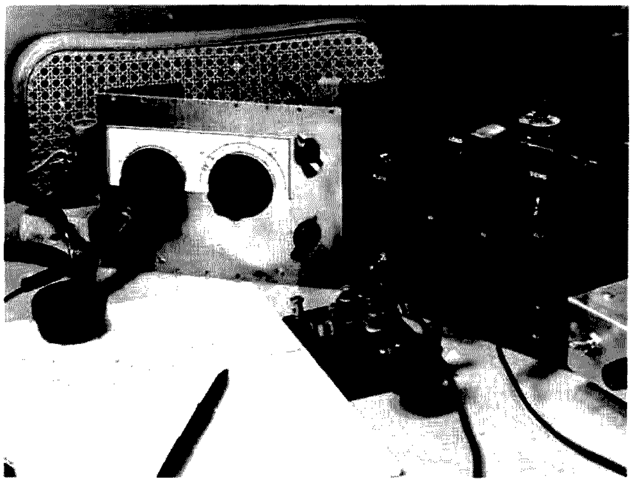
inside the bottom opening and secured in place with wood screws. Don't forget to include an ac line fuse even if you have to buy the holder. My supply is good for 375 volts at 200 mA or so, and 6.3 volts at 3 or 4 Amps. The transmitter will draw at most 75 mA of B+ current and less than an Amp at 6.3 volts.

Tuning Up

Before actually discussing tune-up, let's discuss safety. There are high voltages exposed on the components and wiring of this transmitter. That's easy to forget in these days of transistor equipment and 12-volt power supplies. Remember that the high voltage is there, and remember that the filter capacitors will stay charged for some time after the ac is turned off. Watch your fingers! Watch out also for small children or pets when you're using this rig. This little transmitter is a lot of fun to use but don't let an accident zap your enjoyment.

With only two controls, tuning up doesn't take much time. The procedure is basically the dip-and-load operation used with most tube-type transmitters. Connect an antenna or dummy load (a 7- or 10-Watt, 115-volt bulb works fine as a dummy), plug in a key and crystal, and turn on the power. Eighty-meter crystals will work on 80 or 40 by the way, but the output power is cut almost in half when the transmitter is doubling, so 40-meter crystals are recommended for that band. Set the loading capacitor to maximum capacitance, hit the key, and rotate the tuning capacitor until a dip in plate current is reached somewhere around the middle of the capacitor's range. As always, minimum plate current (as indicated by a drop in the brightness of the plate-current indicator bulb) corresponds with maximum power output.



The complete two-tube station, ready for action. The 6SN7 receiver was described in the December, 1982, issue of 73. This simple and inexpensive setup can provide solid contacts over hundreds of miles on the 80- and 40-meter bands.

There are several peculiarities of this circuit which will be observed. Tuning the output network also affects the oscillator portion of the circuit, so the dip is not always as sharply defined as it would be in a plain amplifier-output stage. If the output is tuned too far below resonance, the oscillator will quit entirely and the plate current will jump to some high level. The desired dip is found at a plate-tuning setting just a little on the low-capacity side of the point where the oscillator starts. When the transmitter is fully loaded, the dip is sometimes hard to observe on the plate-current bulb and the output-current lamp will then provide a better tuning indicator.

Operating Hints

The best way to initiate a contact with this little rig is by calling CQ. Practically everyone else on the band will be using a vfo and super-selective receiver, so unless the other station just happens to be very close to your crystal frequency, the chances of making a contact by answering a CQ are poor. A good antenna will always help, and having several crystals for each band is also an asset. Last but not least, don't let the low power level discourage you. In the last ten years there has been quite an upswing in QRP activity, and many hams operate entirely with power outputs lower than that offered by this one-tuber. Remember that at the distant receiver, 10 Watts is only about an S-unit and a half weaker than 100 Watts!

I've been using the one-tube transmitter as a companion to my one-tube regenerative receiver. Like the transmitter, the receiver was built with the goal of duplicating something a 15-year-old Novice might have constructed around 1955. Together, the two pieces of gear make a nice matched station and have provided many enjoyable hours of air time.

The receiver has plug-in coils which provide plenty of bandspread on both 80 and 40, but operation has mostly been on 80 meters during the early evening hours. Forty meters at night is just too big a challenge for the receiver, although several daytime contacts have been made on that band without difficulty. Eighty is an ideal band for this type of equipment: The lack of interference, strong stable propagation, and slightly better receiver performance all contribute to long and enjoyable contacts.

The biggest practical problem is spotting the transmitter's crystal frequency with the receiver. Presumably, this wasn't as much a bother in the old days—contacts just didn't always occur on one frequency as they do now. I solved the spotting problem by cheating a little: A weak test signal is generated by plugging the crystal into a simple transistor-oscillator circuit. Perhaps some reader can suggest a more authentic spotting procedure.

Relax and Enjoy

One of the amazing things about ham radio is its great variety. Equipment can't get much cruder than the station described here: a 40-year-old circuit design using obsolete salvaged parts and hand-built with carpenter's tools. Yet this set can provide reliable communications over hundreds of miles. Most impressive of all is that more often than not when I exchange signal reports with that distant ham and his $1200 transceiver, I give him the same RST 579 he honestly gave me! (I make it a habit to get a signal report *before* I describe my equipment—that avoids the "sympathy vote.") You'll also find that nothing seems to get past the standard hello/good-bye contact habit faster than a description of this two-tube ham station. Often I can almost see the tears in the other fellow's eyes as he tells me about similar equipment built and operated in the dim past.

I'd be the last to claim that you can set the band on fire with this little transmitter, but I will promise that it's an almost zero-cost source of great entertainment. Discover (or rediscover) for yourself the flavor ham radio had in the days before passband tuning and digital readout. Build it—and enjoy it! ■

Fred E. Bolduan N6LM
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San Mateo CA 94403

Build the Revolutionary Parastat

After some rule-bending and wire-straightening, N6LM discovered the parastat antenna. It has gain when you want and a null when you don't.

This article is directed to the experimenter, particularly one who is partial to wire antennas. No construction information, other than minor basics, is included.

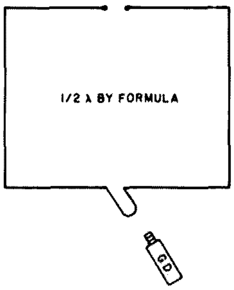


Fig. 1. Square half-wave radiator.

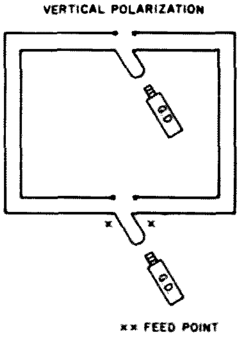


Fig. 2. Setup for vertical polarization.

The individual is permitted to fly on his own. A wall, a barn door, or Grandma's old curtain-stretchers may be used for a test stand.

To investigate the potential of an antenna for a restricted area, the old idea of the square radiator, i.e., a half-wave radiator equilateral, fed as a dipole, was resurrected. (See Fig. 1.) Years ago, this antenna was used as the basis for a spider-web array.

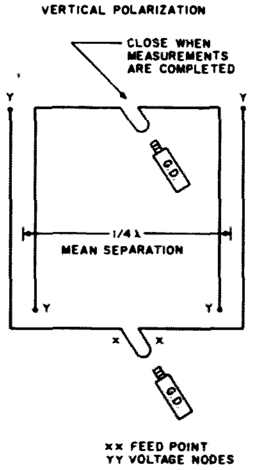


Fig. 3. Quarter-wave separation between legs.

A light X-frame was made up of 6-foot lengths of ¾-inch wooden stock, and a stand of scrap plywood

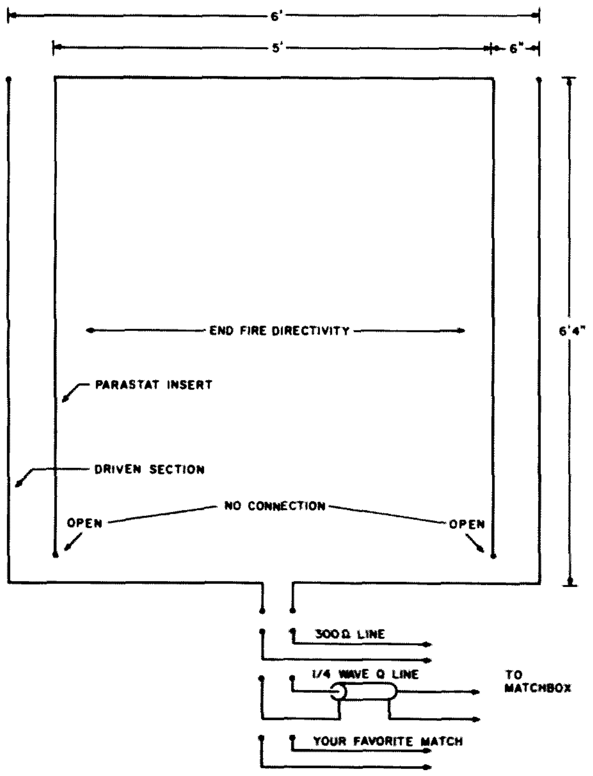


Fig. 4. Details of completed parastat antenna. Skeletal configuration guide—21.100 MHz; vertical polarization; zero broadside null. Radiation resistance is 38 Ohms, approximating that of a close-spaced radiator/director beam antenna.

was constructed to serve as our "test bed." One-inch wire finishing nails were tacked at two-inch intervals on the far ends of the X-frame to wrap, or support, our experimental antenna. No. 22 wire was used in our design. However, no. 18 bell wire or similar light copper stock would be preferable.

It is essential that a portable grid-dip meter and sensitive field-strength meter be available for pruning the antenna to desired frequency and for subsequent testing.

Getting back to our square half-wave radiator, it loaded well but its performance left much to be desired. As a receiving antenna, it was no match for a reference dipole. Rather than discard our efforts completely, we decided to play around with an unorthodox idea. Let's bend a few rules and see what happens when another element is placed inside our loop, opposite in phase, and driven electrostatically in parasitic mode (hence the name coined for this radiator: the "parastat"). See Fig. 2.

We had assumed this configuration would lower the resonant frequency, but we were not prepared for the extent of variation. At this point the grid-dip meter becomes indispensable. Start out by cutting both driven element and parasitic element to ½ wavelength of the chosen frequency, in our case 21.100 MHz. A single turn in the center of each element is set up for grid-dip-meter insertion.

Begin pruning the ends of each element for the desired frequency. Due to the proximity of the elements, an L/C relationship exists and "pulling" will occur as each is pruned to the frequency of the other. Continue pruning until the desired frequency is reached and the elements "slide" together in frequency.

Our antenna has now shrunk significantly, but it still retains some desirable features. It still loads satisfactorily; it approaches the receiving capability of the reference dipole. It also shows a marked increase in directivity and the broadside null is accentuated. Noise pick-up is greatly reduced; in fact, the antenna is now quieter than the reference dipole. On-the-air testing was favorable, signal reports were OK, and some DX was worked.

Considering further improvement, we decided to try ¼-wave separation of the two ¼-wave legs of the parastat, resulting in Fig. 3. Plan on a minimum of 20 feet of wire for each element (21.100 MHz) before pruning. Our test frame is revamped to accommodate the new structure.

A parastatic element is inserted and pruning is again undertaken to reach our selected frequency. A considerable reduction in physical dimension is again realized—to about 18% shorter than that produced by the classic formula for a ½-wave dipole. This system loaded well, showing a reasonable frequency response each side of the selected cut frequency. The system was fed with 300-Ohm ribbon line. A ¼-wave Q transformer between the antenna feedpoint and the 300-Ohm line was also tried. The ¼-wave Q line was made up of a short length of RG-58/U grid-dip cut to the operating frequency. A transmatch was used for tuning the system.

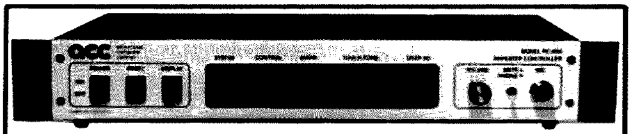
An interesting condition occurred while we were checking the directivity of the system. It was noted that the field-strength meter returned to a zero reading before the system was turned fully and completely broadside. Wondering about this somewhat strange behavior, the field-strength meter was picked up and moved to the system on a line broadside to the elements. Nothing happened to change the zero reading even when the instrument was placed directly in the center of the system. Very intriguing—a completely dead area, devoid of all radiation. Moving the field-strength meter about in this "black hole," it was found that the dead area was quite extensive, several feet in all directions from the center point of the system.

Also of interest, rather than two doughnuts or circles cheek to cheek as in a dipole radiation pattern, we found a definite elongated figure eight, indicating a reasonably sharp directional pattern.

It was a pleasant surprise to discover our latest effort surpassed the receiving capabilities of the reference dipole. It was nothing intense or remarkable, but there was a solid lift in signal strength, plus a significant decrease in noise. Signals formerly masked by background noise became readable. Local, stateside, and DX stations were worked—all continents. And the base of our test antenna stood only one foot above ground.

This configuration may be of interest to the apartment dweller or the amateur who must hide his activities in restrictive neighborhoods. It works out nicely from an interior room, having sufficient concentrated directivity to punch out a respectable signal. In areas where certain interfering signals are prevalent, its broadside black-hole null may be helpful in working around competition. It also suggests a superb HF direction-finding mode, in that the null will not spin out upon closure to a strong signal source.

For mechanical considerations and convenience, 21 MHz was used as a starting point; however, bolder amateurs may wish to project the idea to the lower frequency bands. ■



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Talk Softly and Load a Big Stick

Turn a six-foot stick into an antenna that will ramrod your signal into the ether. And when you're off the air, you've got a coat rack.

This particular antenna was born out of need for a compact aerial that could be carried easily and set up quickly, primarily for indoor use but also for outdoor application, without need to suspend the system between two points. To achieve this end I decided to use a helical-whip configuration capable of working on all bands. The whip length purposely was limited to 2 meters (a little over 6 feet—or 79").

The helix was wound on a collapsible varnished bamboo fishing pole. This choice is the least expensive and most easily available. The pole is sold as a three-piece, 3-meter length (10-foot) unit, but to allow for easy indoor use when desired, it was cut to the aforementioned 2-meter length, consisting of two sections which fasten together.

For indoor use, a wooden board 61 cm by 61 cm by 2 cm (24" by 24" by 3/4") was fitted with a vertical plate of aluminum at the board's center. The plate was drilled to accommodate two 6-32 mounting screws to hold the antenna pole at its lower portion. The mounting holes were drilled 7.62 cms (3 inches) apart. This method of construction facilitates moving the aerial around in the house (and cellar). Ease in moving it also proves useful in portable camping type of operations. See Fig. 1.

Since the plug-in portions of the pole consist of copper-plated ferrule-like fasteners, these were taped over to allow the magnet wire to be wound over the metal portion and still have a measure of good insulation. A length of #16 enameled wire 42.6 meters (140 feet) long was wound on the pole as indicated in Fig. 2. Since my antenna was intended mostly for indoor use, the pole was not weatherproofed.

The antenna has been loaded on the 80-, 40-, 20-, 15-, and 10-meter bands by means of a random-wire antenna tuner. However, especially on the 80-meter band, a very good grounding system is important. An swr ratio of less than 1.1 to 1 has been achieved on all bands.

At my location the aerial grounding system has taken the form of a water-pipe ground plus a counterpoise wire about a quarter wave long. The counterpoise was cut primarily for the 80-meter band and made to extend around the radio-room floor. Care must be taken, as the end of the wire becomes hot with rf. Because of the importance of good grounding techniques, following are some observations on developing good grounds for indoor or portable operation.

A bad ground system results in difficulty in coupling the transmitter to the antenna and creates poor harmonic suppression resulting in TVI and RFI. This is due to (1) creation of an additional impedance level because of transmitter-chassis-system-to-ground impedance, (2) loss of rf power in poor grounds as a result of radiation in the transmitter's power cord, cabinet, and ground system itself, and (3) partial loss of effect of chassis bypassing resulting in harmonic currents radiating out rather than being bypassed to ground because the chassis is not then at ground potential.

The first and easiest approach to a good system is to connect the ground at a metal cold water pipe. This should preferably be done at the point where the pipe from the local water supply enters the dwelling. Another useful ground point is the metal pipe feeding the outdoor garden hose. (Be sure that the piping is of metal and not of plastic as it sometimes is.)

A counterpoise wire (or wires) is most useful (and many times an additional necessity) as an alternative to obtaining a good ground system. That is especially true in outdoor portable use or when setting up a rig

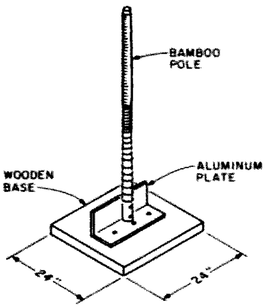

Fig. 1.

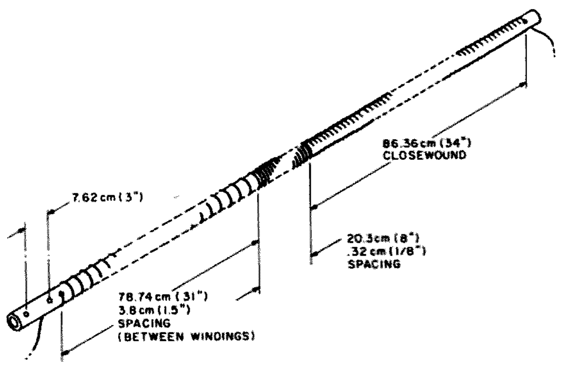

Fig. 2.

in a hotel room when traveling. The counterpoise consists of one or more wires connected to chassis ground. Each of the wires is cut to a length equal to .2 to .25 wavelength for each of various bands. The wires may have to be trimmed down a little at a time to get the most efficient ground as indicated by swr readings while the transmitter is loaded into the aerial. However, the surest way of checking out the total system is to use an antenna impedance bridge.

Either or both of the grounding methods just described plus use of an efficient random-wire antenna tuner will help load this helical antenna on all bands. With regard to the random-wire tuner, every radio amateur should have this accessory. It makes for more flexibility in antenna application, not limiting the operator to a particular type of antenna and operating band. It allows for use of almost any wire length for all amateur bands.

The antenna cost for basic materials was four dollars for the bamboo pole and two dollars and a half for surplus enameled magnet wire. The latter was easily obtained from a local transformer repair company.

As to antenna efficiency, with an output power of 20 Watts on 80- and 40-meter CW, with the aerial *in my cellar radio room*, consistent reports of 5-5-9 to 5-7-9 have been received at medium distances. This performance indicates that with placement of the antenna outdoors, it should perform as well or better than the common 30-foot base-loaded vertical. The six-foot helical antenna thus has the advantages of compactness, ease of installation, and physical durability when the aerial has been carefully weatherproofed. ■

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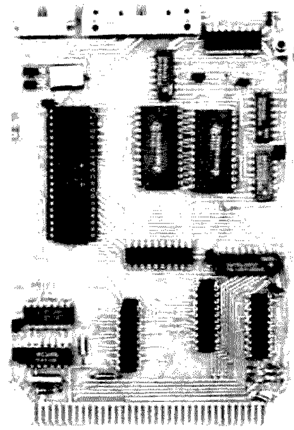

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Nick Testa K6KTS
6420 Dominica Avenue
Cypress CA 90630

Build This Cornerless Quad for 2 Meters

Here's an antenna that you can cut corners on. All you lose is high cost.

A little over a year ago my oldest son, Nick, now KA6OXP, expressed an interest in becoming a ham. After dusting off a lot of vacuum tubes, it became clear that some new equipment was in order. Among the things purchased was a pair of two-meter hand-held transceivers.

Back on two meters after many years, I wondered whether I could work some DX and contact my old friend Tom WA6FIO. Tom lives some 50 miles away across Los Angeles. Our first contact was via repeater but left a lot to be desired in a rag-chew, with timers, QRM, and breaks to contend with. After spending a modest fortune to re-equip our ham shack, the prospect was dim for obtaining a linear or even a commercial high-gain 2-meter antenna. Enter LC4ELQ!

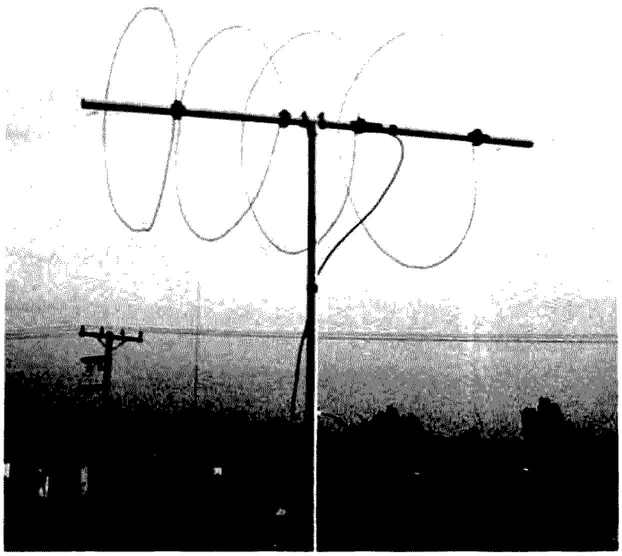
It is the answer to the question of how to boost your signal and reception on 2 meters at the lowest cost. If you have a low-power hand-held and want to use simplex across substantial local distances, as I did, or an SSB transceiver and are looking for the real DX, then LC4ELQ is for you.

It stands for Low Cost 4-Element Loop Quad. The antenna design is based on the 4-element quad but with some important changes to cut costs and simplify construction. A well-stocked junk box may contain all the necessary parts. Even if you have to buy all the parts new, except for an entire case of wire (which you will need only a small portion of), the expense will be under $10.00.

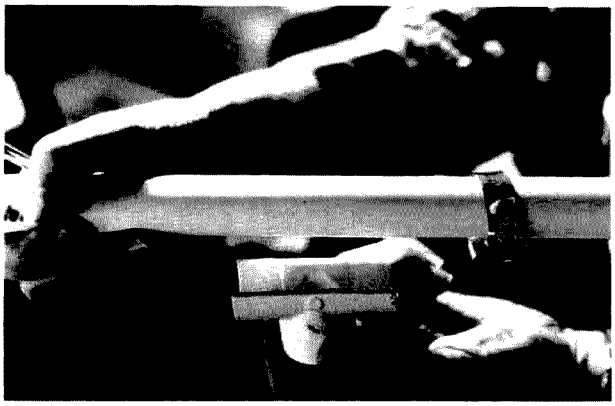
Construction

My trip to to the junk box yielded some 3/4-inch schedule 40 PVC pipe left over from a sprinkler system installation and a quantity of #8 aluminum ground wire (Radio Shack #15-036) left over from grounding my low-band rig.

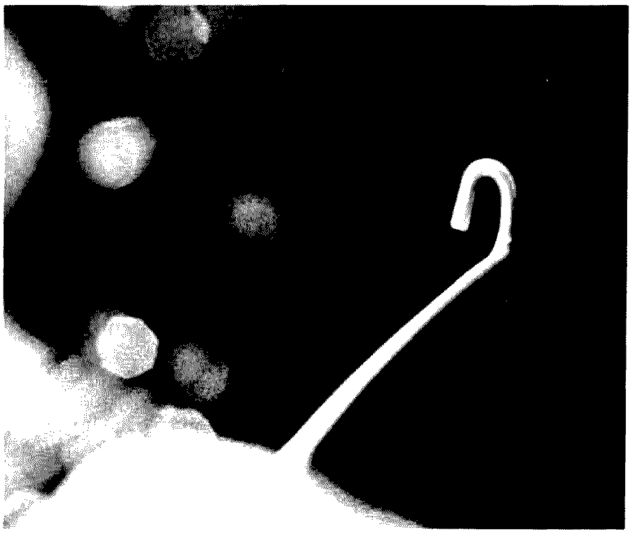
Since I was interested in the design which would have the best chance of being self-supporting, I decided to make the elements loops instead of squares. This has the added advantage of allowing adjustment



The LC4ELQ.



The cut T being positioned on boom. The hose clamp is one of two which will be used to secure the T to the boom.



Forming the bolt hook and the 90° bend.

The end of each element should look like this. Length measures in the table are from the 90° bend to the one at the opposite end. The hook is not included in the dimension.

of the element size without the constant adjustment of corners. This in fact proved very handy at the tune-up stage. Due to the stiffness of the #8 wire, adjusting corners would have made the antenna look like it had been salvaged after being hit by a truck.

Four pieces of the wire were cut to length for a driven element, a reflector, and two directors. The lengths were determined as in a 2-meter quad design such as is found in the *ARRL Antenna Book*, plus 1 inch to allow for forming hooks at the attach points, less the length of the bolts through the boom for the reflector and director elements. In those three elements the 1/4-inch by 2-inch bolts serve as 1 inch of the resonant length. Each element was then formed into a hoop with the ends bent at 90 degrees and then bent to fit around the bolt and screw heads.

The next step was to prepare the boom and mast. I cut the 10-foot piece of PVC into a 4-foot and a 6-foot length. I also cut the top bar of a PVC T joint in half lengthwise. The stem portion of the T was glued to the end of the 6-foot piece of tubing to form the mast. I mounted the 4-foot length for the boom in the U-shaped cradle formed by the remaining top of the T using a pair of 1-1/2-inch-diameter hose clamps. The hose clamps can be loosened to allow for rotation of the boom for vertical or horizontal polarization.

Three 1/4-inch holes were drilled through the boom, one for the reflector and one for each of the directors. A 5/64-inch hole was drilled through the boom for the driven element. A 1/4-inch by 2-inch hex-head bolt was passed through each of the larger holes with a pair of flat washers on each side of the boom. The small hooks at the ends of the elements were slipped between the washers at each side and a nut used to fasten the assembly.

For the driven element, a #8 by 3/4-inch sheet-metal screw was inserted in each side of the boom. Each screw has a pair of 1/4-inch washers and a #8 washer, nearest the head, mounted on it. When the driven element is mounted, the shield and center conductor of 50-Ohm coax are connected, one to each screw. The screw acts as a terminal to connect the coax to the antenna. Solder or crimp #8 spade lugs to the end of the center conductor and shield to ensure good attachment to the antenna.

To tune the antenna, I adjusted the element lengths and spacings until the antenna provided a nearly perfect match to the transceiver across the entire 2-meter band. This gave me a prototype antenna with a few extra holes in the boom. The final lengths are shown in the table of element lengths. Be sure to note that the table gives the length between the 90-degree bends and not to the tip of the wire. I recommend that you form a 90-degree bend and a small bolt hook on the end of the wire and then measure to the next bend point. Make the bend, allowing enough wire to form the

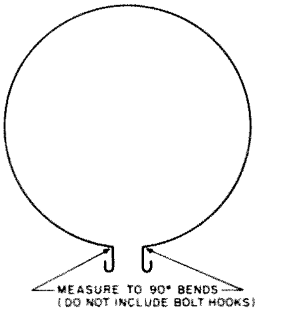


Fig. 1. Element setup.

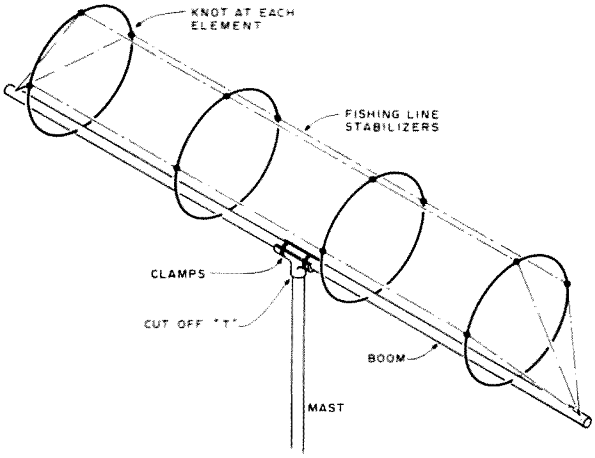
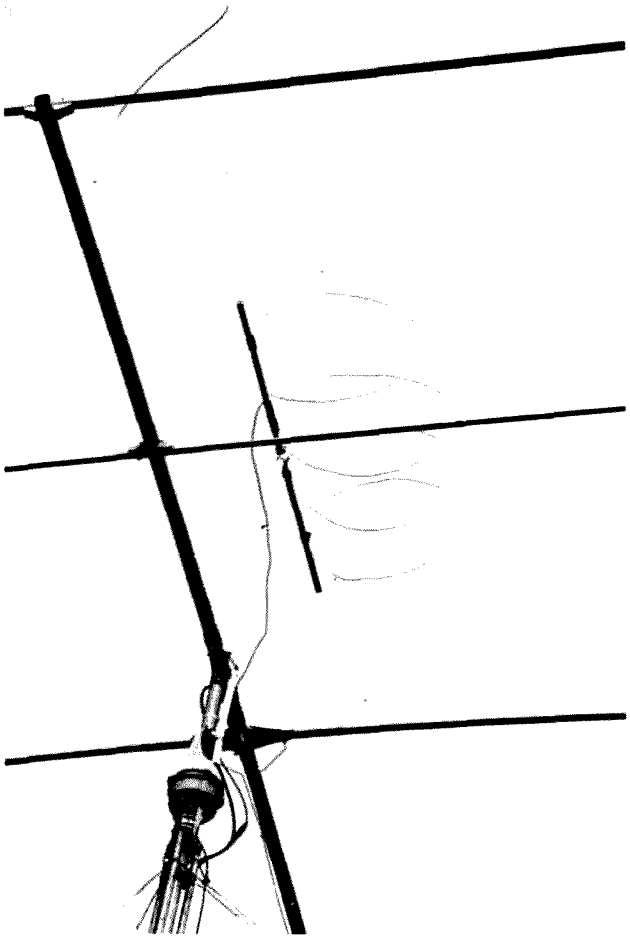
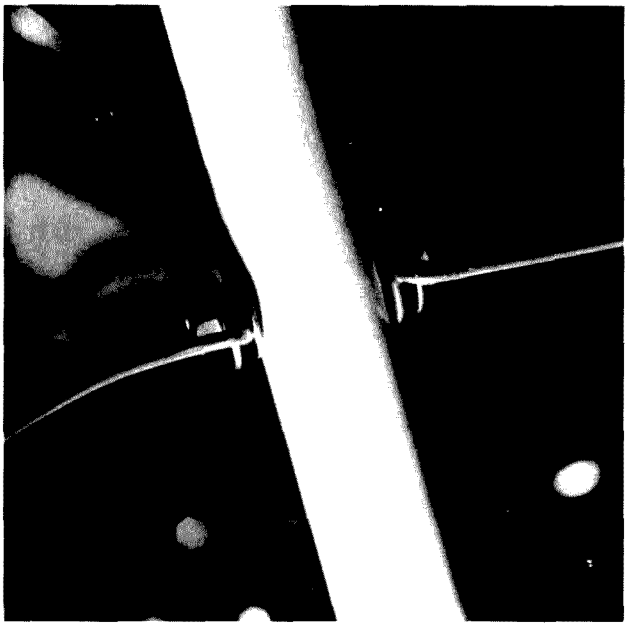


Fig. 2. Mounting pattern for elements.



The LC4ELQ antenna mounted above the tribander.



Element joined to boom. Note the pair of washers on both sides of the boom with the element between. 1½-inch bolts are shown in this picture; 2-inch bolts make installation of the nut easier.

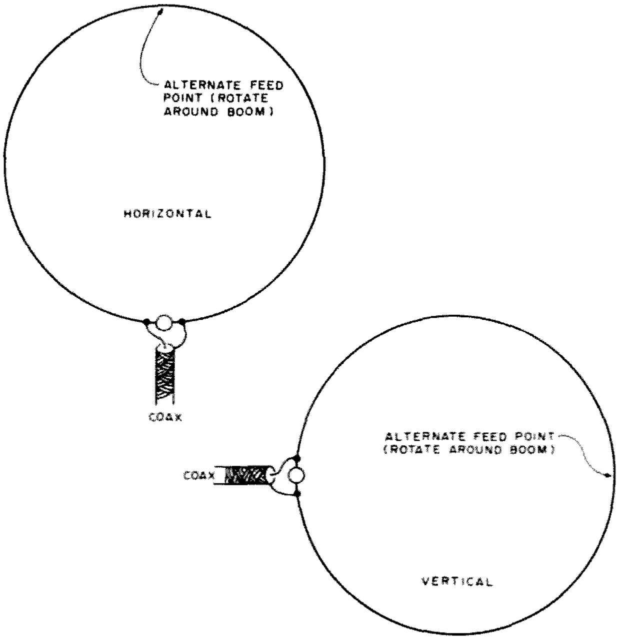


Fig. 3. Feedpoints for horizontal and vertical polarization.

hook around the bolt or screw, and then cut the entire piece off.

In making the swr measurements, I noticed that the relative motion between the elements was enough to change the swr. To prevent this I added three pieces of fishing line tied to each element and to the ends of the boom which extend beyond the elements. If, for example, the loop is fed at the 6 o'clock point looking at the antenna straight down the boom, a length of fishing line runs along the 9, 12, and 3 o'clock positions. A knot was tied at each element with a slight inward bend of the wire at the knot point to retard slippage. The ends of the three pieces of fishing line were tied together and then passed through spare holes at each end of the boom. George N6FFA, in testing copies of the antenna, found that squareness to

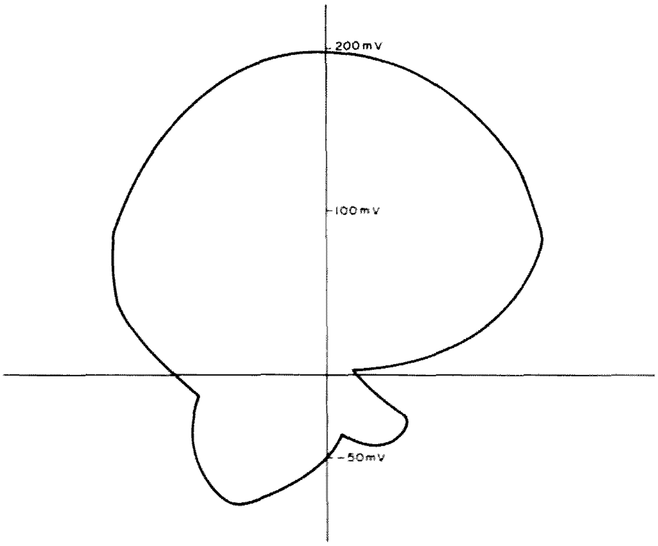


Fig. 4. Antenna pattern measured by N6FFA and KD6EH in millivolts of signal. The LC4ELQ was used as the transmitting antenna and rotated to produce the pattern.

Element Wire Lengths

Element	Length in Inches from 90° Bend to 90° Bend
Director #2	73-3/8
Director #1	74-3/8
Driven Element	79
Reflector	83-1/4

Element Center-to-Center Spacing

From	To	Distance in Inches
Boom End	Director #2	6
Director #2	Director #1	11-3/4
Director #1	Driven Element	8-5/8
Driven Element	Reflector	14-1/8
Reflector	Boom End	≈7

Measured Swr

Frequency in MHz	Final Adjustment Values (Swan)	Measured at 40 ft (Bird)
144.0	1.35	1.45
144.5	1.20	1.25
145.0	1.00	<1.14*
145.5	1.00	<1.10*
146.0	1.00	<1.10*
146.5	1.10	<1.10*
147.0	1.30	<1.10*
147.5	1.40	1.22
148.0	1.55	1.35

*Lowest reading on chart

the boom and parallelism of the elements to each other reduced the rear lobe of the antenna. That means you should do the best job you can in these areas. For long-lasting protection of your connections, wrap each with electrical tape or, better yet, use a commercial silicone sealant to cover them.

Polarization

What would you like? Since I was interested in FM, I wanted a vertically-polarized antenna. I rotated the boom so that the feedpoint was on the side, 3 o'clock or 9 o'clock looking down the boom. This gave me vertical polarization. For horizontal polarization, place the feedpoint at the top or bottom of the loop, 6 o'clock or 12 o'clock. With vertical polarization, N6FFA did notice a reversal of the deep rear side notch in the pattern, depending upon which side the feedpoint was on.

S-Meter Measured Antenna Pattern

Degrees	dB over 9
0 (front)	30
15	28
45	28
75	28
135	10
165 (back)	20
195	19
225	20
255	25
315	25
345	28

Testing

Initial tests were made with the mast held by rubber bands to the desk drawers in my shack and the boom 6 feet off the floor. Readings were taken on a Swan VHF reflected-power meter. Also checked was the performance in vertical and horizontal polarization, and rough checks of directionality were made. The antenna was then clamped above my tribander at 40 feet. Swr tests were then repeated using a Bird model 43. Both sets of test results are shown in the tables.

With the help of Judi WB6SKE, I made the first pattern check. It indicated a front-to-back ratio of 20 dB. The data is also shown in the table. The distance between our QTHs is about 4 miles. N6FFA and Greg KD6EH made the radiation pattern graph shown from the millivolts of signal measured at Greg's location about 12 miles away from N6FFA.

Performance

Yes! I was able to work WA6FIO simplex at nearly full-quieting across the Los Angeles QRM with 1.5 Watts. This same power level has easily provided reliable nearly full-quieting communications via repeaters located in other cities nearly 200 miles away. My QTH is situated on flat land at about 50 feet above sea level so our own elevation is not a factor. Several other local hams have built and used the antenna on both FM and SSB with excellent results. I constantly receive the comment on the air, "You're that far away and just using 1.5 Watts; that's some antenna!" Try one for yourself and see what I mean.

Conclusion

The LC4ELQ is hard to beat for return on your dollar investment for each Watt of effective radiated power. The ease of assembly beats anything with spreaders. One fellow says he has built several and it now takes him much less time than the 45 minutes that he spent on the first.

If you're interested in minimizing your time in construction, drop me an SASE asking for information on a pre-cut and -drilled kit version. ■

Parts List

Quantity	Price	Description	Source
1	$2.19	10-ft. piece of ¾" schedule 40 PVC	Hardware Store
1	.39	¾" PVC T-shaped fitting	Hardware Store
2	1.18	1½" hose clamp	Hardware Store
3	.75	¼" x 2" bolt	Hardware Store
3	.15	¼" nut	Hardware Store
16	.80	¼" flat washer	Hardware Store
2	.10	#8 sheet-metal screws	Hardware Store
2	.10	#8 flat washers	Hardware Store
27 feet	.81	#8 aluminum ground wire	Radio Shack
35 feet	.14	#12 monofilament fishing line	Sporting Goods
	$6.61		

William R. Stocking WØVM
1030 Weidman Road
Manchester MO 63011

Tuned Feeders for Oddballs

To get that good DX you've been missing, add some versatility and multi-band capability to your wire antennas.

The use of tuned feeders makes possible the construction of a single antenna that will work well on two or more bands and which will load up equally well on any frequency in each band, whether the frequency is phone or CW.[1] Tuned feeders will feed "oddball" antenna-wire lengths that would be impossible to feed with coaxial cable.[2] Tuned feeders also have other advantages that have been described in previous *73* articles.[1,2,3] Because of these things, radio amateurs who like to experiment can use tuned feeders to try out many different antenna ideas. The one disadvantage of tuned feeders (resonant lines) is the extra work of adjusting the antenna tuner. However, people who like to experiment usually do not mind this extra work.

Vertical polarization is not commonly used with beam antennas even though it has worthwhile advantages for DX communication. The purpose of this article is to present some experiences and ideas which will encourage its readers to experiment with vertically-polarized beam antenna systems fed with tuned feeders.

It is axiomatic that at easily attained heights, vertical antennas radiate rf at lower angles to the horizon than do horizontal antennas.[1] This accounts for those cases in which vertical antennas have made DX contacts that horizontal beams have been unable to make.

For many years I worked DX using vertical antennas, but was unable to work DX using horizontal antennas. It was only natural for me to think in terms of vertical polarization when I decided to build a beam antenna. The first result of this thinking was what was called the "Chinese Inverted Ice Tongs Antenna," so named because it was made of two long bamboo fishpoles and had such a shape. See Fig. 1. This was a two-element vertical beam for 20 meters using an antenna wire and a reflector wire supported by a frame made of the bamboo fishpoles and some 1-by-2-inch lumber. The antenna was fed as a vertical J. This antenna worked DX quite well. (The bottom of the antenna was 40 feet up from

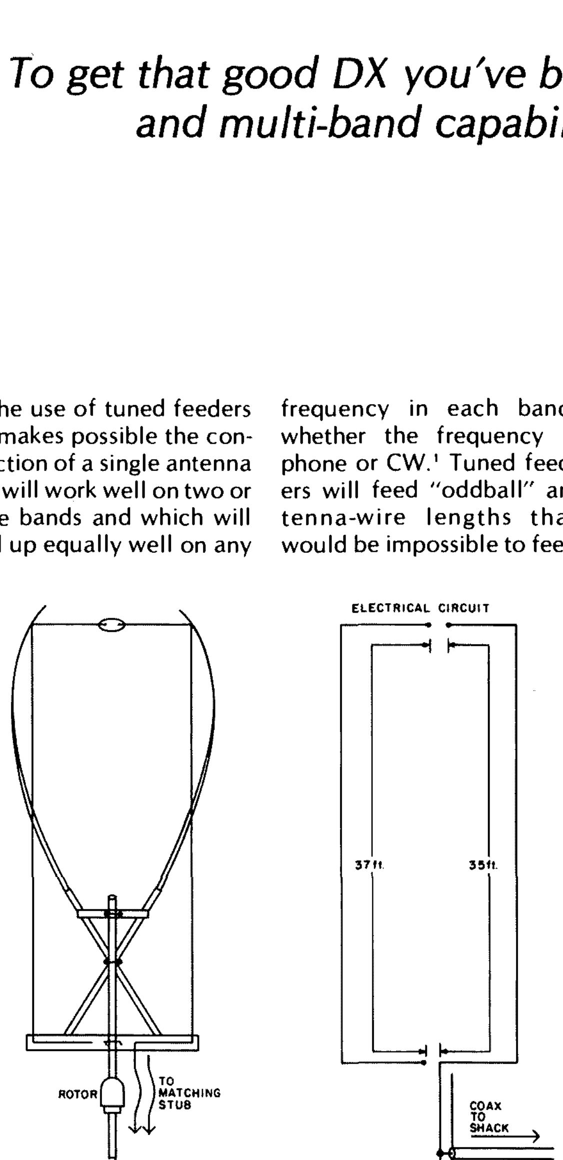
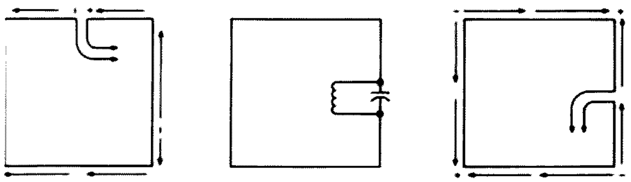


Fig. 1. "Chinese Inverted Ice Tongs" vertical beam antenna. Tuned feeders could have been used.



ig. 2. 20-meter quad tuned to resonance on 15 meters (left) ind 10 meters (right). Reflector with 15-meter trap in vertical vire behind the feedpoint is shown in center.

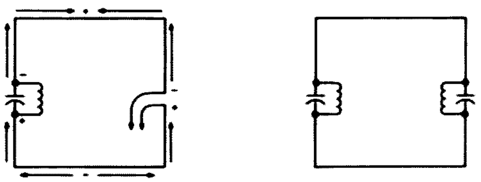


Fig. 3. Use of 10-meter traps to make a 20-meter quad fed with tuned feeders function as an "expanded quad" on 10 meters. (Reflector traps are tuned to a frequency just outside the low-frequency end of the band.) On the left is a 20-meter quad antenna tuned to 10 meters with a 10-meter trap opposite the feedpoint. On the right is a 20-meter quad reflector with 10-meter traps in the vertical wires.

he ground. "There is no substitute for height," as Harry, ıy best radio amateur friend nd "consulting engineer," ften remarked. When I told larry about the DX QSOs, e laughed and replied, Well, the laws of physics ave not been repealed.")

The next vertically-polar-ːed beam was a 2-element 0-meter quad fed in the enter of one of its vertical /ires. This antenna also /orked very well. When I ıoved to another state, I ut up the quad and fed it in ıe center of one of its verti-al wires using tuned feed-rs for vertical polarization. he antenna worked even etter than it did before, ven though it was about 6 eet lower than it was in its ormer location.

One of the characteristics ıf a vertically-polarized ıeam is that the rf is radi-ted in a wide-angle beam. his has been very helpful in arrying on three-way sched-ıles from St. Louis with tations as far apart as cottsdale, Arizona, and ake Stevens, Washington. I ıoint the quad at whichever tation is weaker and both tations can copy my sig-ıals. The great width of the ıeam is especially helpful vhen I do not know the ex-ıct direction in which the ıeam should be pointed. Some people might consid-ːr this wide beam to be a lisadvantage, but I have not ound it to be so.)

The 20-meter vertically-ıolarized quad is excel-ent for working DX. When he band is usable, the DX tations that are called ısually answer. The tuned feeders put the rf into the antenna with great effectiveness. If there had been any doubts about this, they would have disappeared when I worked YU5FAM with less than 1.25 Watts rf output from a Heathkit HW-8 QRP transceiver.

As an experiment, the 20-meter quad was tuned up on 15 meters. It worked very well on this band and many DX stations were worked. A mental analysis of the standing waves on the antenna shows that the two vertical wires of the antenna are excited in phase (broadside radiation). The rf standing waves on the horizontal wires cancel each other. It is hard to know what is happening in the reflector. It may be acting only as a shield to make the beam unidirectional. A 15-meter trap in the reflector on the same side as the feedline would probably make the reflector into a real reflector on 15 meters.

A mental analysis of the standing waves on the 20-meter quad loop, if tuned to 10 meters, showed that the vertical wires would be 180 degrees out of phase and would provide endfire gain and directivity in the plane of the two wires. See Fig. 2. This would be at right angles to the way the quad was pointed as shown on the rotor control box. The vertical endfire beam would be bidirectional. (The horizontal wires would be 180 degrees out of phase also, but the up and down endfire effect would not be useful for terrestrial communication.) The quad was tuned up on 10 meters and the plane of

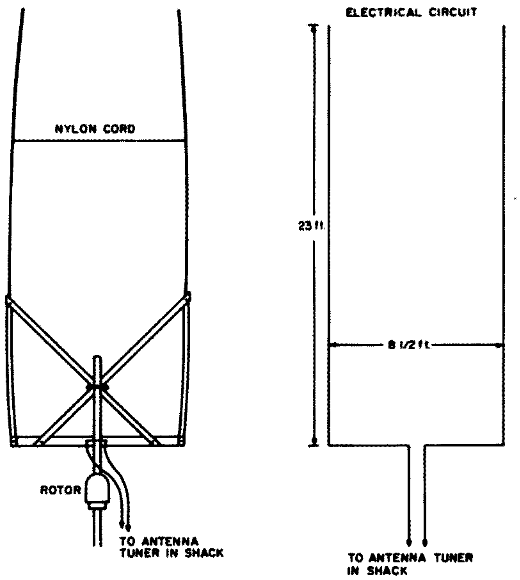


Fig. 4. The "XU" bidirectional beam antenna.

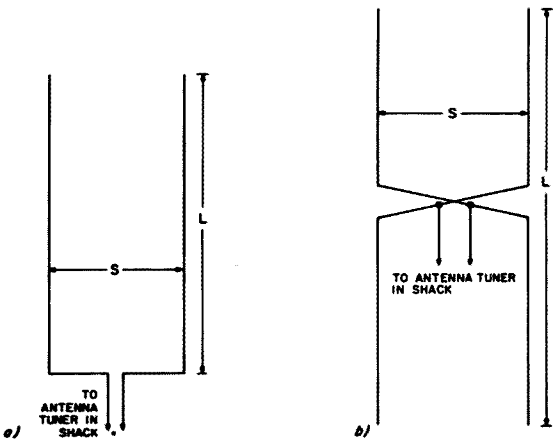


Fig. 5. Electrical circuits of fixed vertical endfire beam antennas. (a) Bottom endfed W8JK endfire vertical beam antenna. (b) Centerfed W8JK endfire vertical beam antenna.

the wires was aimed towards Europe (45 degrees plus 90 degrees, or 135 degrees clockwise from north on the rotor box dial). The first European CQ answered did not result in a QSO, so I called "CQ DX." G3ZRH replied,

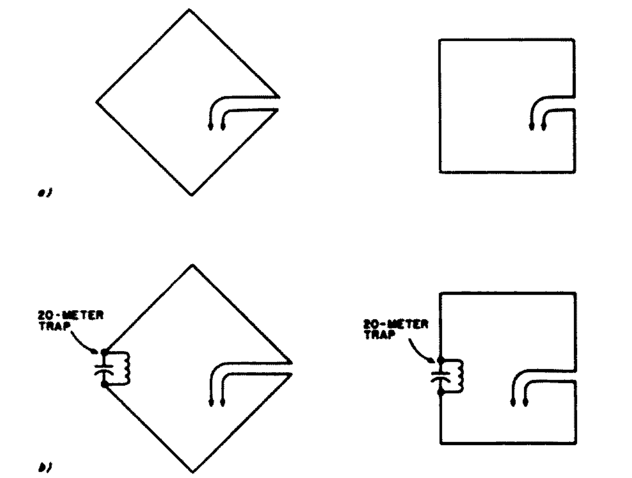


Fig. 6. (a) Vertically-polarized 40-meter quad loops (34 feet each side with tuned feeders going into shack). (b) Vertically-polarized 40-meter quad loops with 20-meter traps for "bisquare" functioning on 20 meters.

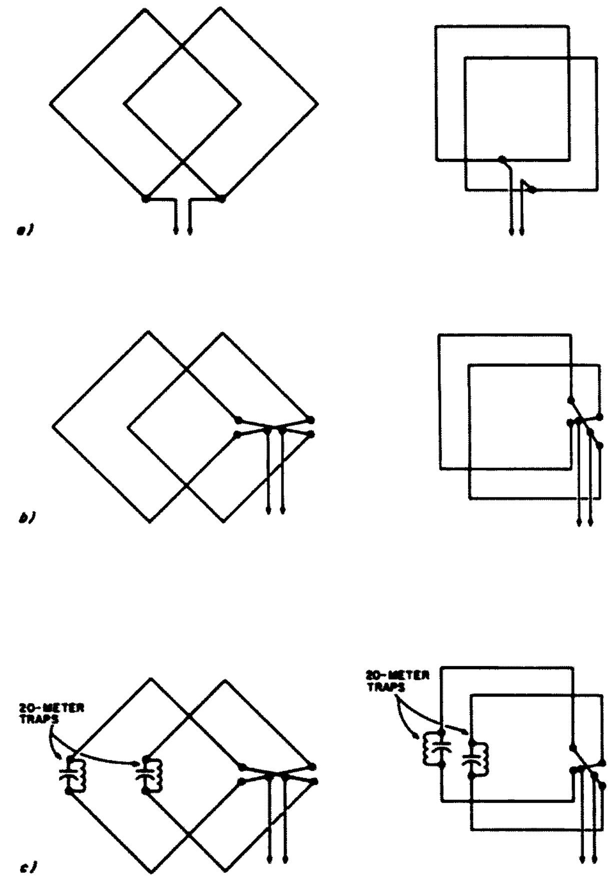


Fig. 7. Two-element vertically-polarized bidirectiona 40-meter quads—bottomfed (a) and sidefed (b). (c) Sidefe vertically-polarized two-element bidirectional 40-mete quads with 20-meter traps for "bisquare" functioning on 2(meters. (Each side of these antennas is 34 feet long. Dis tance between loops is 17 feet.)

giving a 549 report. DJ4DA, DJ4IR, and OK1KPA were worked by calling "QRZ?" at the end of contacts. Another contact was made by answering the CQ of EA4VQ. "QRZ?" after that QSO brought back SM7DWY. The worst signal report from these six consecutive QSOs was the first 549. At least the 20-meter quad could be used on 10 meters.

According to the graph of Fig. 4-20 on page 140 of the ARRL *Antenna Book* (13th Ed.), the gain of half-wave elements fed 180 degrees out of phase and spaced ½ wavelength is slightly more than 2 decibels. The vertical polarization and the one-wavelength height above ground probably account for the good results on ten meters described above. However, a gain in the normal direction of 7 or 8 dB could be obtained on ten meters with a 20-meter tuned-feeder-fed quad by using ten-meter traps as "insulators" in both the antenna and reflector. See Fig. 3. This would make the antenna an "expanded quad" on ten meters.[3]

Endfire beam antennas can be used on two or more bands when they are fed with tuned feeders. The endfed W8JK antenna can be mounted vertically and fed on the bottom with tuned feeders. The spacing between the elements should be ⅛ wavelength for the lowest frequency to be used. The length of the vertical elements should be no longer than ¾ wavelength for the highest frequency to be used. Twenty-three-foot vertical elements spaced 8½ feet apart make a good setup for an endfire bidirectional beam for 20, 15, and 10 meters. Vertical elements 26 feet long would be better electrically, but would be more difficult to build. Twenty-three feet can be obtained by telescoping two 12-foot lengths of aluminum alloy tubing with an overlap of one foot. (This tubing is sold in 12-foot lengths; outside-diameter sizes differ by ⅛ inch and .035-inch-thick walls permit the tubes to telescope into each other.) Twenty-three-foot bamboo fishing poles make very good vertical antenna supports. My endfire beam used two 23-foot bamboo poles, each with 23 feet of number 12 insulated house-wiring wire taped to it with electrician's tape. The bamboo poles were held in place by an X-shaped frame constructed with 1" × 2" lumber. Because of its appearance and the bamboo poles, it was named the "Chinese XU Antenna." See Fig. 4.

In constructing the XU, the bamboo poles were pointed a bit outward. About six feet down from the tops of the poles, a nylon cord was fastened to pull the poles together. This tension preserved the 8½-foot spacing between the wires.

Since 23 feet is only ⅓ wavelength on 20 meters, the beam was somewhat less effective on that band than it was on 15 and 10 meters. However, it did work fairly well on 20 meters. In a 20-meter QSO with a station in Leningrad (USSR), the signal report given was 579. When the transmitter was switched to the 20-meter quad, the signal report wa: changed to 599. That th center of the quad wa: somewhat higher than tha of the XU may have been factor in the better report Until a heavy storm took i down, the XU performe very well on 10 and 15 meters. The rotor used was ar old CD-AR-22. If one canno afford a quad or yag (mounted up 70 feet), an X bidirectional beam woul be well worth considerin Besides being less expensiv than a quad, an XU is easie to put up.

Two fixed vertical anten nas can be fed 180 degree out of phase to form a bidi rectional beam. For a bid rectional beam to be use on 80, 40, and 20 meters, th spacing (S) between the ve

tical elements should be 35 feet (1/8 wavelength for 80 meters). For a bottom end-fed antenna, the height of each element (L) should be no more than 50 feet (3/4 wavelength for 20 meters). See Fig. 5(a). For a centerfed vertical W8JK beam, the total height of each element could be as long as 100 feet if one could find mechanical means of supporting such heights. See Fig. 5(b).

Although the beamwidth of such a beam would be very broad, the tuning of the antenna tuner would be sharp (especially on 80 meters) and the tuner would have to be carefully touched up when changing frequencies within a frequency band (because of the relatively high Q of the antenna system).

A full-wavelength vertically-polarized quad loop would be good for working 40-meter DX. For vertical polarization, the quad loop should be fed on one end for the diamond-shaped loop, or on one of the vertical sides of a square loop. See Fig. 6(a). This loop would have a gain of 1.4 dB as compared with a dipole and would have low angle radiation.

By putting a 20-meter trap in the loop opposite the tuned feedline, the antenna would become a "bisquare array" on 20 meters with a gain of at least 4 dB as compared with a dipole.[3] See Fig. 6(b).

Using tuned feeders, a fixed quad with two loops can be made bidirectional. See Fig. 7. Two 40-meter loops 34 feet on a side with 34-foot spacing between the loops, as shown in Fig. 7(a), would provide a gain of 3.7 dB on 40 meters as compared with a dipole. This antenna system would also work on 80 meters and would be vertically polarized on both 40 and 80 meters. If 80-meter operation were not desired, the spacing between loops could be reduced to 17 feet and provide a gain of 4.3 dB as compared with a dipole.

Feeding the loops on the side with the conventional W8JK center-feed method would also provide vertical polarization. See Fig. 7(b). A 40-meter bidirectional quad could be made to function as a bidirectional expanded quad on 20 meters by adding a 20-meter trap in the center of each side, opposite where the feedline is connected. On 20 meters, the gain would be at least 7 dB as compared with a dipole. See Fig. 7(c).

If you have never tried a vertically-polarized beam or if you cannot afford a commercially-made quad or yagi "way up in the air," try one of the vertically-polarized beam antenna systems described in this article. With a good, carefully adjusted antenna tuner, each of these antenna systems will load up equally well on both phone and CW frequencies in each band, with a very low swr on the coax between the transmitter and the antenna tuner (usually 1 to 1). This will make the transmitter happy, and the resulting DX QSOs will make you happy. For good DXing, try a vertically-polarized beam antenna. ■

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Condo Secret Agent

The word at many condominiums is "no antennas allowed." Here's how one ham survived.

Have you ever seen a notice like this: "... *no exterior antennas and aerials shall be erected except as provided under uniform regulations promulgated by the [condominium] Association*"?

This standard phrase or similar wording used by most Florida condominiums dismays amateur operators contemplating purchase of a condominium housing unit. When one buys into the condo, one agrees to abide by the Declaration and the Association bylaws. There is a considerable body of law under Chapter 718 in the Florida Statutes called "The Condominium Act." The law specifies a Declaration of Condominium as a kind of Magna Carta designed to protect both the developers and owners in organizing and operating a condominium community. The Declaration is a legal instrument recorded in the public records of the county where the condo is situated.

The Association is a nonprofit corporation made up of the unit owners of the condo. Members elect a Board of Administration which runs the affairs of the condominium. It has legal recourse in the event of Declaration or Association bylaw violations. Most condominiums (particularly those with lawyers on the board) are hard-nosed about sticking to the letter of the Declaration. So, how does the ham cope with these restrictions?

The condo purchaser can treat as his own private home the space contained *within the interior walls of his unit*. He can install an inside antenna, if he wishes, subject to other restrictions prohibiting nuisances (TVI, RFI, etc.). The exterior walls, roof, parking lots, trees, lawns, recreational areas, etc., are considered Common Elements to be used and enjoyed by all owners collectively.

Then there are Limited Common Elements *outside the exterior walls*, such as patios, balconies, and garage stalls which may be used exclusively by the owner whose unit adjoins or is attached or assigned to such Elements. This *might* be an out for hams who mount mobile antennas on balcony railings—maybe.

Many condo hams surreptitiously use the "invisible" antenna, an end-fed random length of fine wire strung across a lawn or roof. Some load up down-spouts or metal gravel-stops around the roof—TVI generators if the joints are not welded or effectively bonded. I have heard of ingenious hams who magnanimously donate flagpoles to their condominiums which actually are PVC masts concealing trap verticals inside, with Old Glory proudly waving in the rf field. Other amateurs temporarily run coax out windows and feed mobile antennas on their nearby autos—apparently legal, but creating safety hazards if the cables can be tripped over.

And some hams brazenly install antennas on their condo buildings without permission, hoping they can get away with it. Perhaps some do. Others, such as the writer, attempt to get permission from the Association.

Shortly after moving into my condo, I asked the board president for permission to mount a couple of simple antennas. (Forget about beams and phased arrays—don't press your luck!) I told him I wanted an inconspicuous dipole raised within a line of palm trees along the beach dune, about 100 feet from the building, and a small vertical rod for two meters on the roof. The president cited the Declaration restriction, but said he would allow me to bring up my request at the next annual membership meeting. So, my plea was included under New Business on the agenda.

At the meeting, my

resentation emphasized 1e public service aspects f amateur radio, such as roviding emergency com- ıunications during power r telephone outages fol- ɔwing storms or hur- canes. That perks up in- ɜrest among Florida East oast residents. I also ssured the membership ıere would be no towering tructures or rotatable lements (unsightly in the yes of non-hams). There 'ould be no loose cables or ɜngles of wires, I promised. .nd I also could promise no VI since our building was ɜrved by cable TV. (So far, o problems have been ɜported.)

After a few questions, all f them friendly, the mem- ership voted to grant my ɜquest, and the action was ɔ recorded in the official ıinutes of the meeting. A ɜgal-eagle type might uestion whether the As- ɔciation could waive a rovision in the Declaration 'ithout properly amending . Whatever, I at least ob- ɜined from the Association n agreement not to en- ɔrce the pertinent provi- ion. And I was in business.

It seemed prudent, even 'ith permission, to ıinimize use of the Com- ıon Elements, using imited Common Elements designated for my personal se) and my own private roperty where possible. he exception was the ipole which had to be ıounted among Common lement trees and the eedline under the Com- ıon Element lawn. RG-8/U 'as buried in a lawn slit 'hich quickly grew over nd is undetectable. The oax emerges beneath a ıalm tree and is neatly lressed up the trunk where he antenna center feed- ɔint is secured. The dipole ; a 75-40 meter trap affair 'hich also loads up fairly 'ell on 20 meters. The two- neter Ringo Ranger was nounted on the roof air-conditioning unit which is my private property. Its maintenance and ultimate replacement are at my expense, not the Association's.

Then came the sticky part—how to get the feedlines out of the apartment without drilling holes through the exterior Common Element walls. Access to the dipole resolved itself. I discovered a one-inch plastic pipe had been installed under the apartment floor to drain the air-conditioner condenser in the utility room. The pipe terminated at ground level outside. Obviously, this was a Limited Common Element for my use, so it became a conduit for a length of RG-58/U, connecting outside to the heavier coax to the dipole.

Next, how to get the coax to the Ringo on the roof? Certainly, cable snaked up the exterior wall and across the roof would be a no-no. What about the space between the interior walls, as in concrete block? This seems to be a gray area, although it probably is a Common Element. No matter. Through that space runs thin-wall metal conduit from the utility room to the roof. It contains the ac wiring for my roof air-conditioning unit. Again, this seems to be a Limited Common Element for my use, so with an electrician's fish-tape, I pulled up another length of RG-58/U to the roof circuit-breaker box (my private property) adjacent to the air-conditioner where the vertical was installed. (Eventually, I replaced the RG-58/U with Radio Shack's new small-diameter RG-8/M.)

Later, I replaced the Ringo with a Cushcraft ATV-3 20-15-10-meter trap vertical. (Well, 14 feet is still a "small vertical rod," isn't it?) I could work the local two-meter repeaters with an inside antenna. Radials for the new vertical were out, of course, since this would require a multiwire radial system extending over and secured to the Common Element roof. Ground-strapping the antenna base with heavy braid to the metal mass of the air-conditioner housing seems to work about as well as radials, with only small excursions from the manufacturer's impedance and element-length specs.

Incidentally, an unexpected bonus came with the three-band vertical: It turned out to be four-band! It seemed to load up, get out, and receive as well on two meters as the Ringo. A check with the swr meter at the transmitter indicated almost 1:1 in the 146-147 MHz range. I can't explain it!

The apartment dweller often has problems running coax from one room to another. My cables enter the apartment in the utility room which is separated from the ham shack by a bathroom. At first, I could find no easy and inconspicuous way to route the cables across the Porcelain Palace. Then I noted the one obvious fixture which spanned the walls—the shower curtain rod! A little masonry drill work on *my* walls, and the shower rod became a conduit for the coax.

I have been operating from my condo for three years, and so far there has been no complaint from any of the owners. Although I have a 1-kW linear, I use it sparingly. The exciter output level is adequate in most situations. But even with the linear, I have had no indications of interference.

Maintaining a low profile is one way to retain the operating privilege after obtaining it. Hence, the semiconcealment of my QTH. ■

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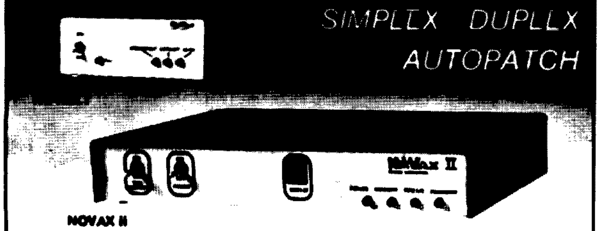

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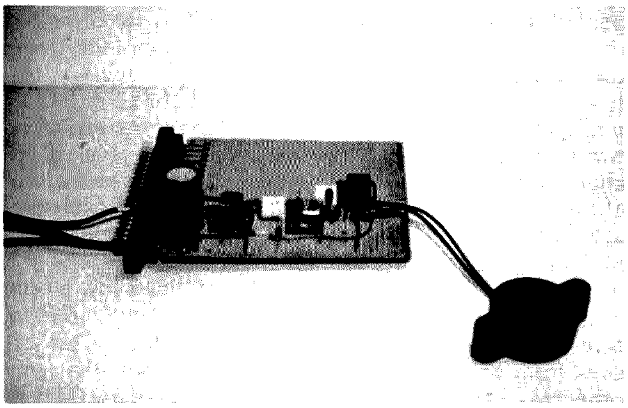
Having recently acquired an Icom 720A and played with it for several weeks, I decided to investigate some interface controls utilizing the information interface provided on the back panel (24-pin molex® plug). According to the operator's manual, pin 13 provides an output voltage which varies with respect to the band selected. The voltage, as indicated by the manual and my test, changes approximately 1 volt per band—following this pattern: 1.8 MHz ≈7.0 V, 3.5 MHz ≈ 6.0 V, 7.0 MHz ≈ 5 V, 14.0 MHz ≈ 4.0 V, 18-21 MHz ≈ 3.0 V, 24-28 MHz ≈ 2.0 V, 10 MHz ≈ 1.0 V.

Now, being basically lazy (and forgetting to change the antenna from the beam to the inverted vee), I decided to design an interface which would do it for me. I needed a circuit which would define and capture a voltage threshold and switch my antenna (via a coaxial relay) when my rig makes the transition from a low band to a high band.

Since 4.5 volts and lower represents the high bands and 5.0 volts and higher represents the low bands, what I needed was a switch that was off (0 V) for an input voltage greater than 4.8 volts and on (Vcc) when the input voltage was less than 4.8 volts. The 4.8 volts is the threshold voltage I selected. My source voltage (Vcc) is 13.8 volts. (By the way, the 720A provides 13.8 volts out on pin 2 with pin 8 being ground.)

I needed an op amp which was easy to use with a single-ended power supply and had a fairly decent slew rate. It was a job for an LM3900, set up as an inverting comparator. Next I needed an NPN transistor capable of switching relay-coil current; I chose the good ol' 2N2222. Since my relay has a coil-voltage rating of 5 volts and my source voltage is 13.8 V, I needed to drop about 8 volts. The transistor will drop about 1 to 1½ volts when saturated (on). Use an LED to drop another volt or so. The LED also lets you know when the comparator has switched states and that the transistor is on. A 100-Ohm resistor completes this series circuit.

The schematic in Fig. 2 shows a few things I haven't talked about, such as a diode across the relay coil, a couple of capacitors, and a spe-



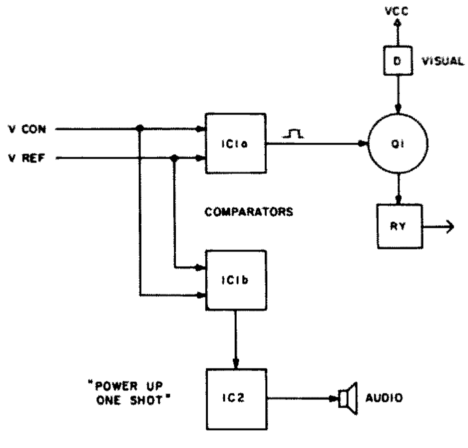


Fig. 1.

cial audio circuit (more on this later). Let's get to the heavy stuff—making the comparator switch states. The output of the comparator will be in one of two states: 0 volts and Vcc (approximately). If you prefer to think in logic, 0=0 volts and 1=Vcc. The output of my Icom 720A (pin 8) was 5 volts on 7.0 MHz and 4 volts on 14.0 MHz. A note here—If you refer to the pattern of changes given in the first paragraph of this article, you will see that it is arranged in order of the output voltage, not the amateur bands. Therefore, when you change from 14 to 7.0 MHz, you go through 10 MHz. In terms of voltage you will go from 4.0 volts (14 MHz) through 0 volts (10 MHz) back to 5.0 volts (7.0 MHz) and the relay will drop in and out. This is the reason I have a 470-uF capacitor (C1) on the input of V control to help hold this voltage up.

I selected 4.8 volts as my threshold voltage (Vref). When the input goes above 4.8 volts, the output goes low (0 volts), and when the input goes below 4.8 volts, the output goes to Vcc. The output I'm referring to is that of the comparator—pin 4, with pin 2 being Vref and pin 3 being Vin. To get Vref, a simple voltage divider will do. Referring to Fig. 2, we see that R2 is 10k Ohms. What we need to do now is to determine the value of R4. Using the voltage-divider rule:

$$\mathrm{Vref} = \frac{\mathrm{R4\,(Vcc)}}{\mathrm{R2} + \mathrm{R4}}$$

$$4.8\ \mathrm{V} = \frac{\mathrm{R4\,(13.8\ V)}}{10\mathrm{k} + \mathrm{R4}}$$

$$48\mathrm{k} + 4.8(\mathrm{R4}) = 13.8(\mathrm{R4})$$

$$48\mathrm{k} = 9(\mathrm{R4})$$

$$\mathrm{R4} = \frac{48\mathrm{k}}{9}$$

$$\mathrm{R4} = 5.33\mathrm{k\ Ohms}$$

If someone uses other than 13.8 V as Vcc, then Vref will change. To eliminate this problem, use a 25k-Ohm trimpot.

Special Audio Circuit

The 720A is a very good rig for the sightless amateur by virtue of the fact that it establishes certain operating parameters and conditions when powered up. With this being the case, why not make the modifications useful for the sightless amateur? Since the LM3900 is a quad-op-amp package and I'm only using one of the four op amps, it would be a simple task to generate another control line whose output voltage would follow that of the first op amp. I call this op amp 1B. When I say simple, I mean it—just parallel the inputs—pin 12 to pin 2 and pin 11 to pin 3. By doing this, both op amps have the same input resistors (R1 and R2) and both use the same Vcon and Vref voltages. The output voltages—pins 4 and 10—are identical, yet independent of each other.

Op amp 1B is used to turn on a 555 which is wired as as "power up one-shot." When this circuit is activated, a high (Vcc) appears on pin 10 and a short beep will be heard from the solid-state piezoelectric speaker. The time duration of the beep is set by R8 and C2. This beep will occur at the same time the LED comes on, indicating that the antennas have been switched.

The project can be built in one evening with Radio Shack supplying all the parts except the coaxial relay for approximately $20.00. Layout is not critical and point-to-point wiring can be used. (I used a prototyping board to test the circuit and then transferred to an edge-connector board.)■

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Design Op-Amp Circuits with Experiments, by Howard M. Berlin, Published by Howard W. Sams and Co., Inc., Indianapolis IN 46268.

IC Timer Cookbook, by Walter G. Jung, published by Howard W. Sams and Co., Inc., Indianapolis IN 46268.

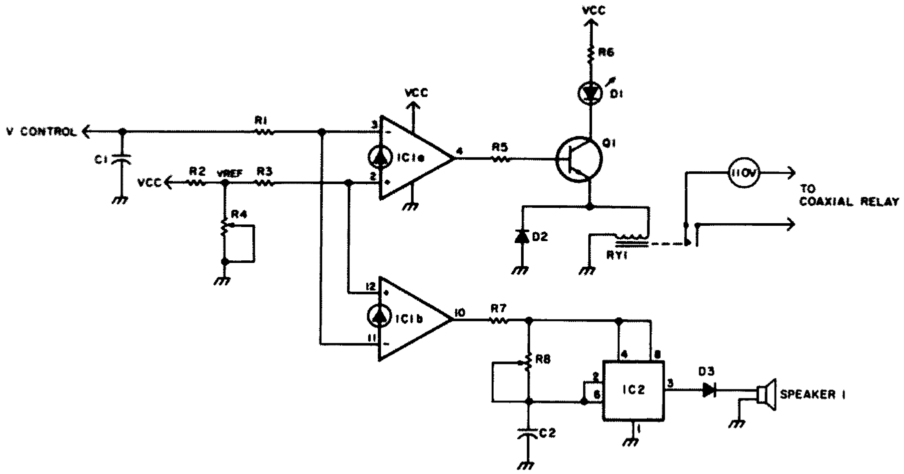

Fig. 2.

Parts List

Item #	Radio Shack Part Number	Qty.	Name	Description	Ref. Desig.
1	276-1713	1	IC	LM3900 - Norton quad op amp	IC1
2	276-1723	1	IC	NE555	IC2
3	276-041	1	diode	LED	D1
4	276-1101	2	diode	1N4001	D2, D3
5	276-2014	1	transistor	2N2222	Q1
6	275-216	1	relay	5 V dc coil, 1 A @ 125 V ac, SPST	RY1
7	273-060	1	speaker	Solid state piezo type	SPK1
8	272-1030	1	capacitor	470 uF @ 35 WV dc, PC mount	C1
9	276-1421	1	capacitor	3.3 uF - low leakage	C2
10	271-1356	2	resistor	10 meg, ¼ Watt	R1, R3
11	271-1335	1	resistor	10k Ω, ¼ Watt	R2
12	271-1330	2	resistor	4.7k Ω, ¼ Watt	R5, R7
13	271-012	1	resistor	100 Ω, ½ Watt	R6
14	271-218	1	trimpot	10k Ω, ⅛ Watt	R4
15	271-229	1	trimpot	1.0 meg	R8
16	276-1551	1	edge connector	44 pin .156 x .200"	
17	276-154	1	PC board	4½" x 4" 44 pin	

The New Communications: VHF Mailboxes

Join the growing wave of hams using digital techniques to get their message across. AF2M describes the (log) ins and outs of mailbox systems.

Robert Swirsky AF2M
412 Arbuckle Avenue
Cedarhurst NY 11516

Radioteletype is a mode that is getting much attention these days. With so many hams using microcomputers and the large number of people with Teletype™ model 15s, 19s, and 28s, the popular RTTY frequencies are crowded.

One of the reasons RTTY is so popular is that the mode is especially suited to automated and computerized embellishments. It is possible to leave the TTY machine set up, leave the shack, and return to see whatever activity was on frequency. To facilitate this, the autostart system was developed. Autostart senses a mark signal on frequency and readies the Teletype machine for copy. This way, the TTY is not on all the time and doesn't print out garbage in the absence of a signal.

While autostart is all well and fine, it does have some serious limitations. One of them is that you receive a copy of everything sent on frequency. If you are just looking for one specific message, you might have to do some digging in order to find it. Also, there is no way of knowing if a message that was sent was ever received. After all, the other station could shut his receiver off before you came on frequency to send him a message.

Because of these limitations, hams started using WRU and Selcal. WRU is a special non-printing control character that causes a properly equipped RTTY machine to send out an identifying message every time the character is received. In order to use WRU legally, there has to be a licensed control operator at the station; this limits its usefulness a great deal. Selcal is a selective calling system. It activates the TTY machine when a specific sequence of letters, usually the last three letters of the station's callsign, is sent. The TTY will remain active until another series of characters, usually NNNN, is received. Selcal is a very useful item, but it is prone to false start-ups and not too many hams have the proper equipment to use it.

A few years ago, when microcomputers were first getting very popular, RTTY mailboxes started popping up across the country. These systems enable a ham on RTTY to leave a message in a computer's memory. The message is then received when the station to whom the message was directed checks into the system. In order to use a mailbox, no special equipment is necessary. Anyone who can get on 60 wpm Baudot (45.45 baud) can use most of the systems that are around.

The procedures for using the various RTTY mailboxes vary from system to system; the one I will describe is that of the Uncle Floyd Radio Club, WA2DCS, which is based in Queens, New York. The operation of this system is roughly the same as the other ones I have tried.

In order to check into

```
UFRC MAILBOX LOG FOR 4/4/81


STATIONS USING THE SYSTEM TODAY:
CALL           TIME
KB2WS          900
KI2U           937
AF2M           1734
WB2VTN         1753
KI2U           1801
WB2HLK         1822
WB2JUF         1849
WA2NDV         2001
KA2BQV         2034
KA0BYW         2056
WB2LWJ         2119
KA2GNJ         2148
KB2UF          2159
WA2DCS         2223
KI2U           2320
KB2UF          243


THERE ARE 37 MESSAGES IN MEMORY.


END OF REPORT.
```

Fig. 1. The log of system-usage that can be printed on the system's local printer.

he system, one gets on fre-
|uency and sends a mark
one for about five seconds
ollowed by a bunch of Vs.
t will automatically switch
o either 60 wpm Baudot or
10 baud ASCII depending
›n what the computer hears
›n frequency. After the sta-
ion trying to check in drops
iis carrier (the system is on
meters), the computer will
end the following mes-
age:

JFRC MAILBOX (date)
THANK YOU FOR CHECKING IN. WHEN THE CARRIER DROPS, PLEASE SEND YOUR CALLSIGN FOLLOWED BY CR LF.

If the station replies
›roperly, the system will ID
n CW, and send a message
uch as:

JFRC MAILBOX (date)
YOU ARE USER NUMBER 56 FOR TODAY. 23 MESSAGES IN MEMORY AT THIS TIME.

If there are any messages
n the computer for you,
'ou will then see something
hat looks like this:

ΛESSAGES FOR KB2UF.
ROM KI2U—JON,
MEET ME ON 21.390 AT 10 PM (date) 1717.
ROM AF2M—HEY JON,
THE REPEATER IS UP AGAIN BUT I'M SURE YOU COULD CARE LESS. I'LL MEET YOU ON CHANNEL 19 TONIGHT. THREES TO YA! (date) 1345.
:ND OF MESSAGES.
CW ID)

Note that the message is
›receded by the originating
tation's callsign and
ollowed by the date and
ime that the message was
eft. Once a message is
:alled up in this manner, it
s deleted from memory.
\fter the CW ID, the system
vill send:

PLEASE ENTER THE STATION FOR WHOM THE MESSAGE IS FOR FOLLOWED BY CR LF AND THE MESSAGE ON A SEPARATE LINE. LOGOFF WHEN DONE.

```
DO YOU WISH TO INSPECT A FILE (Y OR N)? Y
CALLSIGN ?  KI2U


MESSAGES LEFT BY KI2U:


FOR KB2WS--HEY RAY, HOW WAS YOUR DAY? WHAT SAY RAY? IS EVERYTHING OK? CAN YOU CO
ME OUT AND PLAY, RAY?

DELETE (Y OR N)? Y
MESSAGE WAS DELETED.


FOR WB2JUF--MARC, MEET ME ON 21.390 TONIGHT AT 9:00 PM

DELETE (Y OR N)? N

MESSAGE SAVED.
NO MORE MESSAGES.
```

Fig. 2. An illustration of how messages may be inspected and, if garbage, deleted to conserve disk space. This feature is available only on the local terminal, not over the air.

The following is an example of how a message is left:

WA2PAK.
THE HW-30 SOUNDS FB ON THE AIR. I WAS ABLE TO GET AHOLD OF A SIXER. WANNA BORROW THAT TOO??

After the last message is sent, the station types:

LOGOFF

The system responds with a:

GOODBYE, KB2UF.
(CW ID)

This system is rather typical of most of the 2-meter mailbox systems that I have seen. There are some on the low bands; operation on them differs slightly. The 2-meter band is an ideal one for this type of operation because one does not have to worry about QRM, QRN, drifting, selective fading, and other things that plague the lower frequencies.

In order to set up a mailbox system, all that is needed is a computer with a fair amount of disk space, a medium-power 2-meter rig, a stable TU that produces a nice clean AFSK tone, and a good omnidirectional antenna at a decent height. Since every setup will differ, the software would have to be custom-written for the specific equipment involved and the needs of the club.

When writing software for such a project, it is often a good idea to start with a commercially-available program and modify it to suit your needs. This way, much time will be saved. The mailbox system described in this article uses an Apple II Plus computer. The Baudot, ASCII, and CW routines were taken from a program that had assembly language subroutines written for the various codes and an Applesoft BASIC program controlling the display, flow of control, and other such things.

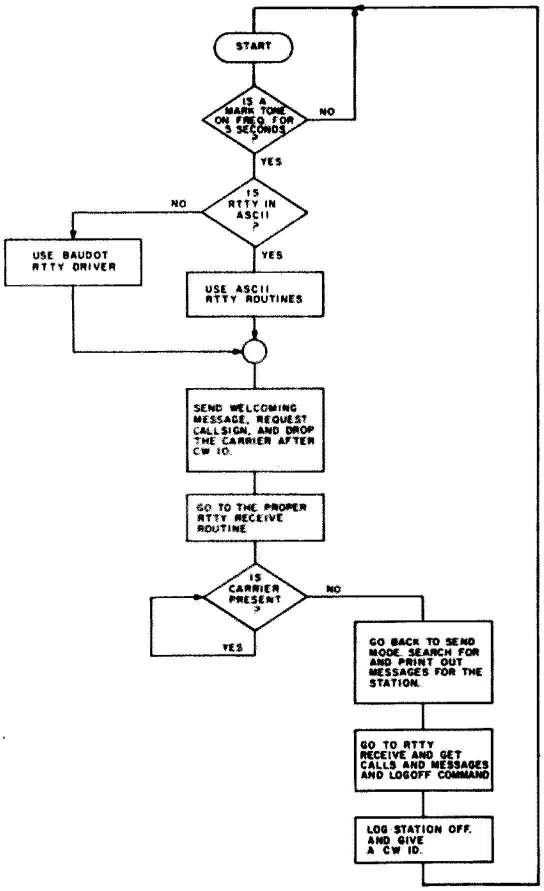

Fig. 3. Flowchart for a basic mailbox system. The RTTY send routine takes care of the CW ID. Random-access disk files are used. This limits length but greatly speeds research time.

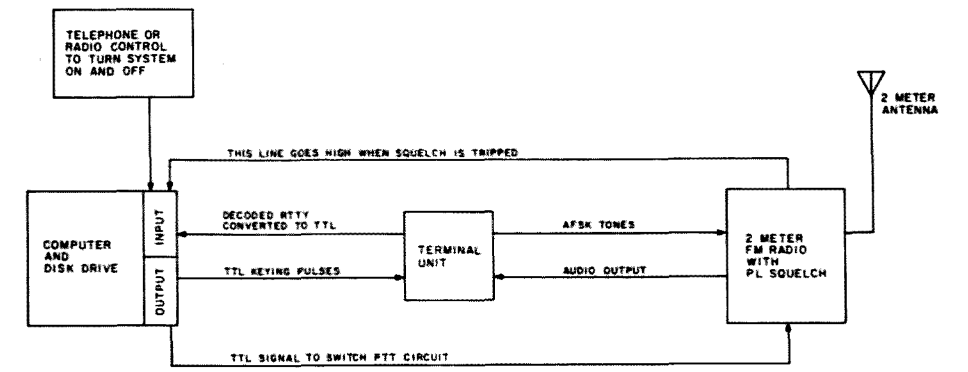

Fig. 4. The various components in the system and their interconnections. The 2-meter rig was modified to provide an external audio output, external PTT input, and a TTL-level output line to tell the computer when the squelch is tripped.

The Applesoft executive program was modified in such a way as to enable the program to function as a mailbox. The task was not as difficult as it sounds; it took one person less than a week to perfect the program. As portions of the program are from a copyrighted program, I obviously am not able to supply a listing of the modified software. If you feel that you are not capable of writing the software, companies such as Macrotronics advertise mailbox software for the TRS-80 and other popular computers. Also, Hal makes a complete stand-alone system, with a dedicated microprocessor terminal for ASCII and Baudot.

If you decide to write your own software, it is wise to plan carefully ahead of time. Get together with other RTTY operators and decide what features you want to include and how to go about implementing them. Draw one flowchart picturing flow of control throughout the entire system and one showing which subroutines the computer should use to accomplish the task. Test your algorithm carefully to be sure it is working the way you want it to. When it comes time to actually code the program, you will find it very easy to do with the detailed planning ahead of time.

After the program is coded, test it off the air. Make sure all the functions are working as they should. You are bound to uncover many bugs during this initial testing period. When you are satisfied that the system is operating smoothly, put it on the air but be prepared to uncover many more bugs. No matter how carefully the program is written, there is always someone who will come along and enter a command that will cause the program to bomb. Hams are very talented in their ability to discover oversights in programs of this nature by entering stuff the programmer never anticipated!

Make sure that there is a way to shut the system down at a moment's notice. You are required to have a control operator monitoring the system at all times. Some means of shutting off the system on another frequency or over the phone line must be provided for. In a busy area, it is wise to use PL or Touchtone™ control so that signals on frequency will not turn on the mailbox when it is not wanted. This is also necessary when you want to limit access to the system.

On UFRC's mailbox system, there are two modes of operation: the normal mode and the privileged mode. In the privileged mode, the user can store longer messages and can use certain commands that are not available to everyone. In addition to saving on disk space by limiting the number of people who can store lengthy messages, it also provides incentive for non-members to join the club and get the priviliged-user status. The privileged mode is accessed with a PL tone and the sending of some non-printing characters during the LOGON process.

The UFRC mailbox is composed of the following hardware: an Apple II Plus computer, the Disk II disk drive, a Flesher TU-170, a Heathkit™ HW-2036A, and a 2-meter ground-plane antenna. Future plans consist of using a local repeater, WB2VTN/RPT (.64/.24), to extend the range of the system. As of now the system is closed, but it will become an open system as soon as we get enough extra disk storage to handle more users. Presently, there are about 20 active users. The system can hold about 150 average messages. You can hear the UFRC mailbox on 145.71 or the alternate frequency, 144.19. The callsign used is WA2DCS, the UFRC club call.

Please note that the mailbox design presented here is not the only possible design. There are many different ways of designing a RTTY mailbox system. Since there aren't a great many of them around, there is still much to be done in the area of hardware and software design.

More advanced systems often have additional features. For example, it is possible to include a library of RTTY art, club announcements, and ham-related news items. As quick and reliable mass-storage devices decrease in price, the capabilities of such systems will most likely increase dramatically. The ideal system would have full duplex capabilities so that the user can interact with the computer more easily. In order to do this, each user would have to use a separate antenna or a duplexer, and separate rigs for transmitting and receiving. If various regional systems link together, a large "ham database" could result. The packet communications systems are especially suited for this purpose.

The UFRC system includes such special features as a log of all activity that is on the system during the day. Also, it is possible to inspect messages left by anybody and edit or delete them. This is necessary to eliminate garbage messages and to free up disk space when it becomes necessary to do so. Examples of this are shown in Figs. 1 and 2. These functions are available only through a local terminal on the mailbox and cannot be used on the air.

Figs. 3 and 4 show a sample flowchart and a diagram of the system hardware, respectively.

If you have any specific questions concerning mailbox systems or how to set one up, please feel free to write. Also, I would appreciate hearing from other owners and users of mailbox systems. ■

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The Morning Beverage Antenna

If you are a coffee drinker and you work 2 meters, you'll love this antenna. W4FXE shows you how to get wide bandwidths and small size at low cost.

Recently, I needed an indoor antenna for two-meter FM operation to place on the windowsill of my high-rise apartment. The $\lambda/4$ ground-plane antenna immediately came to mind but was quickly rejected because of the inconvenience of using the required ground-plane radials. Unfortunately, the $5/8\lambda$ mobile whip antenna could not be used for the same reason.

The Half-Wave Vertical Antenna

Because the $\lambda/2$ vertical antenna does not require ground-plane radials, it appeared to be the proper choice. An endfed $\lambda/2$ vertical antenna exhibits a high impedance at its feedpoint and therefore requires a transformer device to match the impedance of a 50-Ohm coaxial-cable feedline. A parallel resonant circuit will provide a fairly good match to this antenna and the 50-Ohm coaxial cable can be fed directly to a matching position on the inductance (see Fig. 1).

There are several other methods of obtaining an impedance match for a $\lambda/2$ vertical, including the familiar J antenna which has been with us for a good many years (see Fig. 2). I remember using the J antenna during the early 30s with a "rush box" superregenerative one-tube transceiver on the old five-meter band. Another method of matching the $\lambda/2$ vertical is by the use of the gamma loop (Fig. 3), which has been successfully marketed for many years under the name of Ringo.

I first tried the parallel resonant circuit built into a small metal project box, 4" × 2" × 1½". It worked well with a 38" vertical antenna section, but was unstable mechanically and would topple over too easily. I then built a J antenna which also worked quite well, but it was clumsy and the length (57") was too long. I tried shortening the J section to 8" and used a capacitor to bring it to resonance (see Fig. 4). This also worked well but was still too clumsy and inconvenient for a windowsill. I did not try the gamma-loop type, for I knew it would not go well with the awkward mounting.

The Coffee Can

A solution appeared: Why not use a coffee can as the base of the antenna? It would fit nicely on the windowsill and, with a little weighting, would be quite stable. However, instead of using a coil and capacitor

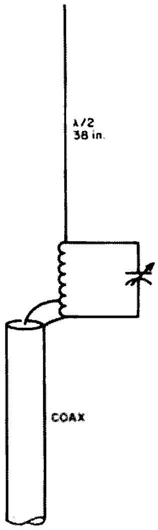


Fig. 1. $\lambda/2$ vertical antenna matched to coaxial cable, using parallel resonant circuit.

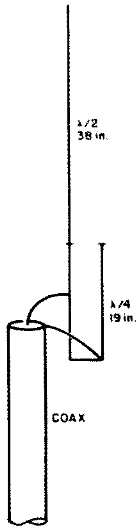


Fig. 2. $\lambda/2$ vertical matched to coax with open stub—known as a J antenna.

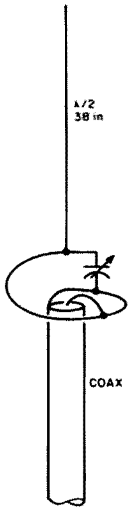


Fig. 3. Gamma-loop matching for $\lambda/2$ vertical antenna.

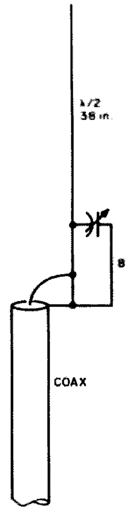


Fig. 4. Shortened J antenna.

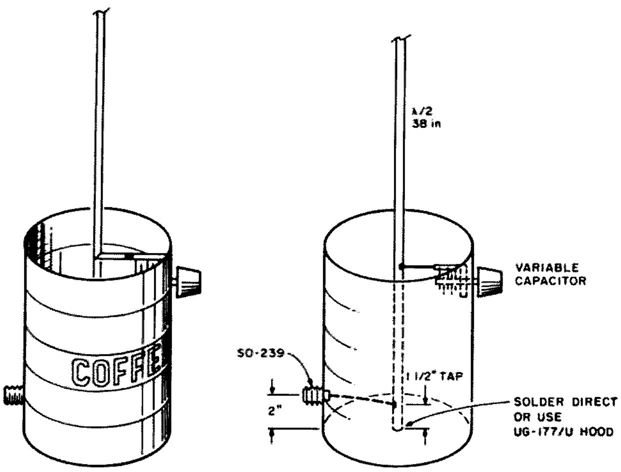


Fig. 5. The $\lambda/2$ coffee-can antenna.

as the parallel resonant circuit as shown in Fig. 1, I decided to use the *can* itself as part of the resonant circuit in a *coaxial* configuration. Being less than a $\lambda/4$ in length, I could tune it to resonance with a small variable capacitor (see Fig. 5).

The top end of the inner conductor, where it is tuned to resonance with a small variable capacitor, is a high impedance point and provides a good match to the bottom end of the $\lambda/2$ vertical antenna section. The bottom end of the can, where the inner conductor is attached, is a very low impedance point . . . comparable to the bottom shorted end of the J antenna. A good impedance match to the 50-Ohm coaxial cable can be obtained at about 1½" from the bottom end.

Usually, a coaxial resonant circuit of this type exhibits a very high Q. However, by feeding the $\lambda/2$ vertical section directly at the high impedance point and by attaching the 50-Ohm feedpoint directly to the inner conductor, the circuit is loaded down, reducing the Q considerably.

Construction

The drawing is self-explanatory. A 50-pF variable capacitor of the APC type (or equivalent) with either a screwdriver adjustment stub or a knob shaft may be used. Make certain that the rotor wiper contact is clean and makes good contact and connect it directly to the inside surface of the coffee can. Run a short, rigid copper wire from the stator plates to the inner conductor as shown. If a screwdriver adjustment shaft is used, solder a jumper wire from the non-rotating portion of the tuning shaft to both mounting studs as shown in Fig. 6. If a knob shaft is used, make the opening in the can smaller so as to make a tight fit around the shaft. This is done in either case to avoid annoying hand capacity.

The inner conductor can be made in one 43½" length so that 38" of vertical antenna ($\lambda/2$) will be exposed above the top of the can level. Copper or brass tubing, ¼-inch o.d., will result in increased bandwidth, although ⅛-inch tubing or solid hard-drawn copper, no. 8 or even no. 10, may be used.

If desired, with a little ingenuity, the antenna section can be made telescopic for convenience. An easy way to attach the inner conductor to the bottom of the can is by soldering it to a socket hood (UG-177/U) as shown in Fig. 7. You can

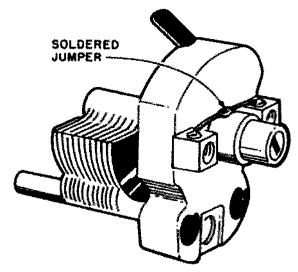


Fig. 6. APC type variable capacitor showing shaft housing jumper soldered to mounting studs.

also make an opening in the bottom of the can for a tight fit with the inner conductor and solder it there securely. With the attachment to the stator plates of the variable capacitor, the inner conductor is quite rigid.

The SO-239 socket is mounted as shown about two inches from the bottom of the can and fed with no. 16 copper wire to a position on the inner conductor about 1½" from the bottom.

Operation

The operation is quite simple. Simply place an swr meter at the antenna base and feed with any convenient length of 50-Ohm coaxial cable directly from the two-meter transceiver (see Fig. 8). Adjust the variable capacitor for the lowest swr at the most used frequency. If the swr does not dip down to a very low reading, move the coaxial-cable tap on the inner conductor up or down a little until the swr is practically at unity. You can leave the

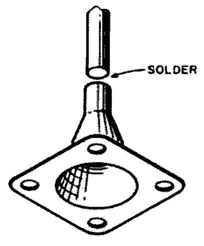


Fig. 7. UG-177/U hood.

swr meter in the line for subsequent adjustments if needed. If not, you can remove it and retune when necessary for maximum received signal strength or with maximum response on a small field-strength meter.

The bandwidth of the antenna is about 2 MHz. You should tune the antenna for a most used center frequency and when shifting frequency about 1 MHz either side, the swr should remain under 1.5:1.

Because of its size, the coffee can provides a nice, stable base. However, it should be weighted down for additional mechanical stability. I live near the beach, so I filled the can with assorted shells that were cleaned thoroughly. You can also use colored glass marbles such as those used decoratively in fish tanks. When the coffee can is filled with the above, slight retuning may be necessary.

A final note: It is good practice from a health viewpoint not to stay too close to the strong rf field of any VHF antenna . . . especially if you are using more than 10 or 15 Watts. ■

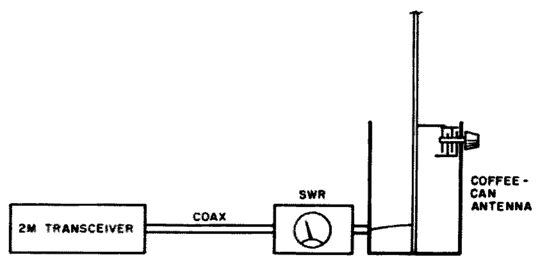


Fig. 8. Test setup for tuning the coffee-can antenna.

Try Out a Low-Level Lazy Loop

It may be only 10 feet up, but this aerial is no worm-burner. Better still, it will fit almost anywhere.

Jim Gray W1XU
73 Staff

The loop antenna is well known, with many variations including the quad loop, the delta loop, and the twin loop. Loops have a reputation of being easily tuned, forgiving of slight mismatch, broadbanded, balanced, and immune to QRN. Many antennas are really loops in disguise; if you don't believe it, consider such diverse examples as the folded dipole and the rhombic.

The "lazy loop" is basically a standard loop antenna arranged horizontally above ground, but at an unusually low height—less than one-tenth of a wavelength, for example. Before you protest that such antennas are earthworm warmers, let me recount some of my experiences.

About two sunspot cycles ago, give or take several years, I was blessed with a typical suburban lot measuring about 75 feet by 200 feet, ideal for a longwire or a collinear, antennas that need little "width" to perform their function. However, I was unsatisfied because I couldn't have that antenna farm we all dream about. You know the one: rotatable rhombics on 160 meters and that kind of thing.

Financial limitations, physical restrictions, and neighborhood censure all discouraged tall towers, large supporting structures, and *wires* (*visible* wires, at least). A lot of digging and poking in the literature kept bouncing me back to the original concept of a horizontal loop, but I could find very little information available on full-wave horizontal loops. Rhombics, yes; full-wave loops, no.

I reasoned that a full-wave loop, horizontally arranged, would use the earth as a reflector of rf energy, and the better the ground, the better the reflection. After all, vertically-mounted loops use other loops, screens, and even linear elements as reflectors, so why not the ground itself? The only drawback I could see was that my soil conductivity (which determines the quality of the "image" antenna or the reflective quality of the earth) was very, very poor. Dry, sandy soil is a poor conductor but a good absorber of rf energy. The only hope I had was that the water table was close to the surface and might provide the needed reflection before too much energy could be absorbed by the earth.

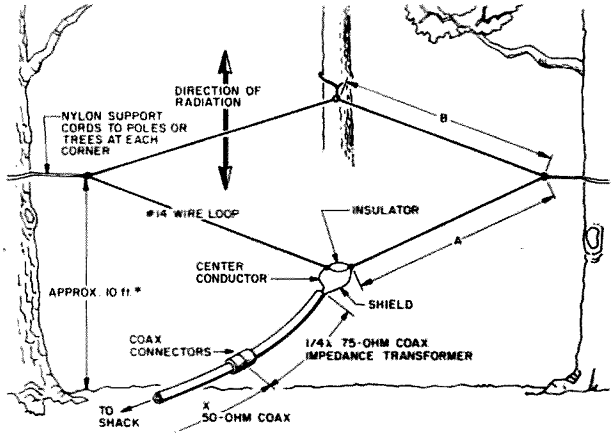


Fig. 1. "Lazy loop" 40-meter loop antenna. A = B if loop is square; 2A + 2B must equal a full wavelength (see text for formula). X = any convenient length of 50-Ohm coax to the shack. The proper 50-Ohm, non-reactive load appears at the end of the quarter-wave section of the 75-Ohm coax. Note: If nylon cord is used to support the loop at the corners, an insulator is needed only at the feedpoint.

It seemed to me that by squirting the signal skyward I could maximize the amount of rf reaching the ionosphere directly overhead and increase the amount re-reflected earthward to enhance my signal at my friends' receivers. Thus the 80-meter horizontal loop was born, with 70-foot sides, supported by TV-mast tubing at about 30 feet above the ground.

Various antenna books quoted the feedpoint impedance of a full-wave loop as being close to 110 Ohms. A quarter-wave transformer of 75-Ohm coaxial cable would change that value to about 50 Ohms, or close enough for my transmitter output impedance. So, a quarter-wave piece of 75-Ohm coax (okay, maybe it was 72-Ohm) of the RG-59/U persuasion was cut to the desired operating frequency.

The reflected power turned out to be very slight and the finals (a tube-type rig) were well-pleased. What about the forward (upward) power? Well, it seemed to come back enhanced as expected because I received lots of reports that my signal was the best ever put out by my Viking Ranger on AM phone; many reports later, I was forced to conclude that the antenna was a huge success. Stations from about 300 miles around all told me that I had greatly improved my signal and that they had noticed much less fading. I, too, noticed a big difference: The band was much more quite. On 75 and 80 meters in the summertime, you know what that means.

Everything seemed to work better than I had hoped, so I tried loading the antenna on other frequencies and bands . . . but without much success. Then I exchanged the coaxial feedline for open-wire feedline and through a tuner loaded on other bands without much difficulty. The antenna proved to have bidirectional properties and even some gain on fifteen and twenty meters. I tried changing the loop configuration (but not perimeter length) from a square to a triangle and even to a rough circle, all without any noticeable difference in performance or loading on the fundamental frequency.

I decided to bring some of the ideas along to a new homestead with a larger lot, but a set of new limitations: It is covered with trees! Not wishing to destroy the natural beauty of the place, I decided to put up the loop and use the trees themselves for support. This time, a loop for forty meters was indicated. The trees made nice, conveniently-located supports, and I was able to achieve a reasonable facsimile of a quad loop, horizontally arranged about ten feet above the ground. A possible advantage of this location was better soil conductivity, and while the trees represented a possible source of signal absorption, I hoped that the advantages and disadvantages would balance each other out, yielding a net positive result.

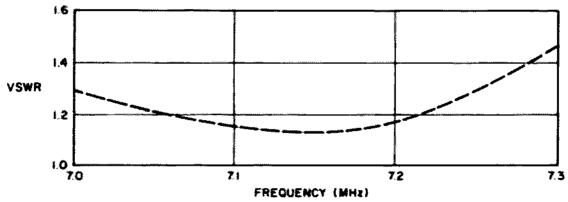


Fig. 2. Vswr at the transmitter end of quarter-wavelength, 75-Ohm matching section. (Measurement made with "MARS" bridge.)

And so it turned out. The quarter-wave matching section was cut, trimmed, and installed, and the first calls made. Results are uniformly good out to a distance of about 600–700 miles. (I have a 40-meter roof-mounted groundplane antenna for direct, switchable comparison.)

Why, then, use a loop? Well, to me, the reasons are manifold. It is easy to put up—takes maybe an hour, if you're slow. It is unobtrusive—invisible to neighbors. It gives great local performance, with reduced noise pickup. It has balanced feed and a balun is not necessary. It has simple impedance matching, and the low height means a minimum of support structure is required. Finally, it has a low cost.

Building Your Own Loop

You will need some wire, some coax, and enough room to put up the loop of your choice. Here's how you calculate the loop size (remember that you can make a square, triangle, or other polygon, regular or irregular). Use the formula $1005/f_{(MHz)}$ = total wire length in feet.

Example: You wish to put up a loop for 7.1 MHz. The formula gives a length of 141.54 feet. If you cut it to 141 feet 6 inches, you will be close enough.

The coax length is calculated by the formula: $246vf/f_{(MHz)}$ = length in feet. The vf is the coax velocity factor, which simply means that radio frequency energy travels at a different velocity in coax than it does in free space. The effect of this is that the electrical length of a quarter-wavelength of coax is different than the physical length. A common value for coax is vf = .66, and this is the value I used to cut mine. (It would be better to use a grid-dip meter to "prune" yours to the exact length needed.)

The formula for a 40-meter antenna, then, is $(246 \times .66)/7.1 = 22.87$ feet. If you cut it to 22 feet 11 inches, you'll be close enough. If that length is not enough to reach from the antenna to your transmitter, you can add any needed amount of 50-Ohm coax in series.

The coax you have cut is known as a quarter-wave matching section; it matches the impedance of the loop (110 Ohms) to the impedance of the source (50 Ohms). The quarter-wave matching-section technique requires that the matching impedance be the "mean" value between the "extreme" values. It is calculated as: $M = \sqrt{S \times L}$, where M is the impedance value of the matching section, S is the source impedance, and L is the load impedance. Thus, $M = \sqrt{50 \times 110}$, or 74.16 Ohms. As you can see, either 75-Ohm or 72-Ohm coax (or other) line would provide a good match.

Performance of the Loop

In my own loop for forty meters, I find that the swr is less than about 1.4:1 over the entire band! I know this sounds phenomenal, but I cannot measure *any* reflected power at the design operating frequency! For stations within about 500 miles or so from my QTH, reports are always in favor of the loop over my comparison vertical (Hy-Gain 14AVQ, roof-mounted with two radials per band—except 40 meters, where I use 4 radials). The signal strength difference has been from nothing to as much as 2 or 3 S-units.

For close-in stations, the loop is clearly superior; for medium-distance stations, it is sometimes better and sometimes worse than the vertical. For long-distance stations, the vertical is always better by an S-unit or two. However, there is a very interesting phenomenon, even at night or at long distances: Selective fading often drops the received signal strength, and it is nice to be able to switch antennas and bring the signal up again in strength to its former level. In fact, diversity reception is a big advantage of using a loop with another type of antenna.

As far as DX is concerned, another antenna would probably be better, although I have worked European DX with the loop and have received good reports.

All in all, the antenna is advantageous for its low cost, simple construction, and excellent performance. This weekend I plan to put up an 80-meter version. Why not try one yourself? I know you'll like it. ■

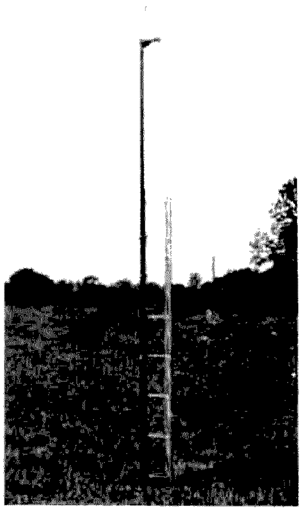
Henry G. Elwell, Jr. N4UH
Rt. 2 Box 20G
Cleveland NC 27013

Gin Pole for Peanuts

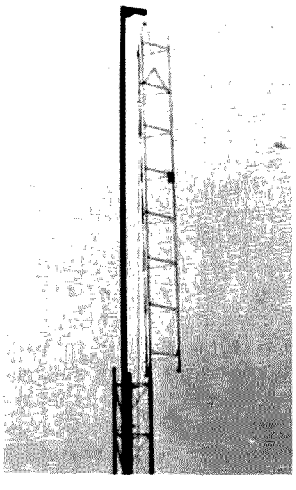
Ever pull yourself up by the bootstraps?
Build this gin pole and let it do the same for your tower.

Have you ever wanted to put up a tower that uses 10-foot sections that bolt together from the ground up, like those in the Rohn 25G tower? Well, I did. Could you have borrowed somebody's gin pole to accomplish the task? I couldn't. Did you want to pay about $150 to buy one? I didn't. So what *did* I do? I built my own for $19.15 plus a little welding of scrap iron done for me by my friend, John Boger. (The welding isn't necessary if you prefer to do some drilling and bolting.)

But I'm ahead of my story. Not wanting to re-invent the wheel, as they say, I reviewed all the back issues of *73, CQ, HR,* and *QST* magazines on hand and found only one reference to making a gin pole—in which the method of attaching it to the tower was too complicated for me. However, in my reference search I came across articles on gin poles used to erect towers by means of leverage principles, which leads me to believe that they are the real gin poles.



Initial position of gin pole with U-clamps loosely connecting it to a tower leg.



Here is a section hoisted up and the rope secured, prior to climbing and bolting to lower section.

Item	Cost
25' thin-wall black pipe, 1⅞" O.D.	$14.50
4 U-clamps, 2⅜" × 4½"	2.76
1 pulley about 3" diameter	1.89
Scrap metal	0.00
	$19.15

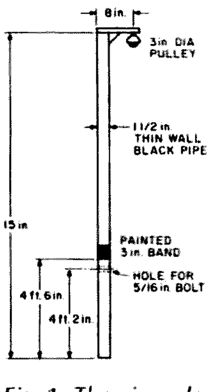


Fig. 1. The gin pole.

Gin-Pole Fabrication

The materials I purchased are shown in Fig. 1. Fifteen feet of pipe is all that is really needed, and Fig. 1 shows how I fabricated the pole.

John took a piece of 1" × 1" × 9" angle iron and welded it to the top of the pipe. He then made a metal triangle with the 90° sides 2" × 3" and welded it to the pipe and angle iron for strength. My task was to drill a hole in the angle iron for the pulley, drill a hole in the pipe for a bolt (use to be explained later), and paint a band around the pipe for an alignment mark. The gin pole

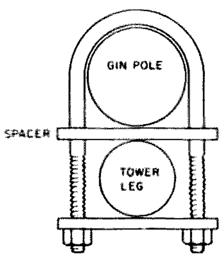


Fig. 2. Upper clamp.

weighed 25 pounds, which was light enough for one man to handle while erecting a tower.

Using the Gin Pole

Let's see how we use it, starting with the first ten-foot section of the tower secured to its concrete footing, and the rope, quarter- or half-inch nylon or manila, already threaded through the pulley on the gin pole.

Step One. With the gin pole on the ground but vertically against the tower, two U-clamps are loosely connected around the tower leg and gin pole. The upper clamp should be positioned between the first and second top tower rungs. The lower clamp should be positioned between the third and fourth rungs.

Climb to the top of the 10-foot section, safety-belt yourself in place, and lift the gin pole so that the painted band is at the level of the tower top. You will see that the hole drilled through it is at a level so that you can stick a 5" bolt through it and rest it and the pole on the top rung of the tower. The two clamps can now be tightened.

At this point it is appropriate to indicate that the two clamps are slightly different. The upper part of the gin pole cannot be snug against the tower or it will be difficult to insert the next section. A slight displacement of the gin pole from the vertical is required to prevent interference between the gin pole and the new section to be inserted. Fig. 2 shows how a spacer is inserted in the upper clamp between the pole and tower to provide the necessary vertical displacement. The spacer can be a duplicate of the outer locking bar.

Step Two. Return to the ground and tie one end of a rope to the top of the next (the second) section. From the ground, pull the second section up until it is slightly lower than its final resting place and tie the rope—see the photo.

Climb to the top of the first section again and safety-belt yourself in. You can now pull on the rope to raise the second section high enough to clear the first section, and then lower onto the first section. The second section can now be bolted to the first section.

Step Three. Climb the second section, loosely connect two more clamps (spaced on the second section as the first two were on the first section). The top clamp again has a spacer in it.

The bottom clamp on the first section can now be removed; loosen the second clamp up and let the gin pole slide down a few inches until the pulley bracket rests on the top of the second section. The other first-section clamp can now be removed.

Climb to the top of the tower, safety-belt yourself in, and raise the gin pole again so that the painted band is aligned with the top of the tower. Slip in the 5" bolt to prevent the gin pole from slipping down, and tighten the two new clamps.

You are now ready to follow step two again, and by an iteration of steps two and three and putting in the guy wires at the appropriate levels, you can go as high as the recommendations for the tower permit.

It would be very nice to say you put the tower up all by yourself, and you can. However, practical considerations, especially safety, say, "Have a ground helper as a minimum requirement!"

Some Suggestions

- All tower sections should be assembled on the ground to make sure the sections go together.
- Top and bottom of each section should be numbered or given a distinctive mark identical to the number or mark on the end of the next section to make certain they are properly assembled.
- Put a little vaseline inside the bottom of each tower leg to facilitate its sliding over the section below it.
- To permit each section to hang vertically when being mated, tie the rope under the second rung down, on each side, with the rope coming up the middle. *Align the numbered tower leg with the matching erected numbered leg before starting to raise the new section.*
- When mating sections, be sure the rope remains outside the tower sections; the rope can inadvertently be caught inside the tower leg, and it's a nuisance to have to pull the free end through the whole tower to clear it.

At completion of the work and when ready to remove the gin pole, loosen the two clamps and (as done before) let the gin pole slide down until it is resting on the top section. Then remove the rope from the pulley, tie it to the top of the gin pole, and, for safety, tie the gin pole to the tower while you climb down for a moment to remove the clamps. Be sure to wear gloves as you lower the gin pole down with the rope. Otherwise you may burn your hands from rope friction.

Temporary guying will give you a better sense of security after passing one permanent-guyed level before reaching the next permanent-guyed level. A good rope is sufficient for that purpose. It will require over 500 feet of rope to erect the 10th section of a 100-foot tower (when three-point guying at the 85-foot level), considering that you need a minimum of 200 feet of rope to get that last section up there. Have enough available for your tower height.

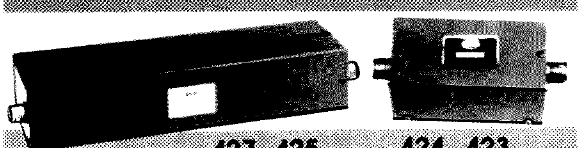
After putting up 370' of tower by this method, I found that it's easier than I had thought. You will, too! ■

Reference

"Safe Tower for a City Lot," Lewis H. Abraham W6FHR, *QST*, August, 1958.

T.V.I. problems?

Low pass T.V.I. filters from Barker & Williamson



427 425 424 423

Model	Power (Watts)	Cut Off Frequency	Frequency of Maximum Attenuation	Minimum Attenuation	Frequency Range	Price
425	1000	34 MHz	52 MHz	70 db	1.8 - 30 MHz	$29.50*
424	100	44 MHz	57 MHz	60 db	1.8 - 30 MHz	$22.50*
427	1000	55 MHz	63 MHz	70 db	6 meter	$36.00*
423	100	55 MHz	63 MHz	50 db	6 meter	$25.00*

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Coax Connector Workshop

Tracking down feedline-related problems can make strong men cry. By starting out right, you can avoid hassles.

Picture this setting: You're sitting in the shack one evening having a good rag-chew with some friends when suddenly your whole station goes bonkers. You wonder what happened.

You check around the shack. Your rig seems to be putting a good signal into the dummy load and all the other connections look good. Yet, somehow, the signal has just gone away.

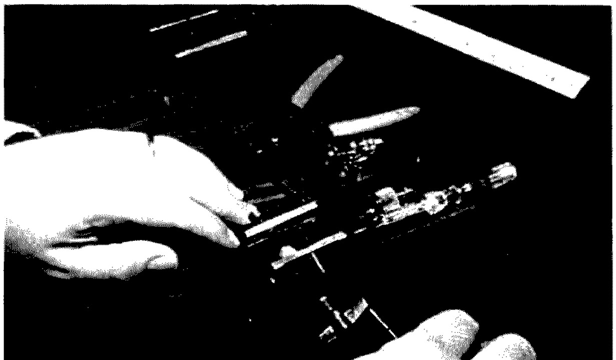
Sitting there, pondering the problem, you think: "It must be in the antenna—it can't be anywhere else. After all, the coax is new, I installed it only last week, and all the fittings and connections are okay!"

So, you're off the air, with no signal, and the next weekend comes. You check out the antenna, but everything seems okay there, too. What's the problem? "It has to be in my rig because everything else is okay. My meter is just probably giving me a false reading into the dummy load!"

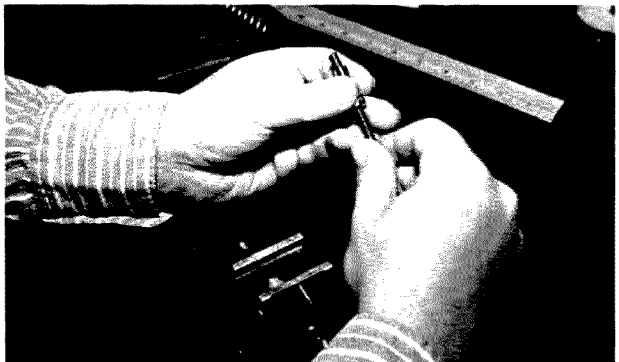
But, wait a minute! Before you haul out the rig's shipping carton and send it off to the manufacturer, there may be one area that you've missed.

Remember that new coax you just installed? Have you checked it out, too? The answer to this one is probably no, because you know how to cut coax, right? Well, just to be sure, check out the coax, too!

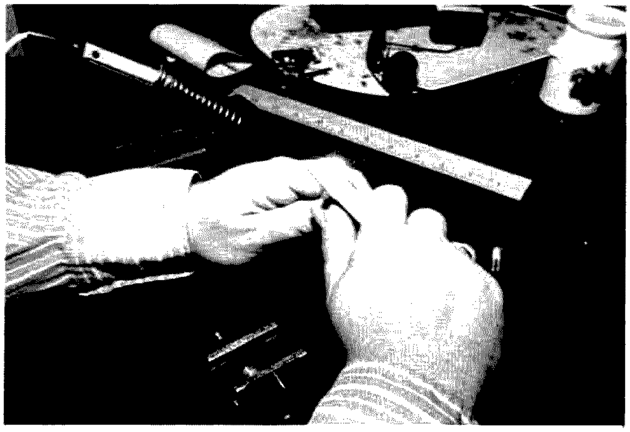
"Okay," you might think, "I might as well check out the coax, too, although it can't be bad. I know what I'm doing with coax!" So, you take the coax down and check it with your VTVM or DMM and you see that there's no continuity. "Something's fishy here!" you



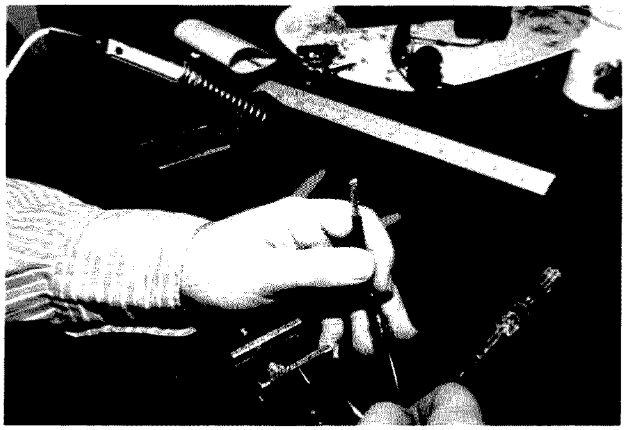
It's always a good idea to lay out the tools and parts you will need to cut coaxial cable before beginning the operation.



The first step in preparing this RG-58 cable for cutting is sliding the UG-175 adapter over the cable. This allows the use of a PL-259, which is actually sized for RG-8/U coax.



Cutting the outer covering of a piece of coax requires a sharp knife and a firm but gentle score around the plastic covering. If you cut too deeply, you risk cutting the outer braid of the coax.



Once the layer of covering material is removed, you will find the tightly twisted shield braid exposed. Here you can see the exposed braid and the UG-175 adapter.

think. You then check it out for shorts, and instead of reading infinity, your meter gives strange readings.

Voilà! You've just solved your problem. The coax was improperly cut.

Improper coaxial cable preparation is probably responsible for more problems in amateur radio than any other single cause. Unless you buy your coax precut with the fittings installed, then chances are one time or another you're going to run into problems with poor cable connections.

This need not be the case if you take some time and work slowly and thoroughly. Proper preparation of coaxial cable and the fitting of the connectors is a relatively easy, straightforward job.

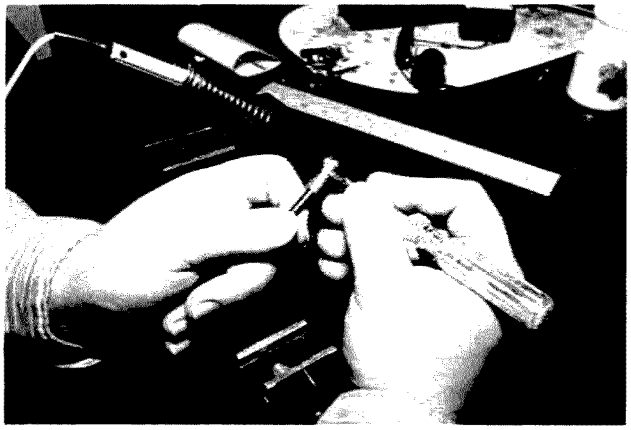
The tools needed for this job include: a sharp knife, hobby knife, or razor blade; an awl, sharp scribe, or ice pick; the cable; the fittings (PL-259 or BNC) and adapters (if needed); about a 60-Watt soldering iron (it can be less, though); and solder.

Once you have the tools laid out, it's time to begin the actual process. The first step involves slicing through the outer jacket of the coaxial cable. Whatever you do, don't carve the cable like it was a turkey because you're going to score or nick the outer shield braid of the cable; if you do this, then you're on your way to a short. So, be gentle when you first slice into the outer jacket of the cable. Just slice it far enough to expose the inner braid. Once you have done this, the jacket should slip right off and expose the braid itself. Remove about 3/4" of the outer jacket.

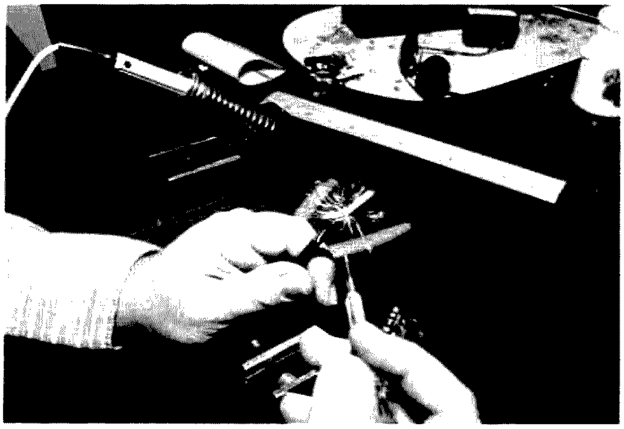
The braid is another area where many amateurs make mistakes. Too often the braid is merely pushed back down over the cable to expose the inner dielectric. Or, worse, a hole is made in the braid and the inner conductor is merely pulled through. In some cases, this is fine, but in most cases, it isn't. What is needed is patient debraiding of the shield braid.

But, before you get to this point, it is wise to install the various fittings which belong on the cable. This includes the barrel of the PL-259 and the adapter (UG-175 or 176) if you are using cable that's smaller than RG-8/U. I like the Radio Shack mini-foam RG-8 myself. The beauty of it is that it is nearly as small as RG-59/U, but is much less lossy.

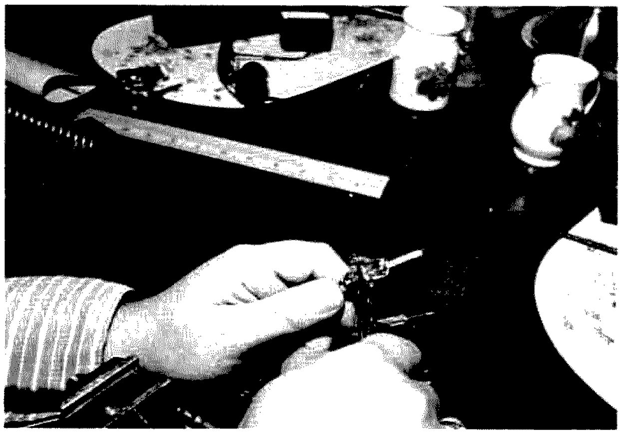
Once the fittings are installed, wiggle the braid a bit to loosen it from the in-



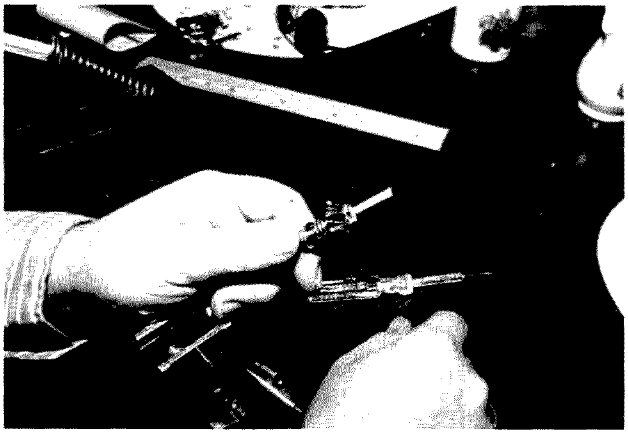
The next step in preparing coax is carefully debraiding the outer shield. For this you will need a sharply pointed scribe, ice pick, or other pointed tool.



When you have finished debraiding the outer coaxial shield, it should look like this. Notice it is fanned at roughly a 90° angle. This fanned braid is then smoothed over the adapter and trimmed.



After the coaxial cable's outer braid is smoothed over the adapter, it is then trimmed. It should be trimmed so the cable covers about 50 percent of the adapter's barrel. A pair of mini-snips makes short work of this.



With the shield braid trimmed, the soon-to-be-completed coaxial cable fitting should look like this. The trimmed braid is smoothed over the adapter and the center conductor's insulation is exposed. The installation should look like this. One note here, even though it is not shown: The screw-on PL-259 barrel is installed before the UG-175 is installed on the cable. This barrel allows the unit to be mated to a female SO-239 connector on the back of a rig. A spare is on the table.

ner dielectric. Then gently insert the awl (scribe or pick) and start to unravel the 3/4" of exposed braid.

To debraid the cable, follow the winds of the strand bundles. Take your time and don't nick or break them because you run the risk of a short if you do. The whole job, by the way, should only take 10 to 15 minutes once you're skilled at it. Yet, however long it takes, this is one of the most crucial parts, so take your time doing it.

After the cable is debraided, spread the braid strands out at a 90° angle from the cable itself. Then take a pair of scissors and trim the braid to about 3/8". (If you're using smaller cable and need the UG-175 or 176 adapter, move it up flush with the end of the outer covering.)

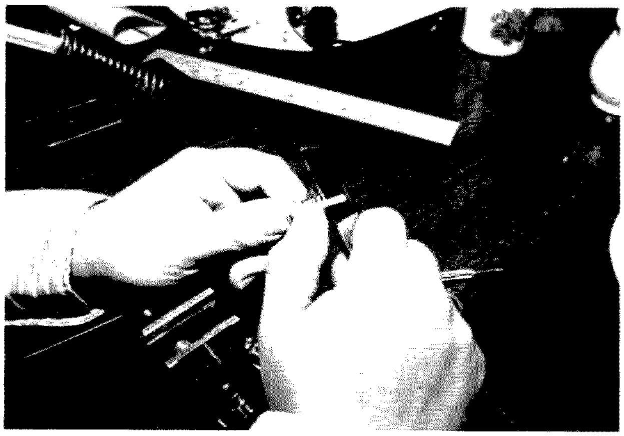
Next, take your knife and gently slice into the dielectric. All you have to do is score the dielectric and pull on it. The piece of dielectric should just slide right off the center conductor. You have to score it roughly 1/8" above the point where you've debraided the outer shield.

Once you've got the center conductor exposed, if it is stranded, twist it into a tight bundle and tin it with a little solder.

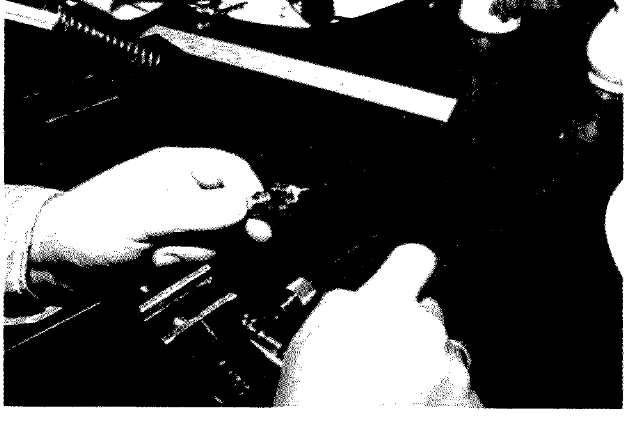
At this point, you're just about ready to slide the body of the fitting over the prepared end of the cable. Carefully take the plug body and insert the tinned center conductor into the shaft of the plug body.

With the center conductor inserted, the next step is to twist the fitting over the end of the RG-8/U. While doing this, you also have to turn the fitting to make sure that it seats properly. You have to exert a fair amount of pressure to do this, but it should be done easily without the aid of tools. Remember, those strands of copper in the outer shield are gentle beasts, so don't use brute force.

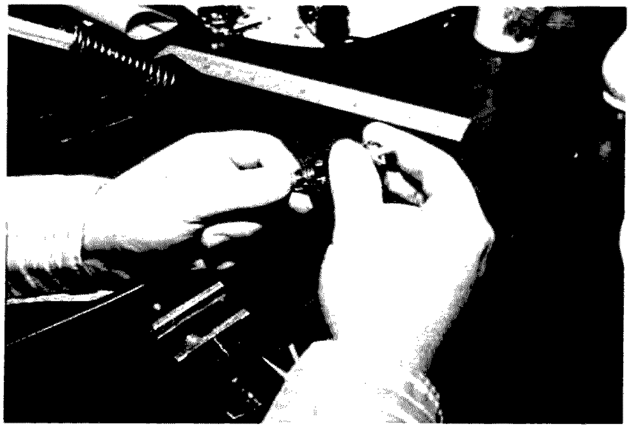
At this point, you're nearly ready to go. It's here that the soldering iron comes into play. In the PL-259 connector, you'll notice four holes in the shaft body. These are soldering holes. It is through these that you connect the outer shield to



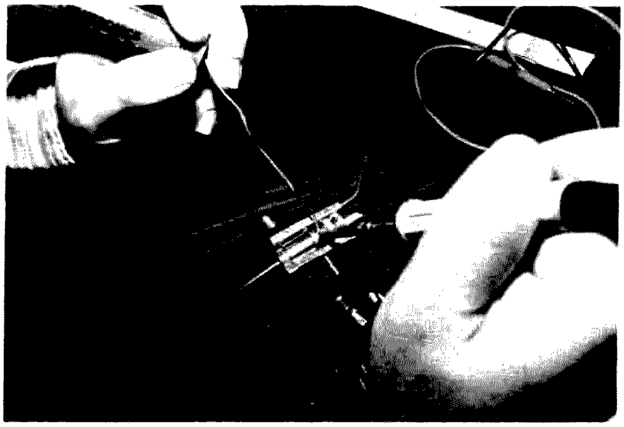
Trimming the center insulation requires careful cutting with a sharp blade. You must cut deeply enough to slice through the plastic insulation material, but not so deeply as to cut the center conductor itself. This takes practice.



With the center insulation removed, the prepared end of the coaxial cable should look like this. Notice that the center insulation is not trimmed to the same point as the shield braid. This is important because it maintains an insulated area between the braid and shield and prevents shorting.



With the cable end prepared, the next step is to install the PL-259's center fitting. This should easily slide over the UG-175 and it will then be screwed snug.



The most crucial part of the PL-259 installation is soldering the plug and coaxial shield. If you have done the installation properly, the coaxial braid should appear through the four solder holes in the body of the PL-259. Don't hold the iron here for a long time because you chance melting the little insulation left between the braid and center conductor inside the plug body itself. This means not using a low-wattage iron. A good 30-60-Watt iron should be able to cope with this task easily. This soldering also provides a good ground, which is necessary for coaxial cable.

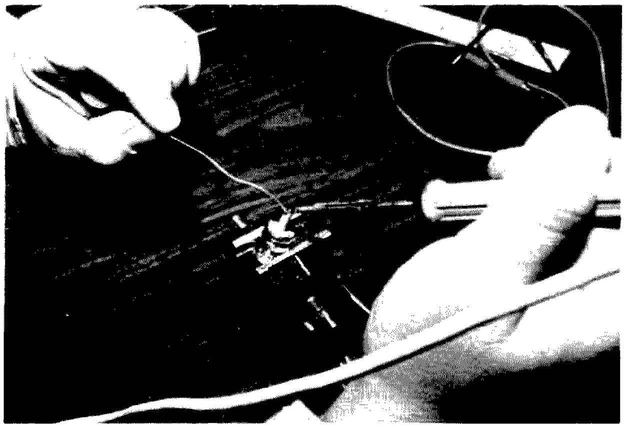
the fitting. These provide the ground for the outer shield.

Making sure that the soldering iron is hot enough and using a pointed soldering tip, apply the iron to both the hole and the shaft of the plug body. You do this by angling the iron slightly. After a couple of seconds, the braid and body should be hot enough to take the solder for a good joint. Don't overheat the braid (though it's a wonderful conductor of heat *away* from the area where you're working), because you can damage the nearby outer jacket easily, and *most importantly*, you can heat the braid to the point of melting the inner dielectric, producing an instant short! Continue the soldering process until all the plug holes are filled with solder and the connections are good. And, once you have completed this step, it's time to move on to the tip of the fitting itself.

What you'll find here is the tinned center connector inside the tip of the plug. Merely apply your iron to the tip and the center conductor and then run in enough solder to fill the shaft. Wipe it quickly with a damp sponge to remove the excess rosin.

The next step is screwing the barrel of the fitting over the body of the body itself—and you've completed the job.

If you're using smaller coax and need the UG-175 or 176 adapter, there's an extra step. You trim the braid as in using the larger-sized cable, but then you screw the fitting body over the adapter. The braid of the outer conductor will be visible through the solder holes. Once this is secure, then you solder through the plug holes just as with normal RG-8. The rest of the procedure is the same.



The last step, after the plug has cooled from the first round of soldering, is running solder into the center conductor pin. This is a hollow opening in the tip of the plug through which the center conductor should appear if it has been installed correctly. It is necessary to fill this totally with solder.

The final step in the installation of coaxial fittings is checking them for both continuity and shorts. Once you have fitted plugs to both ends of your cable and finished the work (yes, it can be tedious), take your VTVM or DMM and run these checks. To check for continuity, first set the meter to read resistance and connect the probe leads to the outer barrels of the plugs on either end of the coax. If there is continuity, you should have a zero reading on your meter. Repeat this process with the center connectors.

To check for shorts, attach one of the probe leads to the outer barrel of one plug and the other probe to the center connector of the same plug. The reading you should obtain is infinity. If you don't get the proper meter readings, then you've got a short somewhere (probably in one of the fittings) and you're going to have to remove the fitting and start all over again.

However, if you've taken your time, you should find that the readings are okay and you're ready to install the coax. That's all there is to it.

Making proper coaxial fittings may not be the most glamorous part of amateur radio, but it is one of the most important. The coax, after all, is what carries your signal to and from your antenna, and without a signal, even the best station and equipment is pretty much useless. ■

Make Your Noise Bridge Even Better

Use these shortcuts for easy calibration and give your transmitter 1:1 vision.

William Vissers K4KI
1245 S. Orlando Ave.
Cocoa Beach FL 32931

While reading the excellent article entitled "QRM-Free Antenna Tuning" in the August, 1981, issue of *73 Magazine*, I was particularly struck with the ingenious associated circuitry of Fig. 3 that allowed the noise bridge to be used also as a QRM-free tune-up device. The authors recognized a problem and offered a solution to it that will be of great benefit to all amateurs. Even more important, the technique described will prevent serious damage to your transmitter by ensuring that it goes directly into a matched load. You will keep your finals cool!

However, I did notice an error in the schematic. Also, I was able to calculate an alternative method of calibration that eliminates the need for standard inductances yet allows for a theoretically exact calibration of the entire reactance scale. My equation allows the bridge to be directly calibrated for the reference frequency of 1 MHz, thus eliminating the need to refer to either graphs or cumbersome equations. However, the graphs and equations have been shown here for information purposes.

A Correction

First the error should be corrected. In Fig. 2 of the referenced article, the 68-pF capacitor should be in series with the antenna jack as shown in Fig. 1 of this article, and *not* connected to ground as originally shown. The sectional schematic shows this correction and also has the parts labeled for identification purposes.

In order to obtain an exact calibration, rather than using the mirror-image method previously described, it will be necessary to use some small fixed capacitors for standards. Ordinary 5% silver micas or their equivalent will work just fine. The values of 10, 20, 30, 40, 50, 60, and 70 pF are used to obtain the basic calibration points. Small values of capacitance can be paralleled to obtain larger values; for example, a 20 pF in parallel with 30 pF will give a 50-pF value.

When using these standard calibrating capacitors,

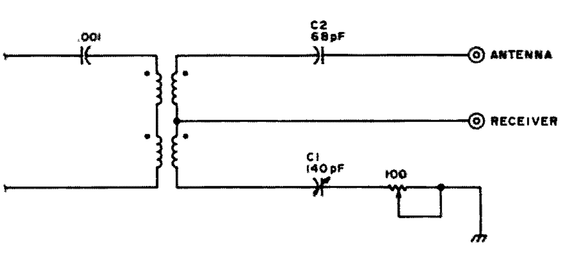


Fig. 1.

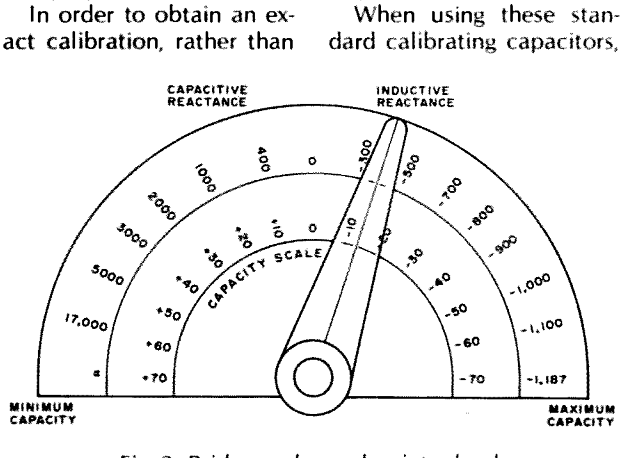


Fig. 2. Bridge scales and pointer knob.

the leads should be kept as short as possible to avoid undesirable lead inductance. As a further method of diminishing the lead-inductance effects during calibration, I prefer to do my own calibration at a low rather than a high frequency. In my own experimentation, I have used a calibration frequency of 3.75 MHz and found it to be very satisfactory. If a bridge is carefully built, the calibration should be satisfactory for the range of 160 to 6 meters.

Fig. 2 shows an outer scale in reactance and an inner scale of the standard capacitances used. (The inner scale is shown to help understand the technique used and is not needed when you actually use the bridge to measure reactance.)

Calibration

The first step is to calibrate the resistance dial of the bridge. The method previously described is correct, and no further comments are needed. When doing the reactance calibration, a 50-Ohm resistance should be connected to the antenna jack of the bridge. For my own purpose I just soldered a 50-Ohm, ¼-Watt resistor inside of a matching plug, keeping the leads as short as possible inside of the jack.

The knob on the variable capacitor should be so positioned that the capacitor is fully meshed when the knob is pointing to the right or the maximum capacitance marking on the scale. Then when the knob is pointing up to the zero point on the scale, the capacitor will be at half capacitance. With the 50-Ohm resistor connected, null the bridge. The reactance dial should be quite close to the mechanical half-point of the variable capacitor. This is called the original null point, and here C1 will have a capacitance value of 68 pF to match that of the 68 pF of C2.

Nulling is obtained when the total impedance of one side of the bridge is exactly equal to the impedance of the other side of the bridge. If the null point is quite close to the mechanical center point of the capacitor, the values can be brought to coincidence by slipping the knob shaft a few degrees one way or the other so that the knob reads zero at the electrical null. This technique will not affect the basic accuracy of the bridge when it is finally calibrated.

It could happen that if the maximum value of C1 were higher or lower than the specified value of 140 pF, the electrical null and the mechanical half-mesh point would be off more than a few degrees. In this case, the value of C2 would have to be changed to bring these two points more closely in line. If this is done, then the actual value of C2 should be recorded since its value is used in the reactance equation shown later on. If, by chance, there is a large, unexplainable difference between the electrical null and the mechanical half-mesh point, the circuit should be checked for wiring errors.

Now that the original null has been accomplished, the bridge can be calibrated. Start with a 10-pF capacitor and connect it across C2. The total capacitance of this circuit will now be 68 + 10 = 78 pF. This means that to null the bridge, the capacitance of C1 will have to be increased to 78 pF. At this null point, mark the capacitance scale as −10 pF. Now remove the 10-pF capacitor from across C2, replace it with 20 pF, and obtain and mark this new null point on the capacitance scale. Repeat this procedure until the right half of the scale is calibrated in capacitance values.

The left-hand side of the scale is calibrated in a somewhat similar manner. Place the 10-pF capacitor across C1. This means that for the bridge to be in balance, the capacitance of C1 will have to be reduced 10 pF. The null point on the scale is marked +10 pF. The 10-pF capacitor is removed and the procedure repeated for the larger sizes of calibrating capacitors until the scale is calibrated.

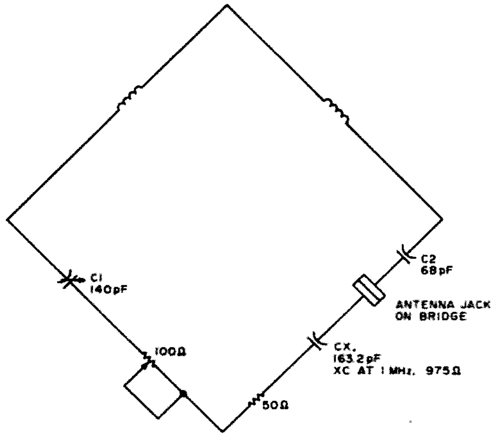


Fig. 3.

The bridge is now calibrated in terms of +C and −C, and all that is needed now is to relate these values to values of X_l and X_c so that the bridge scale can be calibrated directly in terms of reactance. And even though the bridge was calibrated at a frequency of 3.75 MHz, a bit of calculation will enable us to calculate the scale reactance values at our originally stipulated frequency of 1 MHz.

For illustrative purposes, let us pick a series load of 50 Ohms and a capacitance reactance of 975 Ohms at 1 MHz and connect them across the antenna jack of our bridge. The schematic of Fig. 3 will make it easy to follow the mathematics involved. The actual value of the capacitor at 1 MHz is calculated and found to be 163.2 pF. The equation used is C = 1/2πFX, and because F is in MHz and C is in pF, 1,000,000 is needed in the numerator. C = 1,000,000/(2)(π)(1)(975) = 163.2 pF.

From the circuit of Fig. 3, it can be seen that the 68 pF of C2 is in series with the 163.2 pF of the load, and the resultant capacitance of the two is from our series capacity equation, C = (68)(163.2)/(68 + 163.2) = 48 pF. To obtain a null at this point, our variable capacitor would have to be set at a capacitance of 48 pF, which is actually its original null value of 68 pF minus the 20 pF calibration point for the left-hand side of the dial. (I hang my head and confess that the original value of 975 Ohms of reactance was chosen to keep the math easy and make the result come out exactly at the 20-pF point on the scale. This is what is called a planned coincidence!)

By now some of you will be saying, "Hey, if I have to go through all of that stuff every time I want to make a reactance measurement, forget it!" I couldn't blame you. But by sitting down and combining all of the foregoing calculations in a single equation, it is easily possible to just use the scale calibration values and obtain reactance values. And the basic equation is this: X = (−j) [(1,000,000)(dial setting)/(2)(π)(C2)(C2 − dial setting)(frequency in MHz)].

(The term (−j) was added so that all values calculated will come out in the conventional engineering notation, so that capacitance reactance is −j and inductive reactance is +j.)

And now we are better

Dial	Capacitive Reactance	Dial	Inductive Reactance
0	0	0	0
+10	403	−10	300
+20	975	−20	532
+30	1848	−30	716
+40	3344	−40	867
+50	6501	−50	992
+60	17,550	−60	1097
+68	∞	−70	1187

Fig. 4.

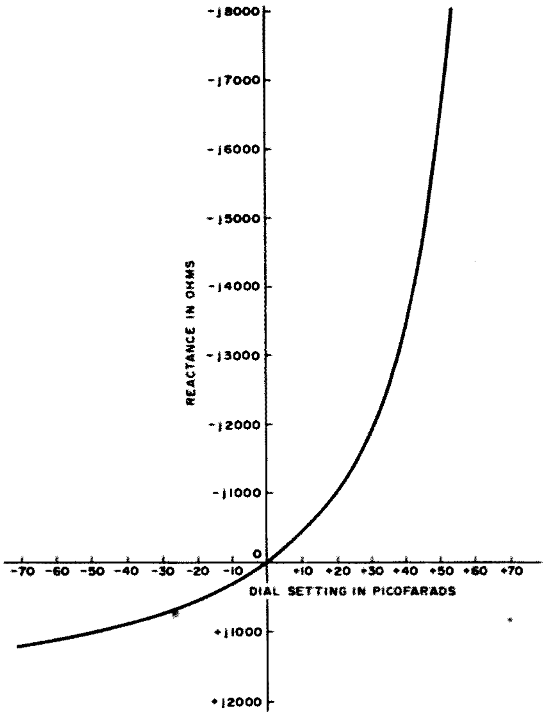


Fig. 5.

able to see that because inductance reactance is opposite to capacitance reactance, the right-hand or inductive reactance side of the scale was marked in *minus* (−C) values.

The equation is easily checked numerically by just putting in the previous values and we shall see that we will wind up back with our value of 975 Ohms: X=(−j)(1,000,000)(+20)/(2)(π)(68)(68−20)(1)= −j975 Ohms.

It will be evident that the sign values for the capacitive scale should be observed in the equation when it is used. This can be illustrated by assuming a null reading of the C scale of −30 pF. This indicates the reactance will be inductive. The calculation is as follows: X=(−j)(1,000,000)(−30)/(2)(π)(68)[68−(−30)](1)= +j716 Ohms. And if we were calibrating our scale, the −30 value of capacitance could be marked as 716 Ohms.

And now to save everybody a lot of time calculating values either for the scale or the construction of a graph, I've included a table of values (Fig. 4) and the graph (Fig. 5) showing values of reactance vs. dial settings of plus and minus C.

The bridge is very easy to use when measuring impedance. Just connect your unknown value of impedance to the antenna jack of the bridge, make your null, and read your resistance and reactance scales. Take your reactance value and divide it by the frequency in MHz at which you are making your measurement, and you have your reactance value in Ohms. The resistance dial does not have to be divided by frequency as it reads correctly independent of frequency.

There is one easy check that you can make to show if your bridge is frequency-sensitive. It theoretically should not be, but naturally all pieces of equipment have distributed capacitance and lead inductances which make theoretical values deviate from the ones measured. The best test is by using a simulated load of a capacitance and resistance in series, and make a null measurement at some low frequency (say, 3.75) as we had originally done. Now, without touching the bridge, increase the measuring frequency to some high value (say, one of 10 or 15 meters).

You may not believe this at first, but the bridge will stay at a null position without having to move either the reactance or resistance dials. This indicates that you have a very good bridge. Practically, you might find some slight deviation in the dial settings, but they should not be excessive. This rather interesting and very useful test result is because the dial was calibrated with standard capacitances and, after all, a capacitance at 3.75 MHz has the same capacitance at 10 or 15 meters. Try it, and you will see how useful this test is in evaluating a bridge unit. It will uncover stray, unwanted capacitances and inductances and will also quickly tell you if you have some basic problem when you first build your bridge.

Easy Tune-Up

As I mentioned earlier, the auxiliary circuit of Fig. 3 of the original article is extremely useful as it allows you to adjust your matching network to exactly 50 Ohms, so that after you have tuned up your transmitter into your dummy load and switched over to your antenna circuit, your transmitter will have an swr of 1:1 and you are ready to go on the air. Tuning up using a matching network directly may result in a period of high swr. This can damage your equipment or, in the case of the newer transistorized rigs, cause you to lose power. So, just tune up your rig into the dummy load at fifty Ohms, then use the auxiliary circuit, tune up your matching network with the bridge, and switch over; you are ready to go on the air.

There is one final note of caution: *Never turn on your transmitter if your auxiliary switch is in position 2 or 3.* If you do, you may see some smoke! In fact, to stress this point, the instructions that accompany Palomar Engineers' noise bridge combine the warning with a picture of a noise bridge buried in a graveyard with a gravestone marked "R.I.P., R-X Noise Bridge."

Using a four-layer rotary switch, a transmitter defeat circuit could be added. Every transmitter's turn-on capability varies with the design circuit, so this protection will have to be left to the ingenuity of the individual amateur. The circuit would have to be so designed that the transmitter would operate only when the switch is in the number one position.

If you decide to buy a commercial bridge, it can be used with the auxiliary circuit. Thus, you will reap all of the advantages of having a means of measuring impedance and a means of tuning up without putting any QRM on the air, and you can tune up your rig without any chance of damage. The original article is well worth every serious amateur's thought and consideration. ■

Antenna Refinishing the Easy Way

When a good vertical begins looking like a rusty downspout, it's time for some maintenance. Here's how K6EW saved a hamfest special.

Sam Creason K6EW
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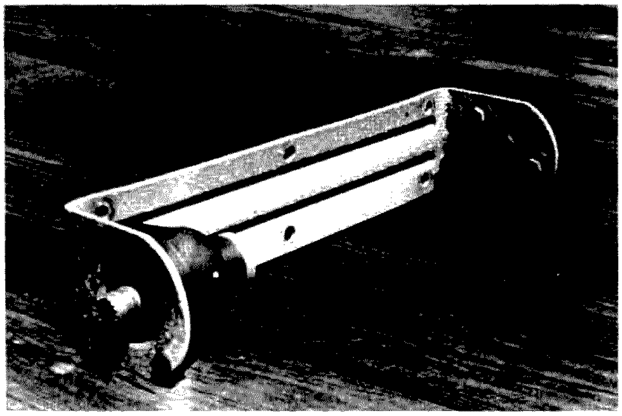
Fullerton CA 92635

At a recent ham swapmeet, I was able to buy a used 18AVT/WB trap vertical antenna for about half the cost of a new one. However, it had been exposed to Los Angeles air for several years, and therein lay a problem. The 18AVT/WB consists of several traps, pieces of aluminum tubing, top-hat radials, and a short metal whip. These parts are assembled telescope-fashion and held in place by compression clamps, nuts, and bolts. Over the years, the smog-ridden air had attacked the metal, making for poor contact between adjoining surfaces. Furthermore, the spacing between traps depends upon whether the antenna is to have minimum swr for phone or CW subbands, and whether it's to be mounted on a rooftop or on the ground. Without an instruction sheet, I had no way to determine the spacings. Finally, like any ¼-wave vertical, the 18AVT/WB requires some sort of ground plane or system of radials. Again, I was at a loss without an instruction sheet.

A letter to Hy-Gain, the manufacturer, brought a brochure on the antenna but no instruction sheet. A letter to *73*'s "Ham Help" column did the trick (thanks to WB4TCP, WB6JOP, N8ECR, WD8JFF, KØYEH, and WAØITU). For someone who is in the same position as I was, the dimensions for the 18AVT/WB and radials are given in Figs. 1 and 2, respectively. Two radials per band are required, and they must be insulated in a rooftop installation. "Egg" insulators are handy for this. Extensions to the radials for attaching to guy points must



Base of antenna. Bottom piece of aluminum tubing passes through the insulated opening (right) and rests on the insulated support (left).

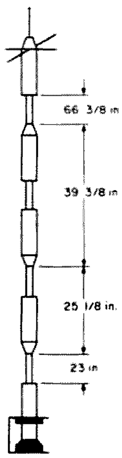


Fig. 1. Dimensions of the 18AVT/WB for CW, roofmount. (Not to scale.)

Band	**Length**
40	37′ 0″
20	18′ 7½″
15	11′ 10½″
10	9′ 10″

Fig. 2. Dimensions for radials for the 18AVT/WB.

be insulated from the radials and should be broken into shorter segments than the radials.

Once the antenna is disassembled, cleaning the various joints requires a few sheets of medium-grit sandpaper, two or three dowels ranging from ⅜" to ¼" in diameter to support the sandpaper against inner surfaces, and some elbow grease. Each mating surface should be sanded until it has a smooth satin surface. Areas where the radials make contact should also be sanded.

Having cleaned, reassembled, and installed my refurbished antenna, I tried making a contact, but to no avail. The photograph shows what I'd forgotten to clean! The lowest piece of aluminum tubing slips over an insulating block which provides vertical support. On top of the block is a disk of aluminum which is a snug fit inside the tubing and provides electrical contact with the radiating portion of the antenna. A setscrew through the tubing forces the disk against the opposite side of the tubing.

Cleaning the joint was no problem, but because the wall of the tubing is rather thin, there are only a few threads to engage the setscrew. Unfortunately, I stripped these threads while reassembling the antenna. However, a 10-32 screw saved the day. It's a little larger in diameter than the original setscrew and the threads are not as coarse. It served nicely as a self-tapping screw in the softer aluminum.

Results with the refurbished vertical have been encouraging. Although I use an HW-8 (about 3 Watts out), I've had no problem at all making stateside contacts. Finland and Japan were the best DX in the first three weeks of operation. I suspect that my vertical will get a yearly cleaning. ■

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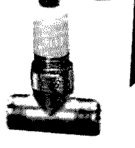
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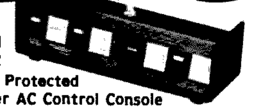
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73 INTERNATIONAL

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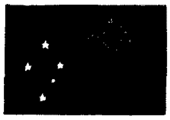

PAPUA NEW GUINEA

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Papua New Guinea

During January, band conditions were very poor; the 10m band appeared dead most of the time or was open only for a short while. I have been having biweekly schedules with my friend Doris N5CFP, in Garland, Texas, for more than two years, but during January we missed out on a number of occasions due to bad conditions. At times we were pleasantly surprised when she called at 2230 GMT and signals were good, but by 2300 the band closed again. We have now arranged for split frequency operation as 15m seems to be more reliable. But on that band, too, the noise level is very high.

Eighty-meter nets are still being run within Papua New Guinea. The Highlands net meets every Monday night on 3560 MHz at 0930 GMT, and another net runs from the national capital, Port Moresby, on Thursdays at 0930 GMT, also on 3560 MHz. The nets are badly attended at present, with only three or four stations checking in. According to Peter P29NUK, 80m in Port Moresby is impossible at the moment—the noise level being unbelievably high—and therefore none of the amateurs from the national capital are able to participate.

One event that the Papua New Guinea Amateur Radio Society is involved in is the Papuan Safari Road Rally, which is held annually over a long weekend marking the September 16 anniversary of independence. The rally has been going since 1979. It is organized by the South Pacific Motor Sports Club, and members of the PNGARS provide communications between checkpoints for scoring and safety. For the occasion, they are granted third-party privileges, to enable them to pass on third-party traffic on behalf of the Sports Club. Normally, third-party traffic is not permitted in PNG. The independence rally runs over three days and nights and attracts international drivers and cars.

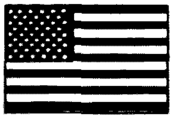
AOCP (full call) examinations were held in PNG on Tuesday, 15 February, at the same time as in centers in Australia. It is once again possible to sit for CW exams in the center nearest to one's QTH, without having to go all the way to Port Moresby. Apparently, a radio inspector to give the examinations is now available to do the rounds again, and he flies to the towns where candidates have applied to sit for exams. It was the lack of a radio inspector that made it necessary for candidates to fly to Port Moresby and not a lack of funds! Now I no longer have an excuse for not attempting the exam.

Margaret P29NUN, "the nun on a broomstick" from Kefama Catholic Mission near Goroka in the Eastern Highlands, will be attempting the full call theory exam this time. I wonder what will happen to that very appropriate callsign when she upgrades? Sister Margaret is an Australian Sister of Mercy and has become a very well-known ham since gaining her license in February, 1981. Her QSL card depicts a caricature of a nun riding a broomstick. Her black habit is billowing out behind her, displaying spotted bloomers. The rig is strapped to her back, earphones are clapped over her ears, and a microphone is clutched tightly in one hand while she holds on to the broom with the other. The card was designed by Bob P29NBF, another ham from Goroka. Needless to say, that card is a prized possession of amateurs all around the world!

Bob P29NBF and his XYL bought a yacht in Cairns (Australia) towards the end of last year and sailed her up to PNG in November. During the trip, Bob maintained daily radio contact with Sister Margaret. Unfortunately, Bob is off the air at the moment, as his radio equipment was damaged in the boat.

The hottest news on the amateur bands at present is, of course, VK0HI—the Heard Island DXpedition. In spite of checking the bands every day, I have not yet managed to work Heard Island. I have heard them on 20m on a number of occasions, but of course that is out of bounds for Novices. My hopes are centered on Jim VK0JS and his XYL, Kirsti VK0YL, who finally arrived on Heard Island around February 9th after having been delayed by various problems. Jim was P29JS, and he really put P29 on the map with his activity. Several years ago, he "went finish" from PNG and took up residence on Norfolk Island, where he married Kirsti, formerly a radio officer on a Swedish ship. Jim is VK9NS and Kirsti VK9NL, but they frequently go on DXpeditions. I should be able to get a contact with Heard Island with Kirsti and Jim there.

I have had a letter from Ron ZL1AMO asking whether a CW operation in P29 would be sought after. I told him that such an operation would certainly be very much in demand and to come on over. I have been asked many times for a CW contact but always had to decline, as I don't even have a key. A real pro like Ron would therefore be a godsend!



GUAM

James T. Pogue KH2AR
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FPO San Francisco 96630

On May 20th, 1976, super-typhoon Pamela screamed across the island of Guam with 170-mph winds. Eighteen hours later, Pamela had left in her wake one islander dead, many injured, and over 30,000 people stranded by floods from 33 inches of torrential rainfall. Over 80% of the island's buildings were destroyed and property damage exceeded $400 million.

A *New York Times* story a few days later stated that the island's communications had been "virtually destroyed." Fortunately, Guam's hams responded to the challenge and helped provide vitally-needed emergency communications. Stationed at key villages throughout the island, they assisted public officials and augmented existing public emergency services. Although the local repeater was knocked off the air due to a massive power loss, 2 meters was still the most active band during the emergency. Messages were also relayed off-island by several HF ham stations with emergency power generators.

Today, the emergency communications system on Guam is constantly striving to be ready to serve the island population. Emergency coordinator Carl Wegner KG6JKV is responsible for organizing and keeping the emergency plan current and operational. The only repeater on the island, a 25-Watt, .34/.94 machine, is located at Carl's home in Barrigada Heights, approximately 750 feet above sea level. Covering roughly 75% of the island, backup battery power can provide over 24 hours of service in the event of a power outage. Dick Takahashi AH2A has also donated a 5-kW butane generator that should soon be installed, giving virtually unlimited service life to the repeater in an emergency.

The Marianas Amateur Radio Club (MARC) has recently received permission to install equipment at the Government of Guam-maintained Emergency Operations Center (EOC). Built almost entirely underground, the EOC is virtually impervious to most natural disasters. Although some antenna problems remain to be resolved, MARC members hope to have a recently-purchased Kenwood HF rig and 2-meter gear installed before the next typhoon season.

When a typhoon is determined to be within 48 hours of possibly passing over Guam, the emergency coordinator calls the "Typhoon Net" on 2 meters. At that time, a survey of available personnel, equipment, and anticipated needs is made. With constant 6-hour updates from the Naval Oceanographic Command Center on Nimitz Hill, Guam, a constant watch is kept on the approaching storm. The hams on Saipan, approximately 100 miles north of Guam, are advised of the storm's location and forecast track via the 2-meter repeater, and hams on other more distant islands are kept posted by the Inter-Island Net that meets on 14,315 kHz.

Here on Guam, a detailed communications plan assigns a ham to the commissioner of each village—or to a group of several nearby villages—to assist him. Two meters, of course, is the standard band for operations, utilizing the .34/.94 repeater as well as .52 simplex.

For communications off-island, the normal terminus is with Hawaii. Frequencies for CW and SSB as well as RTTY have been assigned to handle health and welfare traffic, as well as government messages if asked to do so.

In order to stay proficient at emergency procedures, MARC members regularly volunteer to assist local civic groups by providing communications services for a wide variety of events. These include bike rides, walkathons, marathons, and several offshore marine events between the southern island village of Merizo and nearby Cocos Island.

In spite of all these preparations, though, the emergency communications system on Guam is not without its problems. With a large percentage of the ham population in the military, it is difficult for the Emergency Coordinator to build a steady and dependable core of operators to activate during an emergency. In the event of a typhoon, most military people are called in to their work posts for duty until the storm passes. Frequent transfers of personnel make for a constantly-fluctuating population of operators.

As has so often been the case with hams and emergency communications, the key to successful response and operations must continue to be flexibility and creativity mixed with plenty of hard work.

CANADA

Some time ago it was suggested to the Department of Communications (DOC) that there could be a number of advantages to an arrangement whereby amateurs assisted in the conduct of examinations. CARF (Canadian Amateur Radio Federation) raised the matter again with the DOC last summer. Since then, the Department has been considering the possibility of such an arrangement and the result has been a letter addressed to CARF president Don Slater VE3ID. The letter requested "detailed input" from CARF on areas pertaining to amateur participation, including minimum criteria for amateur examiners, the selection process, the maintenance of examination integrity, exam distribution, and coordination between the DOC and amateur examiners.

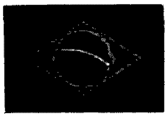
Some ideas for amateur participation have been discussed in recent issues of *TCA* and comment was sought from readers, but to date the response has not been exactly overwhelming. Now, however, the DOC has asked specific questions and is seeking answers from CARF and other organizations. In order to ensure that varying ideas and views are incorporated in the recommendations in the CARF brief to the DOC, comments from clubs and individuals are now urgently sought.

In other action, the DOC approved a request for commemorative prefixes for World Communications Year. Starting on World Communications Day, May 17, through July 17 (inclusive), CY may be used for VE, CI for VO, and CK for VY.

The department has also proposed new regulations covering the radio noise generated by power lines and sub-stations. The first-ever regulations are designed primarily to protect AM sound broadcasting, but obviously they would benefit amateurs as well. The proposed rules are complicated and require special measuring equipment. Amateurs who are interested in this very technical proposal may get a copy from a DOC office. Ask for Notice Delta Golf Tango Roger—021-82.

However, not all of the amendments to the Canadian amateur regulations proposed a year ago have been processed. They would permit repeater operation in the 29-MHz band, SSTV in the HF bands, 6-MHz bandwidth for ATV, and more power on 160 meters. The amendments also would allow foriegn amateurs from countries with reciprocal agreements to operate in the full two-meter band. Currently in the legal mill of the department are the 160-meter power change, deletion of mobile logging, and a provision for amateur-class operators in

remote districts to operate with Advanced privileges on a conditional basis.



BRAZIL

Gerson Rissin PY1APS
PO Box 12178, Copacabana
20000 Rio de Janeiro, RJ
Brazil

PROCEDURES TO GET A BRAZILIAN LICENSE

If your country has a reciprocity agreement with Brazil, you have to present your original amateur license and your passport to DENTEL (Department of Communications), which has offices in all capital cities, and fill out form DNT-143. The license will be issued with a special callsign which has the letter Z after the number; for example: PY1ZXY. The license will be valid for the period of time which you will stay in Brazil or until the date your original license expires, whichever comes first.

During the valid term of the license, you do have to be a member of the Brazilian Amateur Radio League—LABRE. You may contact the League first, and they will be very kind in helping you to get your Brazilian license. Write to the League office in the state to which you are going (see box).

AWARDS

Sponsored by the Rio de Janeiro CW Group, the CWRJ Award is available to all licensed amateurs for confirmed contacts with 20 (twenty) different PY1 stations, including at least 5 (five) CWRJ members. Contacts must have been made after December 16, 1980, on any amateur band. Only two-way CW mode. No QSLs. Send GCR log of stations worked (call, date, time, band, mode, and report) and 10 IRCs for mailing expenses to CWRJ, PO Box 621, 24000 Niterio, RJ, Brazil.

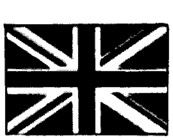
Endorsements are given for each 20 new PY1 confirmed contacts which include one new CWRJ member. CWRJ members: PY1ÁFA, PY1AFG, PY1AJK, PY1ASI, PY1BFZ, PY1BGI, PY1BMF, PY1BOA, PY1BOQ, PY1BUG, PY1BUL, PY1BVY, PY1CBW, PY1CC, PY1CCX, PY1CCY, PY1DCG, PY1DEA, PY1DFF, PY1DGB, PY1DN, PY1DIN, PY1DJY, PY1DPG, PY1DUH, PY1EBK, PY1EWN, PY1FB, PY1HO, PY1LG, PY1MHO, PY1MKA, PY1RJ, PY1UET, PY1VB, PY1VLR, PY1VOY, PY1WDS, PY1WO.

The CWRJ sponsors seven more awards: the Brazilian Stations Award (BSAW), Rio de Janeiro State Cities Award (RJCAW), Geographic Brazil Award (BGAW), Worked CWRJ Associate Members Award (WAMAW), Brazil's Frontiers Award (BFAW), CWRJ YL Flowers Award (YLAW), and the Worked CWRJ Award (WRJA).

Please note that my PO Box number was printed incorrectly last month and that the correct one (12178) appears above.

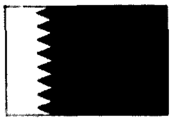
LEAGUE ADDRESSES

LABRE/CENTRAL—SCS-SUL-Trecho 04-Lote 1-A-Brasilia, DF.
LABRE/ACRE—Rua Benjamin Constant s/nº-Ed. Abrahim Sala 308, 3º andar-Rio Branco, AC.
LABRE/ALAGOAS—Ladeira da Catedral, nº 150-Maceió, AL.
LABRE/AMAZONAS—Rua Franco de Sá, 118-Adrianópolis-Manaus-AM.
LABRE/BAHIA—Rua Santa Rita Durão, s/nº-Forte do Monte Serrat-Salvador, BA.
LABRE/CEARÁ—Travessa Pará, 12, Ed. Sul América, sls. 703/704-Fortaleza, CE.
LABRE/ESPÍRITO SANYO—Rua Alberto Oliveira Santos, 59-s/711-Vitória, ES.
LABRE/GOIÁS—Rua do Radioamador, 247-Setor Coimbra-Goiânia, GO.
LABRE/MATO GROSSO—Rua Gen. Valle, 32-Cuiabá, MT.
LABRE/MATO GROSSO DO SUL—Rua Sargento Yulle, 50-Campo Grande, MS.
LABRE/MARANHÃO—Rua Osvaldo Cruz, 340, Ed. Duas Nações, s/112-São Luiz, MA.
LABRE/MINAS GERAIS—Rua N. S. do Carmo, 221, salas 307 a 309-Belo Horizonte, MG.
LABRE/PARÁ—Trav. padre Eutiquio, 719-Belém, PA.
LABRE/PARAIBA—Av. Eng. Leonardo Arcoverde, s/nº-João Pessoa, PB.
LABRE/PARANÁ—Rua Voluntários da Pátria, 475, 9º andar-s/909-Curitiba, PR.
LABRE/PERNAMBUCO—Av. Agamenon Magalhães, 2945-Recife, PE.
LABRE/PIAUÍ—Rua Álvaro Mendes, 1450-Teresina, PI.
LABRE/RIO GRANDE DO NORTE—Av. Rodriques Alves, 1004-Tirol-Natal, RN.
LABRE/RIO GRANDE DO SUL—Rua Dr. Floras, 62, 13º andar-Porto Alegre, RS.
LABRE/RIO DE JANEIRO—Av. Treze de Maio, 13, 20º andar, sala 2018-Rio de Janeiro, RJ.
LABRE/RONDÔNIA—Av. Falqhuar, 2230-Porto Velho, RO.
LABRE/RORAIMA—Av. Getulio Vargas, 25 W, sala 2, Altos-Boa Vista, RR.
LABRE/SANTA CATARINA—Rua Jerônimo Coelho, 325, Conj. 110, Ed. Julieta-Florianópolis, SC.
LABRE/SÃO PAULO—Largo de S. Francisco, 34, 11º andar-São Paulo, SP.
LABRE/SERGIPE—Largo dos Radioamadores, s/nº-Aracaju, SE.



GREAT BRITAIN

Amateurs in Great Britain are enjoying the recently-released *G-QRP Club Circuit Handbook*, edited by G-QRP club president, Rev. George Dobbs G3RJV. The *Handbook* has over 100 pages of QRP circuits compiled from *Sprat*, the club's newsletter. Eight years of circuits and ideas, from 1974-1982, have been included in the book. Newcomers and old-timers alike have been finding useful new circuits, as more British hams are discovering QRP. Amateurs interested in finding out more about this collection of QRP know-how should write to Alan Lake G4DVW, Middleton Cl., Nuthall, Nottingham NG16 1BX, Great Britain.



BAHRAIN

Ian Cable A92BW
PO Box 22381
Muharraq, Bahrain
Arabian Gulf

DX CONTESTING—BAHRAIN STYLE!

Casting around for something useful to do one Friday (a Bahrain Friday equates to an American Sunday) not too long ago, a group of our erstwhile DX chasers gravitated to bandying words over 2-meter repeater A92RP. Replete no doubt with a good curry lunch, someone (he wishes to remain anonymous) voiced the thought that it would be "a very good idea" if the Association were to participate in the upcoming CQ WW Phone DX Contest—due to commence in a few hours time, on that Saturday morning! It was claimed that no prior contest experience was called for, but merely the ability, dedication, stamina, and willingness necessary to carry the enterprise forward to a successful conclusion. In the ensuing discussion, a consensus emerged in favor of the idea.

Suitably fired with enthusiasm and lulled no doubt by honeyed words into a false sense of security, our band of contest warriors repaired to the clubhouse; most were armed with those extra pieces of equipment individually deemed essential to the success of our communal endeavor. The capability of the already-installed club FT-101B transceiver and triband beam was to be enhanced by the addition of a KW-1000 linear amplifier—which promply resulted in cooking the coil in the 200-Watt-rated Daiwa antenna coupler! An 830S was produced with the comment that "perhaps we can manage simultaneous operation on two bands," but this of course would require a second antenna.

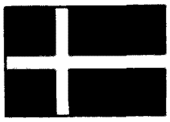
It was by this time becoming dark, so the stringing up of a trap dipole for the LF bands between our own mast and that of our landlord took place after dark. Not surprisingly, the end result when viewed in the light of the following day caused some small degree of concern—our mast had acquired a most definite southbound lean due, no doubt, to the combination of dipole and feeder weight plus over-enthusiastic late-night rigging efforts!

Whilst much of the preceding action was in progress, when the equipment was not under repair or the mast folded over for antenna work, those not otherwise gainfully occupied were conducting a radio advertising campaign, advising all interested contacts of our contest entry. Starting on 21 MHz, they moved successively to 28, 14, and 3.8, and then back to 14 in time to warm up with a few pre-contest QSOs.

Operations continued as dictated by operator availability—always a problem with our different weekend arrangements and, on this occasion, compounded by the fact that not everyone realized that it was a 48-hour contest.

How did we do? Results were reasonable: over 1050 QSOs with 60 countries spread over 5 bands, thanks to the efforts of Sheridan (A92BE), Dhiya (A92DQ), Jon (A92F), Keith (A92P), and John (A92Z).

What did we learn? Other than the obvious and fortunately minor equipment problems, we were not terribly good logkeepers with respect to frequently entering QSO times and the bands on which they were made. Poor Keith had a terrible time attempting to transcribe the log onto the summary sheets and finally had to admit defeat. We won't appear in any listing, but did most definitely have a barrel of fun. Now with all those in-house experts, perhaps the 1983 event ought to be a lot less traumatic!



DENMARK

Henrik Jacobsen OZ6PN
Kløvervaenget 9
Haldbjerg
9900 Frederikshavn
Denmark

There are about 10,000 licensed radio amateurs in Denmark, but I think that only half are active on the bands. There are four license categories and most amateurs here hold a D license which allows them to work on the VHF and UHF bands with 100 Watts. The D license requires only a simple technical test and most students pass the test.

Then we have the C license, for which the technical test is the same as for the D license, but there is also a CW test. The radio amateur with a C license can work on the HF bands, but only CW with 10 W of power. However, C-class amateurs retain D-class privileges on VHF and UHF.

The next category is the B license, which requires possession of a C license for one year or an extended technical test. In both cases, it is necessary to pass a CW test. The B license allows you to work on all the amateur bands with 100 W in all modes.

And last, we have the A license, which requires a B license for one year and allows working with 500 W (0.5 kW!) on all amateur bands and with all modes.

The CW test is given at 12 wpm.

The amateur bands in Denmark are the following:

- 3.500-3.800 MHz (3.5-3.6 MHz CW only).
- 7.000-7.100 MHz (7.0-7.01 MHz CW only).
- 14.000-14.350 MHz (14.0-14.1 MHz CW only).
- 21.000-21.450 MHz (21.0-21.15 MHz CW only).
- 28.000-29.700 MHz (28.0-28.1 MHz CW only).
- 144.000-146.000 MHz (All modes—Reg. 1 band-table).
- 432.000-438.000 MHz (All modes—Reg. 1 band-table).

Danish amateurs can also use the "new" bands (CW only): 1.830-1.850 MHz, 10.100-10.150 MHz, 18.068-18.168 MHz, and 24.890-24.990 MHz.

After receiving a special permit, we may also use the following UHF and SHF bands (all modes): 1215-1300 MHz, 2300-2450 MHz, 5650-5850 MHz, 10.0-10.5 GHz, and 24.0-24.25 GHz.

All radio amateurs can work with homemade stations or with factory toys on all amateur bands, but if one wants to work on the citizens band (27 MHz), one must buy a factory-made station (maximum, 500 mW) and the station must be approved by the Post- and Teleadministration.

Denmark is a little country with about 5 million citizens, but we have a very developed electronics industry and everywhere we look, we see radio amateurs in leading positions.

Radio amateurs are mostly popular in Danish society, but we naturally have problems with hi-fis and video recorders, but our good contacts in the electronics industry can in many cases solve our problems.

This was a little about Denmark and its radio amateurs—in my next column, I will write a little about the Danish radio amateur society, the EDR.

Skip Westrich WB8OWM
1309 24th Street NW
Canton OH 44709

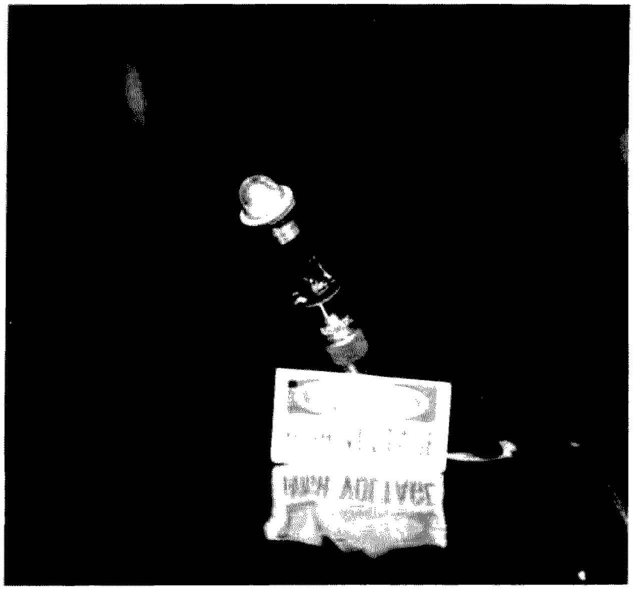
73¢ for a Voltage-Transient Detector

Forget those expensive and complex insurance policies. Here's the best protection you can get—and the cheapest.

Being a doubting Thomas by nature, I have often wondered about the necessity of those antenna surge protectors as advertised in the amateur press. As you know, those surge shunts as advertised are to proect solid-state communications equipment from damage caused by voltage transients entering the antenna system. Those usually are caused by atmospheric static discharges or nearby lightning strikes—according to the ads. The purpose of this article is to show you how these gremlins can be readily detected.

I am not doubting the claims of the advertisers. As any old reader of this magazine can attest, *NO* advertiser would dare to sell anything not up to its claims in this magazine. The shyster would become the object of Mr. Green's unmentionable and merciless wrath. Period. Even in light of these facts, I continued my search for proof.

The first objective was to prove visually the existence of voltage transients. Recalling from my Novice days the fact that neon bulbs glow in the presence of high voltage, I decided to utilize this method of approach. Thus, I reasoned that a neon bulb across the coax plug—disconnected, of course—would reveal the nasty little gremlins.



Neon pilot-lamp assembly.

As you can clearly see, simplicity is the nucleus of the circuit shown in Fig. 1. The parts required are readily available at any nearby hamfest flea market. After comparing many entrepreneurs' offerings of neon pilot-lamp assemblies, I found the one in the photo for a mere twenty-five cents—used, of course (both the quarter and the pilot-lamp assembly). Needless to say, all it lacked was an NE-51 bulb. The latter was obtained for an additional quarter.

Now for connecting my coax to the assembly. A clean RCA phono jack was found at another entrepreneur's stand of irresistible bargains for another quarter. Reaching into my pocket, I came up with two dimes and only three pennies. "It's a deal!" cried the businessman. Total investment? You guessed it . . . 73¢!

After what seemed a long ride home, I headed straight for the workbench (the scene of many electronic tribulations and tests). With the smell of hot solder filling the air and a period of five quick minutes, the tester became reality.

Next, I disconnected the coax connector (via a PL-259 to an RCA-type adapter) from the rig and terminated the coax into the antenna-voltage-transients detector. Did the neon glow? No. As a matter of fact, nothing happened.

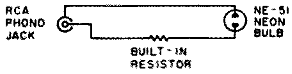


Fig. 1. One scientific circuit for detection of antenna voltage transients.

However, a few nights later while chasing some rare DX on 15 CW, a usually unwelcomed sound of key-rashing ! + #%!!! noise filled the headphones! Ah, an approaching thunderstorm! Quickly! Disconnect the coax from the rig! Terminate into the 73¢ wonder! Eureka! There it was, flashing away before my very eyes! Success. The neon bulb was flashing its heart out as the thunderstorm approached. Success.

In the interest of a longer life here on Earth, I disconnected the coax and grounded everything. Be very careful when doing this . . . it is not my intention to send any readers to Silent Key land after building and using one of these 73¢ detectors. There is a high-voltage hazard present, so use your common sense and disconnect as the neon gets brighter. Also, keep the bulb cover on the assembly in case the neon bulb should break. And be sure to check for a built-in resistor in your neon pilot-lamp assembly—otherwise your NE-51 will fire its last and first time forever. Good luck and good viewing—but be careful. And yes, the ads are correct; those gremlins do indeed exist. ■

William P. Smith K3LF
Cold Spring Creamery Rd.
Doylestown PA 18901

Build the Armchair Satellite Tracker

Simple and cheap, this setup will follow OSCAR around like a dog. Put it together, lean back, and let this control system do the work for you.

Editor's Note: This ingenious tracking system can be used for satellites like UoSAT and Russian "RS" amateur birds as well as the ever popular OSCAR 8.

This article describes a fully-automatic system for tracking satellites in low, near-circular orbits such as that of OSCAR 8. The system requires as little as one rotator and a very simple rotator-control unit. Normally, two rotators will be desired, but they are not necessary to achieve fully-automatic tracking with fairly good accuracy. This system eliminates problems associated with conventional antenna-pointing systems such as high cost, complexity, and large tracking errors.

Photo A. The completed system. The tilt axis is positioned for a near-horizon satellite pass. This position may also be used for terrestrial operations using the elevation rotator as a conventional azimuth rotator.

Conventional systems are based on a system of azimuth and elevation settings. Some are computer-controlled and some use a computer-generated chart with manual adjustment of the controls of the two rotators. One system uses a single azimuth rotator with the antenna pointed about 30 degrees above the horizon. Pointing errors reach as much as 60 degrees with this system.

There is one reason common to all of these systems that makes for complexity, high cost, or marginal results: They all are based on a reference system which is parallel and perpendicular to the surface of the Earth while the satellite's orbital plane is normal to some other reference system. Conventional antenna-

pointing systems are always bucking this natural motion of the satellite. My system attempts to align the reference plane of the antenna rotator with the reference plane of the satellite. It is not perfect; it is not designed for the purist who has access to megabyte computers and megabuck wallets. It is designed for the amateur who is a casual operator but desires some sophistication and moderately good accuracy.

To obtain some idea of how my system works, let us discuss the special case of the direct overhead pass and the conventional azimuth/elevation system. Let's say the satellite is ascending, has a polar orbit, and will be above the horizon for 16 minutes. The satellite will rise in the south (bearing 180 degrees), pass directly overhead 8 minutes later, and set to the north (bearing 360 degrees) sixteen minutes after acquisition.

If we had set our elevation rotator to point at the horizon and the azimuth rotator to a bearing of 180 degrees, we could have tracked the satellite just by operating the elevation rotator only. We would start with the antenna pointing at the southern horizon, slowly rising through the vertical as the satellite passed overhead, and on to the northern horizon. In this special case, the plane of the orbit coincides with the plane described by the movement of the elevation rotator.

Next, let's examine a more common case of an other than direct overhead orbit. Imagine an orbit where the satellite reaches a maximum elevation of 60 degrees to the east of your QTH. We will start off with the conventional azimuth/elevation system by setting the azimuth rotator to a bearing of 180 degrees and the elevation rotator to point at the southern horizon. Again, the antenna will be pointing at the satellite when it rises, but if we tried to track it as in the last example, we would soon have a large tracking error. By the time the antenna reached the vertical position, the satellite would be 30 degrees away toward the east. Continuing on to the northern horizon, the pointing error would gradually decrease with the antenna again pointing at the satellite as it set to the north.

Now let's go through the last example again, only we will make an adjustment to the antenna-mounting system which will alter the results considerably. With the antenna pointing at the southern horizon, remove the azimuth rotator and mount the elevation rotator on an axle which is parallel to the surface of the Earth and aligned north-south. The elevation rotator is now free to tilt to the east or west. If we tilt the elevation rotator so that what used to be the azimuth mast is now aimed at a point 60 degrees above the eastern horizon, we will change the entire geometry of the tracking system. We lock the new axle in the 60-degree position and begin the satellite

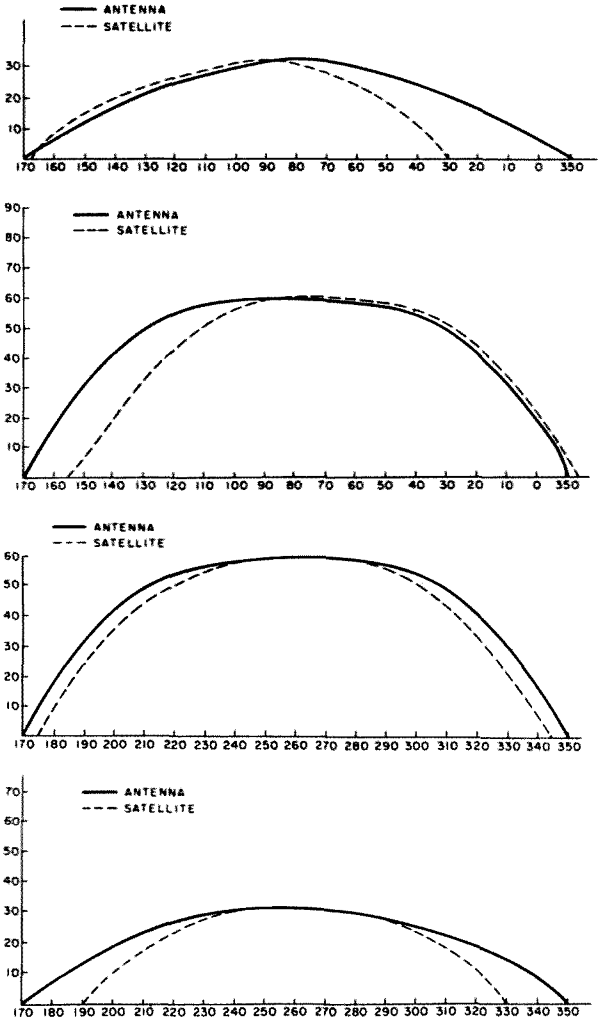


Fig. 1. Charts of relative bearings and elevations of OSCAR 8 compared to the antenna-pointing position. All satellite coordinates are for ascending orbits and a QTH latitude of 42 degrees north. Antenna-pointing positions, above, top to bottom: 30° East, 60° East, 60° West, and 30° West.

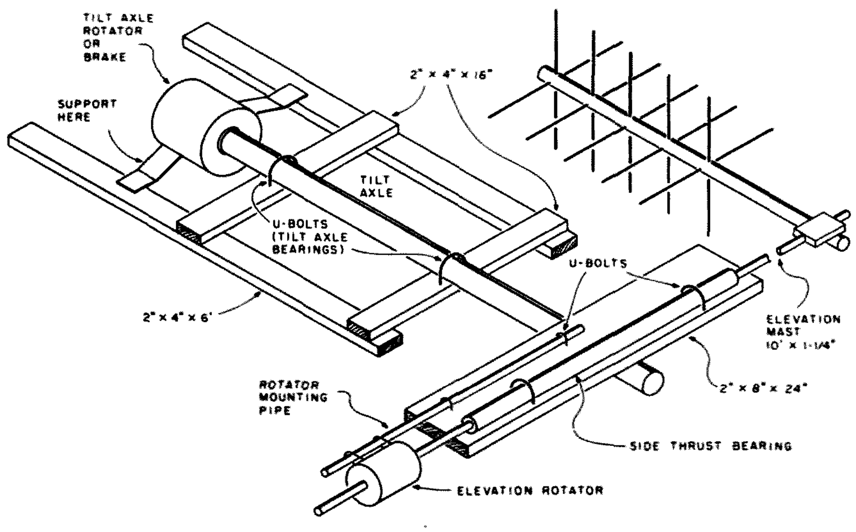


Fig. 2. Antenna/rotator assembly with antenna oriented to begin an overhead pass.

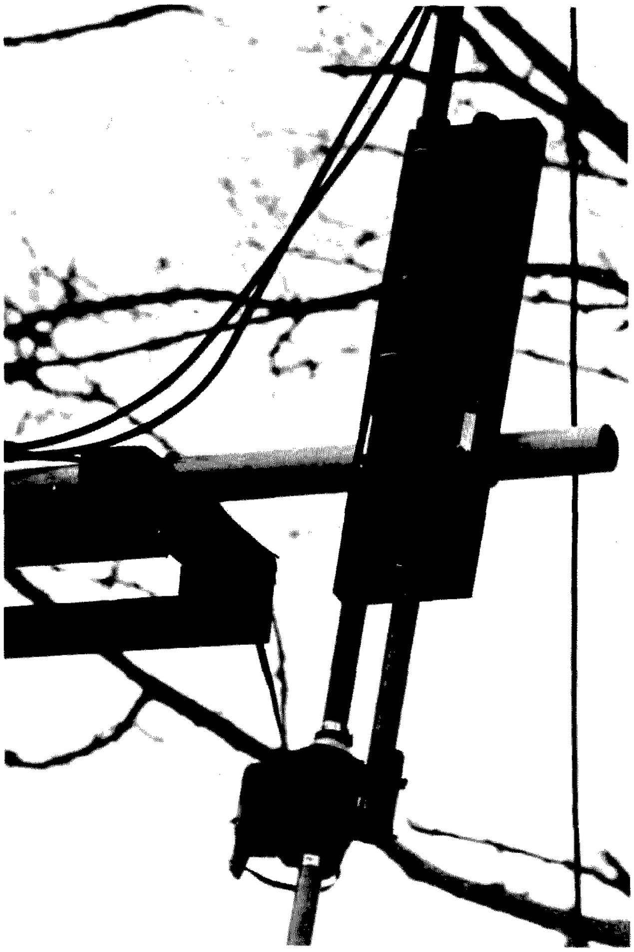


Photo B. Close-up view of the elevation rotator mounting board. Note the method of mounting. A small tab must be removed from this type of rotator in order to mount it right-side up.

pass. As the satellite rises and travels toward the midpoint of its arc, the elevation rotator is activated. Instead of moving to the vertical position, the antenna will closely follow the satellite. We have tilted the plane described by the elevation rotator so that it nearly coincides with the plane of the orbit. To the elevation rotator, the satellite appears to be making an overhead pass.

At this point, you are probably thinking that it sounds too easy and that there must be a catch. The catch is that the system is not perfect; there are some pointing errors, the magnitude of which depends on the orbit involved, the position of the satellite along the orbit, whether it is a descending or ascending pass, and if the automatic tracking unit is used. To find out just how big the errors are, I made an analysis of several typical orbits.

I selected orbits for OSCAR 8 when it reached a maximum elevation of 30 degrees and 60 degrees to the east and to the west. I also analyzed the overhead pass. I drew up charts for the first four orbits—shown in Fig. 1. (There is no chart for the overhead orbit as the antenna follows the satellite very closely and the pointing error probably does not exceed 5 degrees.) The charts are set up using conventional azimuth and elevation bearings for the two axes, azimuth along the bottom and elevation up the side. You will notice that the antenna coordinates start at 170 degrees and end at 350 degrees as opposed to a true north-south. This 10-degree difference is to compensate for the inclination of OSCAR 8's orbit and will be discussed later. The antenna coordinates have been calculated, while those for the satellites have been measured using an OSCARLOCATOR. If you use the automatic control unit, the pointing errors will generally be greater than indicated by the charts since the additional dimension of time is added. With the automatic control unit, the antenna will match the satellite at the beginning, end, and midpoint of the pass. The remainder of the time there will be some additional error. This error is greatest for overhead passes and becomes minor for passes below a maximum elevation of 60 degrees.

Mounting

The way you mount the rotators will determine the degree of success of your installation, so exercise care and do the job correctly. The angles and various motions are unusual, and if you do not think things through carefully you can get into trouble.

The most important point to keep in mind is that the system must be made so that it cannot self-destruct. In this regard, my prototype was somewhat short of being a resounding success. I was trying out the automatic control unit when I noticed that the swr seemed to be increasing on the 2-meter uplink antenna. I shut everything down and headed outside to see if I could spot a loose cable or whatever. "Whatever" turned out to be a mangled ten-element "Twist" antenna. I had gotten the control unit hooked up the wrong way and automatically rotated my antenna into the chimney on which everything is mounted. Those little TV rotators are amazingly powerful. I rebuilt everything and modified the mounting so that there is plenty of clearance for the antenna regardless of which rotator I operate in any direction. Once the rotators are set up and the antennas mounted, I suggest you move the rotator controls to a position where the antennas may be observed and try simulating several satellite passes to get the feel of everything.

The mounting I ended up with has worked well for some time now, and it was very inexpensive. I will describe it in detail so that it may be copied. The dimensions and materials are not critical and may be changed to suit your situation and junk box. I constructed the mounting first, which clamps to my chimney, but you could use any type of support such as a tower or telephone pole. Next, I built the "tilt-axis" support, a rectangular arrangement of two-by-fours used to hold the tilt-axis rotator and axle.

The axle must be long enough to allow the antenna to clear the mounting support. It is mounted parallel to the Earth on a true bearing of 350 degrees. I used a piece of 2-1/2-inch aluminum conduit for the axle and a prop-pitch motor for the tilt-axis rotator. (The motor was contributed by a friend, W1NDO/3.) Smaller tubing would work just as well, and the rotator could be eliminated. If you have access to the mounting before each satellite orbit, you could substitute a brake mechanism for the rotator. Remember that the tilt-axis rotator is not operated during any particular orbit.

I started out climbing up on the roof of my house be-

fore each pass and presetting the tilt angle. This was a little inconvenient, so I added the tilt rotator. If you do use a rotator for this function, I recommend a good one, preferably one with a brake. There will be a fair amount of stress unless you keep everything perfectly balanced.

The elevation-rotator mounting board is assembled next. I used a two-by-eight board which is secured to the tilt axle with U-bolts. This board acts as a mounting platform for the TV-type elevation rotator and holds a side-thrust bearing. This bearing is nothing more than a two-foot section of pipe which is just large enough to allow the elevation mast to pass through it without binding. I used a 1-1/4-inch mast and a pipe with a 1-3/8-inch inside diameter for the side-thrust bearing. The bearing is secured to the mounting board with two U-bolts. Be sure it is perpendicular to the tilt axle or additional tracking errors will result.

Next, insert the mast in the side-thrust bearing and attach the rotator to the mast. Bolt a short section of pipe to the bracket which is used to mount the rotator. This pipe should be parallel to the side-thrust bearing and about 3 inches away. It is fastened to the rotator mounting board with two U-bolts. The rotator should be on the opposite side of the tilt axle from the antenna to help balance the tilt axis. Be sure the rotator is not mounted upside down, as then it will turn the wrong direction. You may have to file off a small tab on some TV rotators.

Paint all wooden parts and apply a little axle grease to the bearing surfaces. The rotator assembly is ready to be mounted to your supporting structure. Since the antenna rotator assembly is fairly heavy and is not well balanced, make this attachment strong. The unbalance results from mounting the assembly near the tilt rotator so that the antenna will clear the support. You should be able to point the antenna at the support with the elevation rotator and then turn the tilt rotator through 360 degrees without the antenna being fouled anywhere. The mounting should be aligned 10 degrees west of true north. This works well for OSCAR 8.

Automatic Control Unit

The purpose of the control unit is to periodically turn the elevation rotator on and off. If the frequency and duration of the "on" pulses are just right, the antenna will move evenly across the sky from horizon to horizon in the same time it takes the satellite to make its pass. Fig. 3 is a schematic of the circuit I used to operate the elevation rotator. The values of the components will turn the rotator on every 40 seconds for a duration of 1 to 3 seconds, meaning that the rotator would be on for about 2 seconds and off for 38 seconds, then back on again. At a normal rotator speed of 1 rpm (3 degrees per second), it will take 20 minutes for the antenna to turn the necessary 180 degrees to track the satellite. By adjusting the "on" time or duration, we can adjust the effective rotation speed to correspond to the speed of the satellite.

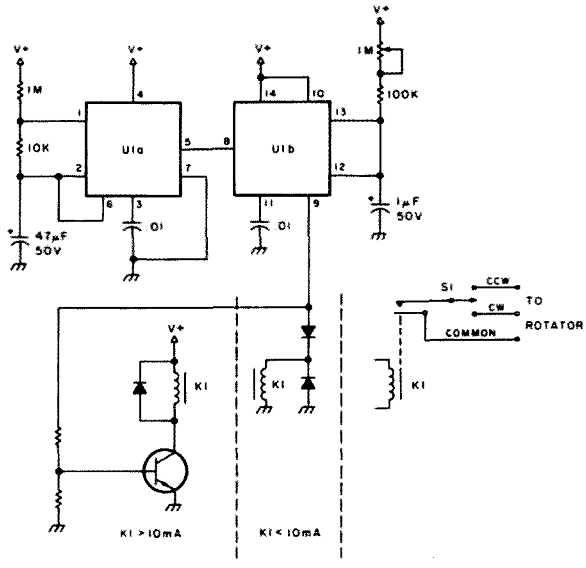


Fig. 3. Automatic control unit. The relay circuit on the left is for relays which draw over 10 mA, the one in the center for relays drawing less than 10 mA, and the circuit on the right shows the wiring of the relay contacts.

The control is made up of two multivibrators and a relay circuit. All parts may be purchased from Radio Shack, and values are not very critical. Integrated circuit U1 is a 556 dual timer. The first timer is an astable multivibrator with a frequency of 40 seconds per cycle (.025 Hz). The other section, U1b, is a one-shot multivibrator with an adjustable cycle length. It is triggered by the astable multivibrator and its output operates the relay. The time constant may be varied by the 1-meg potentiometer.

Two relay circuits are shown. If your relay draws less than 10 mA, you may omit the transistor and diode D3; the IC can drive the relay directly. Be sure to use the appropriate diode to protect the transistor or the IC from high voltages which can be developed when the magnetic field in the relay collapses. The relay is wired in parallel with the rotator switch. A DPST switch is inserted in the line to select clockwise or counterclockwise rotation. The relay must be capable of handling the current and voltage across the rotator switch, so you should check this out before purchasing a relay. You may want to install another switch on the unit to operate a brake if your rotator is so equipped, or to turn the power to the rotator on and off. In my unit, the power switch was integral to the rotation switch. This on-off switch had to be paralleled along with the rotation-select switch.

Calibration of the control unit is easy. Tape a piece of paper behind the control knob for the 1-meg pot. Mark four or five settings on the paper at random. Set the control to the first mark and time how long the rotator takes to turn 180 degrees. This time, in minutes, is marked on the paper. Continue on to the other marks and do the same. You'll end up with a dial calibrated in minutes.

Operation

Operation of the system is not difficult. Using an OSCARLOCATOR or similar device, determine the maximum elevation the satellite will reach and how long it will be above the horizon. Set the tilt axle so that the elevation mast is pointing 90 degrees from the highest elevation reached by the satellite. If the satellite reaches an elevation of 60 degrees above the eastern horizon, point the elevation mast to 30 degrees above the western horizon. If the satellite reaches 40 degrees above the western horizon, point the mast 50 degrees above the eastern. Next, set the elevation to point the

antenna south for an ascending pass and north for a descending pass. If you have everything set up properly, the antenna should be horizontal. If you are using the automatic control unit, set the 1-meg control to the number of minutes the satellite will be above the horizon. Once you have acquisition of the satellite, turn on power to the control unit and everything is automatic from then on. Be sure to turn off the control unit after the pass or the antenna will continue to rotate.

If you are not using the automatic control unit, you will have to adjust the elevation rotator manually. This is really easy; just operate the elevation control from time to time keeping the signal as loud as possible. Remember, you are operating only one rotator. I found that a short burst every two or three minutes will keep your antenna fairly close to the satellite. When not using the system to track satellites, it works well for terrestrial operations. This may be accomplished by positioning the elevation mast so that it is vertical: the antenna will be horizontal and the elevation rotator will act as a conventional rotator.

My experience has shown that the automatic unit works best on orbits below 60 degrees maximum elevation. Above 60 degrees, I usually operate manually. My antenna is a ten-element Twist for 2 meters, a dipole for 10 meters, and I hope to add a small helical for 70 cm. I have had no problems with all of these antennas on my mounting. I have found that operating through OSCAR has been a real pleasure since installing my system. ■

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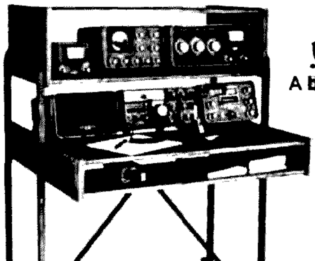

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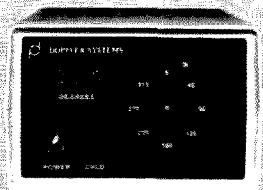

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SOCIAL EVENTS

DAYTON OH
APR 29-MAY 1

The first International VHF/UHF Conference will be held from April 29-May 1, 1983, as part of the Dayton Hamvention, Dayton OH. There will be technical talks and forums with recognized experts, noise-figure and antenna-gain measuring contests, and a hospitality suite get-together with refreshments. For further information, or to advise us of participation in the noise-figure and antenna contests, please contact Jim Stitt WA8ONQ, 311 N. Marshall Road, Middletown OH 45042, or phone (513)-475-4444 (business) or (513)-863-0820 (home).

DAYTON OH
APR 30-MAY 1

The Dayton Amateur Radio Association, Inc., will sponsor the Dayton Hamvention on April 30-May 1, 1983, at the Hara Arena and Exhibition Center, Dayton OH. Admission is $7.00 in advance and $9.00 at the door (valid for all 3 days). Flea-market space is $15.00 in advance and $16.00 at the door. Other features will include forums, new products, exhibits, women's activities, awards, and special group meetings. For special motel rates and reservations, write to Hamvention Housing, 1406 Third National Building, Dayton OH 45402 (no reservations will be accepted by telephone). For other information, write Box 44, Dayton OH 45401, or phone (513)-849-1720. Make checks payable to Dayton Hamvention, Box 2205, Dayton OH 45401.

GREENVILLE SC
APR 30-MAY 1

The Blue Ridge Amateur Radio Society will hold the Greenville Hamfest on Saturday and Sunday, April 30-May 1, 1983, at the American Legion Fairgrounds, White Horse Road, ½ mile north of I-85, Greenville SC. Admission will be $3.00. For advance sales, write Mrs. Sue Chism, Rt. 6, 203 Lanewood Drive, Greenville SC 29607. Talk-in on 146.01/.61 and 223.46/224.06. For further information, write Phil Mullins WD4KTG, Hamfest Chairman, PO Box 99, Simpsonville SC 29681.

SACRAMENTO CA
MAY 1

The North Hills Radio Club will sponsor its 11th annual Sacramento Valley Amateur Radio Hamswap on May 1, 1983, from 9:00 am to 3:00 pm, at the Placer County Fairgrounds, Roseville CA. Admission is free. Tables will be $6.00 to $8.00 and tailgate sites will be $5.00. Talk-in on 144.59/145.19 (K6IS repeater). For further information, contact Doug Long KB6ZR, 8810 Swallow Way, Fair Oaks CA 95628, or phone (916)-961-0728.

CENTRALIA IL
MAY 1

The Centralia Wireless Association, Inc., will hold its annual hamfest on Sunday, May 1, 1983, at the Kaskaskia College Gymnasium, 3 miles northwest of Centralia IL. Admission to the hamfest is free and there will be no charge for the flea-market and exhibit space (a limited number of tables will be issued on a first-come, first-served basis). Doors will open at 7:00 am for flea-market and exhibit setups. Food and refreshments will be available, as well as plenty of free parking. Talk-in on 147.27/.87 and 146.52. For further information, phone Bud King WB9QEG at (618)-532-6606, Lou Hodges W9IL at (618)-533-4724, or write CWA, Inc., PO Box 1166, Centralia IL 62801.

SANDWICH IL
MAY 1

The Kishwaukee Radio Club will hold a hamfest swap and shop on Sunday, May 1, 1983, at the Sandwich Fairgrounds, Sandwich IL. Advance tickets are $2.50 and tables are $3.00 each. Overnight camping (no hookups) will be available. Talk-in on 146.52 and .13/.73. For more information, contact Howard Newquist WA9TXW, PO Box 349, Sycamore IL 60178.

MELVILLE LI NY
MAY 1

The Suffolk County Radio Club All-Indoor Flea Market will be held on Sunday, May 1, 1983, from 8:00 am to 3:00 pm, at Republic Lodge No. 1987, 585 Breadhollow Road (Route 110), Melville LI NY. General admission is $2.00; children under 12 and wives will be admitted free. Sellers' tables are $7.00 (which includes one admission). There will be refreshments and free parking. Talk-in on 144.61/145.21 and 146.52. For additional information, contact Richard Tygar AC2P evenings at (516)-643-5956.

PUTNAM CT
MAY 1

The Eastern Connecticut Amateur Radio Association will hold its 9th annual radio and computer flea market on Sunday, May 1, 1983, from 9:00 am to 2:00 pm, rain or shine, at the Elks Lodge, Putnam CT (just off exit 96 of Route 52). Tables are $5.00 in advance or $7.00 at the door. Electricity, food, and beverages will be available. Talk-in on 147.225 (K1MUJ repeater). For reservations or additional information, write Don Amirault K1APE, 66 Labonte Road, Box 310, RR #1, Thompson CT 06277, or phone (203)-923-2727.

PARAMUS NJ
MAY 1

The Bergen ARA will hold a Ham Swap 'n' Sell on May 1, 1983, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. Admission for sellers is $3.00; buyers will be admitted free. There will be thousands of spaces but tailgating only. Sellers must bring their own tables. Talk-in on .79/.19 and .52. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

DULUTH MN
MAY 7

The Arrowhead Radio Amateur Club will hold its annual swapfest on Saturday, May 7, 1983, from 10:00 am to 3:00 pm, at the Holiday Inn, 207 West Superior Street, downtown Duluth MN. Admission will be $2.50 in advance or $3.00 at the door. Tables (4-foot) are $3.50 in advance or $4.00 at the door. There will be plenty of food, free parking in the ramp, and an enclosed shopping mall for the XYLs. Talk-in on .34/.94. For advanced reservations, room discount rates, or more information, send an SASE to Jerry Frederick N0BNG, 1127 104th Avenue West, Duluth MN 55808.

CEDARBURG WI
MAY 7

The Ozaukee Radio Club will sponsor its 5th annual swapfest on Saturday, May 7, 1983, from 8:00 am to 1:00 pm, at the Circle B Recreation Center, Highway 60, Cedarburg WI (located 20 miles north of Milwaukee). Admission is $2.00 in advance and $3.00 at the door. All 8-foot tables are $3.00. Sellers will be admitted at 7:00 am for table setups. Food and refreshments will be available. For tickets, tables, maps, or more information, send an SASE to 1983 Ozaukee Radio Club Swapfest, PO Box 13, Port Washington WI 53074.

NEENAH WI
MAY 7

The 3F ARC Swapfest will be held on May 7, 1983, from 8:00 am to 3:00 pm, at the Neenah Labor Temple, Neenah WI. Tables (4-foot) are $1.50 in advance and $2.00 at the door. Talk-in on 144.61/145.21. For advance registration, contact Mark Michel W9OP, 339 Naymut Street, Menasha WI 54952.

BREWSTER NY
MAY 7

The Putnam Emergency Amateur Repeater League (PEARL) will hold its 2nd annual indoor hamfest on Saturday, May 7, 1983, from 9:00 am to 4:00 pm, at the JFK Elementary School, Foggintown Road (off Farm-to-Market Road, off Route 312), Brewster NY. General admission is $1.00 and exhibitors' admission is $4.00. Talk-in on 144.535/145.135 and .52. For advance table registration and further information, contact Frank Konecnik WB2PTP, RD 1, 244 C, Carmel NY 10512.

DEERFIELD NH
MAY 7

The Hosstraders will hold their tenth annual Tailgate Swapfest on Saturday, May 7, 1983, from sunrise to sunset, at the Deerfield NH Fairgrounds. Admission is $1.00 for all, including tailgaters and commercial dealers. For a nominal fee, there will be Friday-night camping for self-contained rigs. No one will be admitted before 4:00 pm Friday. Profits will benefit the Boston Burn Unit of the Shriners' Hospital. Last year's donation was $2,622.75. For further information or a map, send an SASE to Norm WA1IVB, RFD Box 57, West Baldwin ME 04091; Joe K1RQG, Star Route, Box 57, Bucksport ME 04416; or Bob W1GWU, North Walton Road, Seabrook NH 03874.

BATON ROUGE LA
MAY 7-8

The Baton Rouge Amateur Radio Club will hold its annual hamfest on Saturday and Sunday, May 7-8, 1983, at Catholic High School, 855 Hearthstone Drive, Baton Rouge LA. There will be forums, and activities for the non-ham wives and children. Talk-in on .19/.79 and .52. For further information, write BRARC, PO Box 4004, Baton Rouge LA 70621.

CADILLAC MI
MAY 14

The Wexaukee Amateur Radio Association will hold its 23rd annual Swap Shop & Eyeball QSO on Saturday, May 14, 1983, from 8:00 am to 2:30 pm, in the Wexford Civic Arena, US 131 North, Cadillac MI. Transportation will be available for anyone flying in and there is camping in the area. Talk-in on 146.37/.97 (WA8SUE). For further information, please write to Wexaukee Amateur Radio Association, PO Box 163, Cadillac MI 49601.

YAKIMA WA
MAY 14-15

The Yakima Amateur Radio Club (W7AQ) will hold the Central Washington State hamfest on May 14-15, 1983, at the Hobby Building at the Central Washington State Fairgrounds, Yakima WA. On Saturday, the hours will be 9:00 am to 5:00 pm with lunch available; on Sunday, 8:00 am to 2:00 pm with breakfast and lunch available. Registration is $4.00 in advance and $5.00 at the door. Activities include regional dealers' displays and a free swap and shop with plenty of tables. Talk-in on 148.01/.61. For pre-registration, contact Dan Haughton, PO Box 9211, Yakima WA 98909.

WAGONER OK
MAY 14-15

The Broken Arrow Amateur Radio Club will hold their annual swapfest on Saturday and Sunday, May 14-15, 1983, at the Western Hills Lodge in Sequoyah Park, located 6 miles east of Wagoner OK (off highway 51). The hours on Saturday will be 9:00 am to 5:00 pm and on Sunday, 9:00 am to noon. Admission at the door is $3.00 for both days or $2.50, if pre-registered. Swap tables are available at the door for $10.00 for both days or $7.00, if pre-registered. There will be dealer and non-dealer displays and many family-fun things to do at the lodge. A cookout dinner will be served on the lakeshore Saturday night. For more information and pre-registration forms, contact Vic Yingst KD5KI at the BAARC, PO Box 552, Broken Arrow OK 74012.

WABASH IN
MAY 15

The Wabash County Amateur Radio Club will hold its 15th annual hamfest on Sunday, May 15, 1983, from 5:00 am to 3:00 pm, at the 4-H Fairgrounds, Wabash IN. Admission is $2.50 in advance and $3.00 at the door. There will be a large flea market, a dealers' display inside, and free overnight camping. Talk-in on 147.63/.03 or 146.52. For more information, send an SASE to Dave Spangler N9ADO, 45 Grant Street, Wabash IN 46992.

EASTON MD
MAY 15

The ninth annual Easton Amateur Radio Hamfest will be held on May 15, 1983, rain or shine, from 8:00 am to 4:00 pm, in the Easton Senior High School Cafetorium, Route 50 at mile marker 66, just south of Easton MD. Donations are $2.00, with an additional $4.00 for tables or tailgaters. Talk-in on 146.445/147.045 and .52. For more information, write Van Herridge WB3HGQ, Box J, St. Michaels MD 21663 or Easton Amateur Radio Society, Inc., Box 781, Easton MD 21601.

ARVA ONT CAN
MAY 15

The annual Southern Ontario Repeater Team Amateur Radio Flea Market will be held on Sunday, May 15, 1983, from 9:00 am to 2:00 pm, at Medway High School, Medway Road (just west of Highway 4), Arva, Ontario. Admission is $2.00 per person. For sellers, indoor or outdoor permits are $1.00 and indoor tables are $2.00 each. Sellers

only will be admitted at 8:00 am; they are required to purchase an admission ticket. For table reservations, write SORT, Inc., PO Box 73, Hyde Park ONT N0M 1Z0, or call Dave Toth VE3GYQ at (519)-473-1643.

EVANSVILLE IN
MAY 15

The Tristate Amateur Radio Society (TARS) will hold their annual hamfest on Sunday, May 15, 1983, beginning at 6:00 am CDT, at the Vanderburgh County 4-H Center, Evansville IN. Admission is $2.00. It will be indoors (air-conditioned) and tables will be available. There will also be an outdoor flea market. Talk-in on 147.75/.15 and 146.19/.79. For additional information and table reservations, contact Hal Wilson WB9FNN, RR #8, Box 427B, Evansville IN 47711.

WRIGHTSTOWN PA
MAY 15

The Warminster Amateur Radio Club will hold its annual hamfest on Sunday, May 15, 1983, from 7:00 am to 2:00 pm, at the Middletown Grange Fairgrounds, Penns Park Road, Wrightstown PA, near Philadelphia. Admission is $3.00 per ham with an additional $2.00 for each 8-foot seller's space. There will be inside spaces but no power will be available. If pre-registered before May 1, 1983, the admission fee will be $1.00 less. Refreshments will be available. Talk-in on 147.69/.09 and 146.52. For more information, contact WARC, Box 113, Warminster PA 18974, or phone Frank AK3O at (215)-968-3133 after 2300 UTC.

KNOXVILLE IL
MAY 15

The Knox County Amateur Radio Club will hold their ARRL-approved 1983 hamfest on May 15, 1983, just off I-74 at Knoxville IL. Tickets are $2.00 in advance and $3.00 at the gate. Camping will be available. For more information or tickets, contact Timothy S. Smith KA9LXB, 229 South Main Street, Monmouth IL 61462, or Keith Watson WB9KHL, 119 South Cherry Street, Galesburg IL 61401.

ATHENS OH
MAY 15

The Athens County ARA will hold their annual hamfest on Sunday, May 15, 1983, from 8:00 am to 4:00 pm, at the Athens City Recreation Center, US 33 and 50. Setup begins at 7:00 am. Tickets are $1.00 in advance and $2.00 at the gate. There will be acres of outside, paved flea-market area at $2.00 per space. Indoor flea-market space is $3.00 and is available on a first-come, first-served basis. There will be food, free parking, and nearby restaurants, recreation area, and the Athens Mall. Talk-in on 146.34/.94. For more information or tickets, write ACARA, PO Box 72, Athens OH 45701, or phone Joe WB8DOD at (614)-797-4874.

ROCHESTER NY
MAY 20-21

The Rochester Hamfest, in conjunction with the ARRL New York State and Atlantic Division Conventions, will be held on May 20-21, 1983, at the Marriott Thruway Hotel and the Monroe County Fairgrounds. Tickets are $4.00 in advance and $5.00 at the gate. Flea-market tickets are $2.00 per space. The banquet will be held at 6:30 pm on Friday and be followed by the annual Funfest at 8:00 pm. The flea market will open at 6:00 am on Saturday; the commercial exhibits, at 8:30 am. The hamfest will close at 6:00 pm. There will be FCC exams given at the Rochester Hamfest for those who have sent Form 610 to FCC, 1307 Federal Building, 111 W. Huron Street, Buffalo NY 14202, by May 1st. A ladies' program will be available. Talk-in on 146.28/.88 and 144.51/145.11. For advance tickets, contact K2MP, 737 Latta Road, Rochester NY 14612. For more information, write Rochester Hamfest, 300 White Spruce Boulevard, Rochester NY 14623.

ROGERS AR
MAY 21

The Northwest Arkansas Amateur Radio Club, Inc., will hold its 3rd annual Hamfest/Swapmeet on Saturday, May 21, 1983, from 8:00 am to 4:00 pm, at the Rogers Youth Center, 315 West Olive Street, Rogers AR. General admission is free. The fee for commercial exhibitors and flea market space is $2.00 on a first-come, first-serve basis. Doors will open at 6:00 am for setups. Free parking will be available and there will be a snack bar on the premises. Talk-in on 146.16/.76 and 146.52. For more information, write Mary Webb KA5HEV, PO Box 338, Prairie Grove AR 72753.

COLUMBIA MO
MAY 21

The 8th annual Columbia Hamfest will be held on Saturday, May 21, 1983, at the Columbia Ramada Inn. Admission to the Convention Center is $3.00 at the door or $2.50 in advance. A large, hard-surfaced parking area near the Convention Center will be provided for tailgaters; reserved tailgating space is $2.00, or $1.00 as you enter. There will be a banquet on Friday night, May 20th, at the Ramada Inn with Joel P. Kleinman N1BKE as keynote speaker. Tickets are $12.00 each and may be purchased in advance only. Other features include commercial exhibits, free forums, and amateur organization meetings. Talk-in on 146.16/.76. For more information, tickets, or Ramada reservations, write Columbia Hamfest '83, PO Box 283, Columbia MO 65205.

HARTWELL GA
MAY 21-22

The Anderson, Hartwell, and Toccoa Amateur Radio Clubs will hold the 5th annual Lake Hartwell Hamfest on May 21-22, 1983, at the Lake Hartwell Group Camp, located on Highway 29, 4 miles north of Hartwell GA. There will be free admissions, camping, and flea-market space. Activities include a left-footed CW contest and games. Fishing, swimming, and camping (campgrounds open at 6:00 pm on Friday) are available on the site. Talk-in on 146.19/.79, 147.93/.33, and 146.895/.295. For further information, contact Ray Pettit WB4ZLG, Rt. #1, Dooley Drive, Toccoa GA 30577.

KENNEWICK WA
MAY 21-22

The Tri-City Hamfest Council will hold its 4th annual hamfest on May 21-22, 1983, starting at 9:00 am, at the Benton-Franklin Fairgrounds, Kennewick WA. Admission is $3.00 in advance and $4.00 at the door, and children under 12 will be admitted free. There will be vendors, swap tables, and a bunny hunt on Sunday morning. Camping and RV space will be available at the site for $6.00. For reservations or more information, write Tri-City Hamfest Council, PO Box 1181, Richland WA 99352, or phone (509)-967-2358 or (509)-586-9375.

PITTSBURGH PA
MAY 22

The 29th annual Breeze Shooters Hamfest will be held on Sunday, May 22, 1983, from 9:00 am to 5:00 pm, at the White Swan Amusement Park, Rte. 60 (Parkway West), near the Greater Pittsburgh International Airport, Pittsburgh PA. Registration is $2.00 or three for $5.00. There will be a free flea market and a family amusement park. Sheltered tables for vendors are available by advance registration only. Talk-in on 146.28/.88 or 29.0. For further information, contact Don Myslewski K3CHD, 359 McMahon Road, North Huntingdon PA 15642, or phone (412)-863-0570.

DELOIT IA
MAY 22

The Denison Repeater Association will hold its annual flea market on Sunday, May 22, 1983, from 8:30 am to 4:00 pm, in Deloit IA. General admission is $1.50 in advance or $2.00 at the door. Sellers' tables are $2.00 in advance or $3.00 at the door. There will be tailgating, if weather permits. Talk-in on 147.69/.09 and 146.52. For more information, write Gene Mitchell N0DQS, Highway 39, Deloit IA 51441, or call (712)-263-4782.

FREMONT OH
MAY 22

The Fremont, Ohio, Radio Club, in cooperation with the Ottawa County Radio Club, will hold their 6th annual hamfest on May 22, 1983, beginning at 8:00 am, at the fairgrounds in Fremont OH. Flea-market tickets are $2.50 in advance and $3.00 at the door. Tables are $3.00 per 8 feet. Dealers may set up at 7:00 am. Talk-in on .31/.91 and .52. For tickets and table reservations, send an SASE to John Dickey W8CDR, 545 N. Jackson Street, Fremont OH 43420, or call (419)-332-8066.

MUNCIE IN
MAY 22

The fourth annual MAARC Hamfest will be held on Sunday, May 22, 1983, from 8:00 am to 3:00 pm, in the Memorial Building located on the grounds of the Delaware County Fairgrounds. Tickets are $2.00 in advance and $3.00 at the door, and flea-market tables are $5.00 each on a first-come basis. Two new features are computer displays and the first annual Middletown USA QSO party which will be run during this weekend. The MAARC club station will be in operation from the hamfest site. Electrical hookups and security will be provided during the entire show in a clean and fully enclosed building. Food and free parking will be available. Talk-in on 146.13/.73, 146.52, and 223.10/224.70. For additional information, contact Craig Graham WD9EHF, RR 12, Box 86, Muncie IN 47302.

KNOXVILLE TN
MAY 28-29

The Radio Amateur Club of Knox County will hold its 17th annual hamfest on May 28-29, 1983, at the Kerbella Temple Auditorium, just east of US 441 at the Tennessee River behind the Vol Inn Motel. On Saturday, the hours will be 9:00 am to 5:00 pm and on Sunday, 10:00 am to 4:00 pm. Admission is $2.00 in advance and $3.00 at the door. There will be radio and computer forums, dealers, indoor and tailgate flea markets, and free parking. Talk-in on 147.90/.30. For tickets, dealer, or flea-market information, contact Mark Nelson AJ2X, 4317 Foley Drive, Knoxville TN 37918, or phone (615)-687-9656.

WEST FRIENDSHIP MD
MAY 29

The Maryland FM Association will hold its annual hamfest on Sunday, May 29, 1983, from 8:00 am to 4:00 pm, at the

HAM HELP

Is anybody out there willing to donate printed QSL cards? Surely somebody prints them up who could donate a batch.

Gary Mitchell KH8AC
c/o Box 1536
Hilo HI 96720

I am looking for information on RTTY interfacing for the Texas Instruments TI-99/4A home computer.

Paul McDonald
PO Box 7068
Nashua NH 03060

I need service information and schematics for the Bearcat 220 scanner. I will pay copying and mailing costs.

Scott Raigner N7BNP
626 NE Floral Pl.
Portland OR 97232

Wanted: Technical Material Corp. PS-4A low-voltage power supply (military no. PP-2765A/URA-36) for use with the PAL-1K(A) linear amplifier.

Michael Pallock NA6J
4955 School House Road
Catheys Valley CA 95306

I would like to find the schematic and maintenance manual for the Ligna-Sweep model C-P, made by Kay Electronics of Pine Brook NJ. I will pay all costs.

Stas J. Andrzejewski W6UCM
7970 Orchid Dr.
Beuna Park CA 90620

Can anyone provide me with detailed information for properly connecting a TVT 6-5/8 (a construction project from *Cheap Video Cookbook* by Don Lancaster) to a VIC-20 computer?

Joe Demke W7KCF
R4-100
Hillsboro OR 97123

I am desperately looking for a schematic and technical manual for a Pride KW-ONE 80-10 meter linear amplifier. I will pay a reasonable fee for the information.

Mark Macktanar WB8EHE
23563 W. Walbridge Rd.
Curtice OH 43412

I have an Aerotron 700 FM base station and I need a schematic for it. I would also like to hear from someone who has converted this rig to 10-meter FM.

Hoyt Duff KB4OQ
2209 New Bern Lane
Virginia Beach VA 23451

I am looking for manuals or schematics for the Hickock model 1805A oscilloscope, Polarad model DU2A TSA-W spectrum analyzer, Ampex model VR 7000 video tape recorder #70, Singer TML 4/120 telemetering indicator, Erie model 400 counter, Beckman model 7360-20 counter, and TEK 535-S4 oscilloscope.

Jim Babb WA0DBT
636 N. 6
Wakeeny KS 67672

Howard County Fairgrounds in West Friendship MD (about 30 miles west of Baltimore on I-70). Admission is a $3.00 donation, tailgating is $3.00, and inside tables are $6.00 each in advance and $10.00 each on the day of the hamfest, if available. There will be commercial displays (commercial vendors must have proper tax/license certificates available and items offered for sale must be amateur-radio related). Ample parking, food, and drink will be available. Talk-in on 146.16/.76 and 146.52. For reservations and more information, contact John Elgin WA3MNN, 5495 Apt. 2, Harpers Farm Road, Columbia MD 21044, or phone (301)-596-3741.

ST. PAUL MN
JUN 4

The North Area Repeater Association will sponsor the Amateur Fair, a swapfest and exposition, on June 4, 1983, from 6:00 am to 6:00 pm, at the Minnesota State Fairgrounds in St. Paul MN. Admission is $4.00 and children under 12, accompanied by an adult, will be admitted free. Features will include an inside flea market but space is limited and available on a first-come, first-serve basis and tables will not be provided. There will be demonstrations, exhibits, booths, an outdoor flea market, and on Friday, June 3rd, free overnight parking for self-contained campers. There will be food concessions inside and outside, and free parking will be available. Talk-in on .25/.85 or .16/.76. For more information or dealer inquiries, write Amateur Fair, PO Box 857, Hopkins MN 55343, or call (612)-420-6000.

GUELPH ONT CAN
JUN 4

The Guelph Amateur Radio Club (VE3ZM) will hold the 9th annual Central Ontario Amateur Radio Flea Market and Computerfest on Saturday, June, 4, 1963, from 8:00 am to 4:00 pm, at Regal Hall, 340 Woodlawn Road West, Guelph ONT. Admission is $2.00 and children 12 years and under will be admitted free. Vendors must pay an additional $3.00. Doors will be open to vendors only from 6:00 am and a quantity of 3′ × 8′ tables will be available for rental for $5.00 each. Features will include commercial displays, surplus dealers, computer software and hardware, indoor and outdoor displays, and a refreshment concession. Talk-in on 146.370/146.970 (VE3KSR), 147.960/147.360 (VE3ZMG), and .52/.52. For further information contact Al Krist VE3KVI at (519)-821-4337, Henry Christiansen VE3BYU at (519)-743-9022, or write VE3ZM, PO Box 1305, Guelph ONT N1H 4M9, Canada.

GRAND RAPIDS MI
JUN 4

The Independent Repeater Association will hold its annual Hamfestival on Saturday, June 4, 1983, from 8:00 am to 4:00 pm, at the Wyoming National Guard Armory, 44th Street, just east of the US-131 expressway. Admission is $3.50. Free table space will be provided to all sellers and dealer setups will be at 6:00 am. Programs will include ATV, satellites, QRP, DX, a CW rx contest, computers, technical upgrade course, MARS, and a shack-photo contest. Talk-in on 147.165/147.765. For advance table reservations or for more information, call John Knoper KC8KK at (616)-534-5501, or write IRA, 562 92nd Street, SE, Byron Center MI 49315.

MANASSAS VA
JUN 5

The Ole Virginia Hams ARC, Inc., will hold the ninth annual Manassas Hamfest on Sunday, June 5, 1983, beginning at 8:00 am, at the Prince William County Fairgrounds, VA Route 234, ½ mile south of Manassas VA. General admission is $4.00 per person (children under 12 will be admitted free) and there will be no advance sales. Activities will include 25 acres of tailgating (setups at 7:00 am), indoor commercial exhibits, breakfast and lunch menus, a YL program, and CW proficiency awards. Talk-in on 146.37/.97 (Manassas repeater) and 146.52. For more information, contact Bob Kelly KA4NES, General Chairman, Manassas Hamfest, c/o Ole Virginia Hams ARC, Inc., PO Box 1255, Manassas VA 22110, or phone (703)-361-9468.

HUMBOLDT TN
JUN 5

The Humboldt Amateur Radio Club will hold its annual hamfest on Sunday, June 5, 1983, from 8:00 am to 4:00 pm, at Bailey Park in Humboldt TN. Admission is $2.00. There will be a flea market, ladies' activities, lunches, refreshments, and RV parking. Talk-in on 146.37/.97. For more information, contact Ed Holmes W4IGW, 501 N. 18th Avenue, Humboldt TN 38343.

CHELSEA MI
JUN 5

The Chelsea Swap and Shop will be held on Sunday, June 5, 1983, at the Chelsea Fairgrounds, Chelsea MI. Gates will open for sellers at 5:00 am and for the public from 8:00 am until 2:00 pm. Donation is $2.50 in advance or $3.00 at the gate. Children under 12 and non-ham spouses will be admitted free. Table space is $6.00 per 8 feet and trunk sales are $2.00 per space. There will be plenty of parking (including for the handicapped) and there are campgrounds available in the area. Talk-in on 146.520 and 147.855. For more information, write William Altenberndt, 3132 Timberline, Jackson MI 49201.

TERRE HAUTE IN
JUN 5

The 37th annual Wabash Valley Amateur Radio Hamfest will be held on June 5, 1983, at the Vigo County Fairgrounds on US-41, ½ mile south of I-70. Advance registration is $2.00 or 3 for $5.00, or $3.00 at the gate (children under 12 will be admitted free). A covered, 12 × 12, flea-market space is $3.00; outdoor flea-market space is free. Some ac and tables will be available on a first-come basis. There will be overnight camping, food and refreshments, and a giant shopping mall nearby. Forums will include computer and ARES. For tickets and detailed information, send an SASE to WVARA Hamfest, PO Box 81, Terre Haute IN 47808.

COEUR D'ALENE ID
JUN 11

The Kootenai Amateur Radio Society will hold their Hamfest '83 on Saturday, June 11, 1983, from 8:00 am to 4:00 pm, at the North Idaho Fairgrounds, Coeur d'Alene ID. There will be free swap tables, a large RV parking area, and food available. Talk-in on 146.38/.98 or 146.52. For further information, contact Vladimir J. Kalina, South 1555 Signal Point Road, Post Falls ID 83854.

BOWLING GREEN KY
JUN 11

The Kentucky Colonels Amateur Radio Club, Inc., will hold the 1st annual Bowling Green Swapfest on June 11, 1983, from 8:00 am to 4:00 pm, at the Jaycee Pavilion, Morgantown Road (off US 231), Bowling Green KY. Donations are $2.50 in advance and $3.00 at the door. Indoor, air-conditioned vendor space is $1.00; outside vendor space will be available and all setups begin at 7:30 am. Proceeds will go for emergency communications equipment. There will be plenty of free parking and concessions will be available. Talk-in on .25/.85 (KA4CLL) or 146.52. For more information or advance tickets, please send an SASE to Jack Wilson WA4SAC, 451 Skyline Tr. Park, Bowling Green KY 42101, or Ed Schwab KA4REF, 1546½ Chestnut Street, Bowling Green KY 42101.

DEAL NJ
JUN 12

The Jersey Shore Chaverim Amateur Radio Club will hold the Jersey Shore Hamfest and Electronic Flea Market on June 12, 1983, from 9:00 am to 3:30 pm, at the Jewish Community Center, 100 Grand Avenue, Deal NJ. Admission is $3.00 per person (children under 12 and XYLs will be admitted free). Indoor space is $5.00 for an 8-foot table and outdoor tailgating is $2.50 per space. Refreshments will be available. Talk-in on 147.045 + .6 and 146.52 simplex. For space reservations, send an SASE and check (payable) to Jersey Shore Hamfest, PO Box 192, West Long Branch NJ 07764 by May 15, 1983.

CORTLAND NY
JUN 18

The Skyline Amateur Radio Club (SARC) will hold their hamfest on June 18, 1963, from 9:00 am to 5:00 pm, rain or shine, at the Cortland County Fairgrounds, I-81, Exit 12, Cortland NY. There will be indoor and outside flea markets. Talk-in on .52. For additional information, write Robert H. Partigianoni, Advertising Chairman, Skyline Amateur Radio Club, PO Box 537, Tully NY 13159, or phone (315)-696-8476.

WILKES-BARRE PA
JUN 19

The Murgas Amateur Radio Club K3YTL will sponsor the annual Wilkes-Barre PA Hamfest on Sunday, June 19, 1983, beginning at 8:00 am, rain or shine, at the Kingston Armory, Market Street, Kingston PA. Donations are $3.00 (children under 12 and XYLs will be admitted free) with tailgating $1.00 extra per space. Doors will open at 6:00 am for setups only. There will be plenty of food and free parking. Talk-in on 146.61, 146.88, 224.66, and 142.52 simplex. For more information, contact Hamfest Committee, PO Box 1094, Wilkes-Barre PA 18703, or phone (717)-779-3882.

MILTON ONT CAN
JUL 9

The Burlington Amateur Radio Club, Inc., will host the ninth annual Ontario Hamfest on Saturday, July 9, 1983, at the Milton Fairgrounds. For more information, write Burlington Amateur Radio Club, Inc., PO Box 836, Burlington ONT L7R 3Y7, Canada.

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FCC

LICENSE EXAMINATIONS

Reprinted from the *Federal Register*, the following is the text of the FCC's proposed rule which would turn license-examination responsibilities over to amateurs.

PART 0—[AMENDED]

Parts 0, 1 and 97 of the Commission's Rules are amended as follows:

1. Paragraph (a) of § 0.483 is revised to read:

§ 0.483 Applications for amateur or commercial radio operator licenses.

(a) Application for a new or upgraded amateur operator license shall be submitted to the examiners prior to the examination (See § 97.26). The examiners are required to submit the applications of persons passing their respective examinations to the Commission (for Novice Class operator licenses) or to the Volunteer-Examiner Coordinator (for all other Amateur operator licenses). All other applications for amateur radio licenses shall be submitted to the Federal Communications Commission, Gettysburg, Pennsylvania 17325. Only one copy of the application is required.

• • • • •

2. A new § 0.484 is added to read:

§ 0.484 Amateur radio operator examination points.

Generally, examinations for amateur radio operator licenses shall be administered at locations and times specified by volunteer examiners. When the FCC conducts examinations for amateur raduo operator licenses, they shall take place at locations and times designated by the FCC.

3. The heading of § 0.485 is revised to read:

§ 0.485 Commercial radio operator examinations.

• • • • •

PART 1—[AMENDED]

4. Paragraph (a) of § 1.912 is revised to read:

§ 1.912 Where applications are to be filed.

(a) Applications for any class of new or upgraded amateur operator license shall be submitted to the examiners prior to the examination. (See § 97.26) The examiners are required to submit the applications of persons passing their respective examinations to the Commission (for Novice Class operator licenses) or to the Volunteer-Examiner Coordinator (for all other Amateur operator licenses). All other applications for amateur radio licenses shall be submitted to the Federal Communications Commission, Gettysburg, Pennsylvania 17325. Only one copy of the application is required.

• • • • •

5. Paragraph (e) of § 1.925 is revised to read:

§ 1.925 Application for special temporary authorization, temporary permit, temporary operating authority, or interim amateur permit.

• • • • •

(e) Upon successful completion of an Amateur Radio Service operator examination, an applicant already licensed in the Amateur Radio Service may operate his/her amateur radio station pending issuance of his/her permanent amateur station and operator licenses by the Commission for a period of 90 days or until issuance of the permanent operator and station licenses, whichever comes first, consistent with the rights and privileges of the higher operating class for which the applicant has passed the appropriate examination(s), provided that the applicant retains the certificate(s) issued by a VEC for successful completion of the examination(s) at the station location, and provided that the applicant uses an identifier code provided by a VEC as a suffix to his/her present call sign.

• • • • •

6. Section 1.934 is revised to read:

§ 1.934 Procedure with respect to amateur radio operator license.

Each candidate for an amateur radio license which requires the applicant to pass one or more examination elements must present the examiner(s) with a properly completed FCC Form 610 prior to the examination. Upon completion of the examination, the examiner(s) will immediately grade the test papers. If the applicant is successful, the examiner(s) will forward the candidate's application to: (1) The Commission's Gettysburg, Pennsylvania facility for an application for a Novice Class operator license, or (2) a Volunteer-Examiner Coordinator (VEC) for all other classes of operator licenses. A VEC will then issue a certificate for successful completion of an amateur radio operator examination, and will forward the application to the Commission's Gettysburg, Pennsylvania facility.

PART 97—[AMENDED]

7. New § 97.26 is added to read:

§ 97.26 Examination procedure.

(a) Each examination for an amateur radio operator license shall be administered at a location and a time specified by the examiners.

(b) The examiners must be present and observing the candidate throughout the entire examination.

(c) The examiners will be responsible for the proper conduct and necessary supervision during each examination.

(d) Each candidate for an amateur radio license, which requires the applicant to pass one or more examination elements, must present the examiners with a properly completed FCC Form 610 prior to the examination.

(e) The candidate shall comply with the instructions given by the examiners. The examiners must immediately terminate the examination upon failure of the candidate to comply with the examiners' instructions.

(f) At the completion of the examination, the candidate shall return all test papers to the examiners.

8. Section 97.27 is revised to read:

§ 97.27 Examination preparation.

(a) Each Novice code test (Element 1(A)) shall be prepared by the examiner. The examiner must hold an Amateur Extra, Advanced, or General Class operator license. The test shall be such as to prove the applicant's ability to send correctly by hand and to receive correctly by ear texts in the international Morse code at the rate of five (5) words per minute. Subjects for this code test may include the twenty-six letters of the alphabet, the numerals 0–9, the period, the comma, the question mark, $\overline{\text{AR}}$, $\overline{\text{SK}}$, $\overline{\text{BT}}$, and $\overline{\text{DN}}$.

(b) The general code test and the expert's code test (Elements 1(B) and 1(C)) shall be prepared by the examiners. The test shall be such as to prove the applicant's ability to send correctly by hand and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed. Subjects for these code tests may include the twenty-six letters of the alphabet, the numerals 0–9, the period, the comma, the question mark, $\overline{\text{AR}}$, $\overline{\text{SK}}$, $\overline{\text{BT}}$, and $\overline{\text{DN}}$.

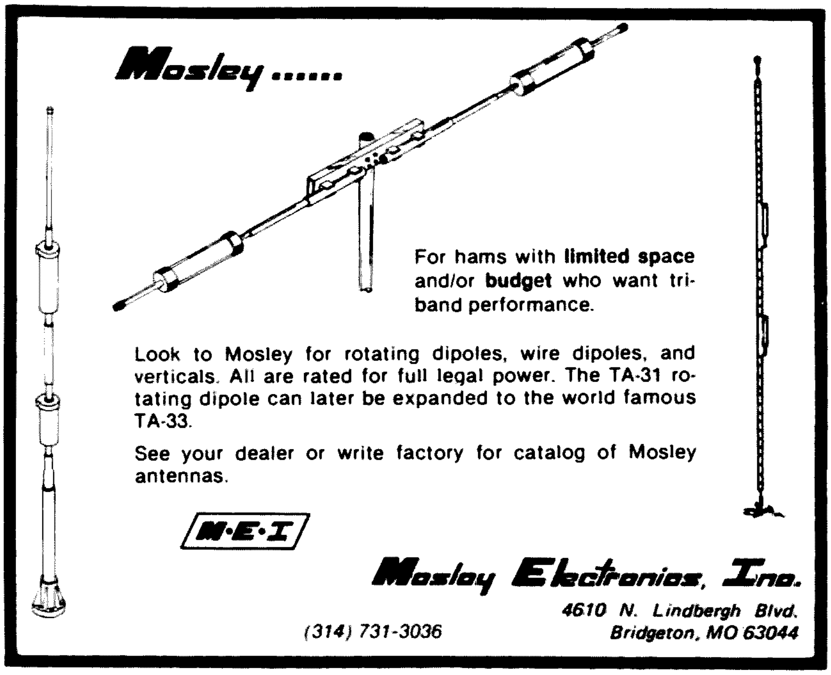
(c) Each written test for the Novice Class operator license shall be prepared by the examiner. The test shall be such as to verify the candidate's knowledge of each general subject area listed for the Element 2 test in the Commission's *Study Guide for the Amateur Radio Operator License Examinations* (PR Bulletin 1035, latest date of issue), but need not be limited to the list of questions approved by the Commission for Element 2 (PR Bulletin —, latest date of issue).

(d) Each written test, except for the Novice Class operator license, will be designed by the Federal Communications Commission (FCC). The FCC will select questions for each test from the list of questions approved by the Commission (PR Bulletin —, latest date of issue). Volunteer-Examiner Coordinator (VEC's) and Amateur radio operators may suggest questions to be included on this list by submitting them in accordance with the instructions in PR Bulletin 1035. VEC's and Amateur radio operators holding Amateur Extra Class licenses may submit questions for any written examination element. Amateur radio operators holding Advanced Class licenses may only submit questions for Element 2 and 3. Amateur radio operators holding General Class or Technician Class licenses may only submit questions for Element 2. For any given written examination element, the percentage of questions on each subject shall be specified in PR Bulletin 1035.

9. Section 97.28 is revised to read:

§ 97.28 Examination administration.

(a) Unless otherwise prescribed by the Commission, each examination for an amateur radio operator license (except the Novice Class operator license) shall be administered by three accredited volunteer examiners (see § 97.30). There will be a team chief. The team chief must hold an Amateur Extra Class operator license. The other two accredited volunteer examiners must hold Amateur Extra Class operator licenses, unless: (1) They are administering telegraphy element 1(A), in which case they may hold Amateur Extra Class, Advanced Class or General Class radio operator licenses, or (2) they are administering written examination elements 2 or 3, in which case they may



hold Amateur Extra Class or Advanced Class radio operator licenses.

(b) Unless otherwise prescribed by the Commission, each examination for the Novice Class operator license shall be administered by one volunteer examiner. The examiner does not have to be accredited. The volunteer examiner must hold a current General, Advanced or Amateur Extra Class operator license issued by the Commission.

(c) Each team chief shall maintain a record of each examination he/she administers. This record shall be maintained in the team chief's station records for one year following the administration of the examination. This record shall be made available to the Commission upon request. The record shall include:

(1) Candidate's name and address;
(2) Candidate's amateur radio station call sign (if any);
(3) Examination location and date administered;
(4) The examination papers;
(5) The examination grades; and
(6) Names of other examiners also administering the examination.

(d) Upon completion of the examination, the examiners shall immediately grade the test papers.

(e) When the candidate does not score a passing grade on an examination element, the examiners shall so inform the candidate and return the application (see § 97.26) to the candidate.

(f) When the candidate scores a passing grade on all examination elements required for the class operator license sought (see § 97.23), the examiners shall certify to the following information on the candidate's application form (see § 97.26):

(1) Examiners' names, addresses and amateur radio station call signs;
(2) Examiners' qualifications to administer the examination (see § 97.30); *and*
(3) Examiners' signed statements that the applicant has passed the required examination elements.

(g) Within ten days of the administration of a successful examination for the Novice Class operator license, the examiner shall submit the candidate's application to: Federal Communications Commission, Gettysburg, Pennsylvania 17325.

(h) Within ten days of the administration of a successful examination for the Technician, General, Advanced, or Amateur Extra Class operator license, the examiners shall submit the candidate's application to a Volunteer—Examiner Coordinator.

10. A new § 97.29 is added to read:

§ 97.29 Examination grading.

(a) Each examination element shall be graded separately by the examiners.

(b) An applicant passes a written examination if he/she answers at least 74 percent of the questions correctly.

(c) An applicant passes a code element examination if he/she proves his/her ability to send correctly by hand and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed.

11. A new § 97.30 is added to read:

§ 97.30 Volunteer examiner requirements.

(a) Each volunteer examiner administering an examination for an amateur radio operator license must be at least 18 years of age and unrelated to the candidate.

(b) Any person who owns a significant interest in, or is an employee of, any company or other entity which is engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur station operator licenses, is ineligible to be a volunteer examiner.

(c) Each volunteer examiner shall be uncompensated for his/her services.

(d) Each volunteer examiner administering an examination for the Technician, General, Advanced or Amateur Extra Class operator license must be accredited by the Volunteer-Examiner Coordinator (see Subpart I).

§ 97.31 [Reserved]

12. Section 97.31 is removed and reserved.

13. A new Subpart I is added to Part 97 to read, as follows:

Subpart I—Volunteer-Examiner Coordinators

General

Authority: 47 U.S.C. 154(i) and 303(r).

Subpart I—Volunteer-Examiner Coordinators

General

§ 97.501 Purpose.

The rules in this subpart are designed to proyide for the establishment of volunteer-examiner coordinators to coordinate the efforts of volunteer examiners in preparing and administering examinations for amateur radio operator licenses.

§ 97.503 Definitions.

For the purpose of this subpart, the following definitions are applicable:

(a) *Volunteer-examiner coordinator* (VEC). An entity which has entered into an agreement with the Federal Communications Commission to coordinate the efforts of volunteer examiners in preparing and administering examinations for amateur radio operator licenses.

(b) *Volunteer-examiner*. An amateur radio operator who prepares or administers examinations to applicants for amateur radio operator licenses (see § 97.30).

§ 97.505 Applicability of rules.

These rules apply to each entity that serves as a volunteer examiner coordinator.

Volunteer-Examiner Coordinator Functions

§ 97.511 Agreement required.

No entity may serve as a VEC until that entity has entered into a written agreement with the Federal Communications Commission to do so. The VEC must abide by the terms of that agreement.

§ 97.513 Scheduling of examination.

A VEC will coordinate the dates and times for scheduling examinations (see § 97.26) throughout the areas where communications are regulated by the Federal Communications Commission. A VEC may also coordinate the scheduling of testing opportunities at other places.

§ 97.515 Coordinating volunteer examiners.

A VEC will accredit amateur radio operators, licensed by the Federal Communications Commission, as volunteer examiners (see § 97.30). A VEC will seek to recruit a broad representation of amateur radio operators to be volunteer examiners. A VEC may not discriminate in accrediting volunteer examiners on the basis of race, sex, religion or national origin. A VEC may not refuse to accredit a volunteer on the basis of membership in an amateur radio organization. A VEC may refuse to accredit an amateur radio operator volunteering to be as examiner if:

(a) The volunteer examiner does not meet minimum statutory qualifications or minimum qualifications as prescribed by the rules;

(b) The FCC refuses to accept the voluntary and uncompensated services of the volunteer examiner;

(c) The VEC determines that the volunteer is not competent to perform the function for which he/she volunteered;

(d) The VEC determines that questions of the volunteer's integrity or honesty could compromise the examination(s); *OR*

(e) The VEC determines that no additional volunteers are needed.

§ 97.517 Written examinations.

A VEC will assemble, print and distribute written examinations designed by the FCC (see § 97.27(d)).

§ 97.519 Examination procedures.

At the completion of each examination, a VEC will collect the candidates' application forms and test results from the volunteer examiners (see § 97.28(h)). A VEC will:

(a) Make a record of the date and place of the test; the names of the volunteer examiners and their qualifications; the names of the candidates; the test results; and, related information.

(b) Screen the application for completeness and authenticity.

(c) Forward the application to: Federal Communications Commission, Licensing Division, Private Radio Bureau, Gettysburg, Pennsylvania 17325.

§ 97.521 Evaluation of questions.

A VEC will be expected to evaluate the clarity and accuracy of examination questions on the basis of experience, and to bring ambiguous or inaccurate questions to the attention of the Commission, with a recommendation on whether to revise the question or to delete the question from the Commission's list of approved questions.

§ 97.523 Identification of applicants passing examinations.

(a) A VEC will issue a certificate for successful completion of an amateur radio operator examination.

(b) The VEC issuing a certificate for successful completion of an examination will establish a unique identifier code for each testing session. The identifier code will be appended as a suffix to the licensee's call sign (see § 97.84(f)).

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extensive on-the-air testing, until now off limits to most amateurs. The following is the text of the FCC's recent ruling which permits all amateurs to use AMTOR.

PART 97—[AMENDED]

Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, is amended as follows:

In § 97.69, paragraphs (a) and (b) are revised to read as follows:

§ 97.69 Digital communications.

* * * * *

(a) The use of the digital codes specified in paragraph (b) of this section is permitted on any amateur frequency where F1 emission is permitted, subject to the following requirements:

(1) The sending speed shall not exceed the following:

(i) 300 baud on frequencies below 28 MHz;

(ii) 1200 baud on frequencies between 28 and 50 MHz;

(iii) 19.6 kilobaud on frequencies between 50 and 220 MHz;

(iv) 56 kilobaud on frequencies above 220 MHz.

(2) When type A2, F1 or F2 emissions are used, the radio or audio frequency shift (the difference between the frequency for the "mark" signal and that for the "space" signal), as appropriate, shall be less than 900 Hz.

(3) When type A2 or F2 emissions are used, the highest fundamental modulating frequency shall be less than 3000 Hz.

(b) Except as provided for in paragraph (c) of this section, only the following digital codes, as specified, may be used:

(1) The International Telegraph Alphabet Number 2 (commonly known as Baudot); provided that transmission shall consist of a single channel, five unit (start-stop) teleprinter code conforming to the International Telegraph Alphabet Number 2 with respect to all letters and numerals (including the slant sign or fraction bar); however, in the "figures" positions not utilized for numerals, special signals may be employed for the remote control of receiving printers, or for other purposes indicated in this section.

(2) The American Standard Code for Information Interchange (commonly known as ASCII); provided that the code shall conform to the American Standard Code for Information Interchange as defined in American National Standards Institute (ANSI) Standard X3.4-1968.

(3) The International Radio Consultative Committee (CCIR) Recommendation 476-2 (commonly known as AMTOR); provided that the code, baud rate and emission timing shall conform to the specifications of CCIR 476-2 (1978) Mode A or Mode B.

SATELLITES

Amateur Satellite Reference Orbits

	Date	OSCAR 8 UTC	OSCAR 8 EQX	RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
May	1	0127	104	0156	240	0059	230	0141	238	0059	225	1
	2	0131	105	0151	240	0043	228	0131	237	0057	226	2
	3	0135	106	0146	240	0028	225	0122	236	0054	226	3
	4	0140	108	0140	241	0013	223	0112	235	0051	227	4
	5	0001	83	0135	241	0156	250	0102	234	0048	228	5
	6	0005	84	0130	241	0141	248	0053	234	0045	229	6
	7	0010	85	0124	241	0125	246	0043	233	0042	230	7
	8	0014	86	0119	241	0110	244	0033	232	0040	230	8
	9	0018	87	0114	242	0054	241	0024	231	0037	231	9
	10	0023	88	0108	242	0039	239	0014	230	0034	232	10
	11	0027	90	0103	242	0024	237	0004	229	0031	233	11
	12	0032	91	0058	242	0008	234	0154	258	0028	234	12
	13	0036	92	0052	242	0151	262	0144	257	0025	235	13
	14	0040	93	0047	242	0136	259	0135	256	0023	235	14
	15	0045	94	0042	243	0121	257	0125	255	0020	236	15
	16	0049	95	0036	243	0105	255	0115	255	0017	237	16
	17	0053	96	0031	243	0050	252	0106	254	0014	238	17
	18	0058	97	0026	243	0034	250	0056	253	0011	239	18
	19	0102	99	0020	243	0019	248	0046	252	0008	239	19
	20	0106	100	0015	244	0004	245	0037	251	0005	240	20
	21	0111	101	0010	244	0147	273	0027	250	0003	241	21
	22	0115	102	0004	244	0131	271	0017	249	0000	242	22
	23	0120	103	0159	274	0116	268	0008	248	0157	273	23
	24	0124	104	0153	274	0101	266	0157	277	0154	274	24
	25	0128	105	0148	275	0045	264	0147	276	0151	274	25
	26	0133	106	0143	275	0030	261	0138	276	0148	275	26
	27	0137	108	0137	275	0014	259	0128	275	0145	276	27
	28	0141	109	0132	275	0158	286	0118	274	0142	277	28
	29	0003	84	0126	275	0142	284	0109	273	0140	278	29
	30	0007	85	0121	276	0127	282	0059	272	0137	278	30
	31	0011	86	0116	276	0112	279	0049	271	0134	279	31
Jun	1	0016	87	0110	276	0056	277	0040	270	0131	280	1
	2	0020	89	0105	276	0041	275	0030	269	0128	281	2
	3	0024	90	0100	276	0025	272	0020	268	0125	282	3
	4	0029	91	0054	276	0010	270	0011	268	0123	283	4
	5	0033	92	0049	277	0153	298	0001	267	0120	283	5
	6	0037	93	0044	277	0138	295	0151	296	0117	284	6
	7	0042	94	0038	277	0122	293	0141	295	0114	285	7
	8	0046	95	0033	277	0107	291	0131	294	0111	286	8
	9	0051	96	0028	277	0052	288	0122	293	0108	287	9
	10	0055	98	0022	278	0036	286	0112	292	0106	287	10
	11	0059	99	0017	278	0021	284	0102	291	0103	288	11
	12	0104	100	0012	278	0005	281	0053	290	0100	289	12
	13	0108	101	0006	278	0149	309	0043	289	0057	290	13
	14	0112	102	0001	278	0133	306	0033	289	0054	291	14

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HAM HELP

I need an assembly manual for the Heath HM-102 HF wattmeter/swr bridge. I will pay for copying costs.

Ira Linderman
PO Box 229
Commack NY 11725

I am interested in forming an intercollegiate HF net for traffic, technical information exchange, or other purposes. Any college radio clubs interested in joining, please contact me for information.

Timothy O'Neill KA2NNQ
Polytechnic Institute of New York
Amateur Radio Club
333 Jay St., Box 682
Brooklyn NY 11201

I have a Roto Beam rotator made by Gordon Specialties of Chicago. However, I do not have the indicator nor any idea of what was used with this unit. If anyone has a diagram of the indicator or has the actual unit, I would like to hear from you.

Henry B. Plant W6DKZ
4160 Holly Dr.
San Jose CA 95127

Does anyone know of a color code for diodes?

George Kitts KA3IMO
38 Queenlily Rd.
Levittown PA 19057

I need information on home-brew memory expansions for the VIC-20, as well as RTTY information. I am also looking for remote control heads and cabling for 3-6-MHz ARC-5 receivers and transmitters.

R. F. Cann W4GBB
1606 Lochwood Dr.
Richmond VA 23233

I need the main tuning dial knob, part no. NPS 22N2LA, and the bandswitch knob, part no. NPS 9KZLA, for the National HRO 5000. Please send both price and payment terms. I would also like to hear from anyone who can help me make a digital readout for this receiver.

Carlos A. N. Roxo
R. Ramalho Ortigao, 36
P-2750 Cascais
Portugal

I am a ham, and I am very proud to be one! But I am not proud to be confined at Walla Walla state prison for 40 months. I would like to ask other hams to donate any used electronics correspondence courses such as CIE, NRI, or ICS.

Benard Drew WA7UUF
287407
PO Box 520
Walla Walla WA 99362
5W A14

I need a copy of the schematic and manual for the Wabco 20TS-1 Carryphone type 14H81C transceiver, manufactured by Union Switch and Signal Division. I will pay copying costs.

Jim Cadoret VE6CNY
1066 Edmonton, Alta. T6K 3R4
Canada

I have the operator's manual, but I would like to obtain the full documentation for the AJ830 printer terminal. I would also like to know about any modifications for the Heath H-14 printer.

Mike Cebula
8409 Porter Lane
Alexandria VA 22306

CORRECTIONS

In "Build the Deadeye Dish Controller," which appeared in the April issue of *73*, an incorrect part number was given in the parts list on page 91. The two 1-12 position switches were identified as Radio Shack number 257-183. The correct identification is Radio Shack number 275-1385.

Avery L. Jenkins WB8JLG
***73* Staff**

In the results of *73*'s 1st annual 40/80 phone contest on page 105 of the January, 1983, issue, the 40-meter single-operator champion of Norway was incorrectly identified as LA5YF. The correct winner is Bjorn-Hugo Ark LA5YJ. Our apologies to Bjorn for the error.

Avery L. Jenkins WB8JLG
***73* Staff**

Transcriptions of the CW and/or RTTY receiving tests should be submitted "as received." No attempt should be made to correct possible transmission errors.

Time, frequency, and call letters of the military station copied as well as the name, callsign, and address (including zip code) of the individual submitting the entry must be indicated on the page containing the message test. Each year, a large number of acceptable copies are received with insufficient information, or the necessary information was attached to the transcription and was separated, thereby precluding the issuance of a certificate.

Entries must be postmarked no later than 28 May 1983 and submitted to the respective military commands.

Stations copying AIR send entries to: Armed Forces Day Test, 2045th CG/DONJM Andrews AFB DC 20331.

Stations copying NAM, NAV or NPG send entries to: Armed Forces Day Test, HQ, Navy-Marine Corps MARS, 4401 Massachusetts Ave., N.W., Washington DC 20390.

Stations copying WAR send entries to: Armed Forces Day Test, Commander, 7th Signal Command, Attn: CCN-PO-OX, Fort Ritchie MD 21719.

LETTERS

MISSING THE BOAT

I think we (hams) are missing the boat on the two-GHz band! There are thousands of 2-GHz downconverters out there, and kit prices are cheap.

I would like to see someone come out in print in *73* on transmitting for 2 GHz, how to build for communications such as ATV, etc., or see some advertiser, like Universal Communications, come out with a simple transmitter—as it said a long time back it would, but has not to date.

Keep up the good work at *73*, and thanks for taking time to read my ½-cent's worth.

Larry N. Ingram WA0WOX
Augusta KS

Well, it might make semi-honest men of the 2-GHz converter crowd, so by all means, let's see some transmitters for the band. We'll publish 'em.—Wayne.

NEW CONTEST RULE

I read with great interest your editorial in the December, 1982, issue of *73* and agree with you in taking issue with the PY0SS DXpedition in causing QRM over a 100-kHz segment of the 20-meter band. Your positive approach and suggestion for handling the pileup is a good one and I hope future DXpeditions will take note.

A related subject is that of DX contests. I love contests and participate in them, but can easily see that as they are now conducted they are a source of QRM and irritation to non-contest hams and to a lot of those in the contest, too. The practice of parking on a frequency and calling "CQ DX contest" incessantly is a prime source of QRM and unnecessary spectrum use. To the end that it frequently results in ill feelings in the ham fraternity, contesters and non-contesters alike.

Here on the west coast, DX contesting becomes a matter of primarily working a lot of different countries for multipliers and then working as many JA stations as possible to obtain a high score. It's called running a string of JAs. In recent years, many JA stations, becoming wise to this, refuse to be a part of such antics and now, instead, call CQ themselves. Of course, many of the newer JA hams will respond.

To reduce QRM and to make DX contests more fun for all participants, I propose that contest committees formulate a new rule wherein USA hams listen for and answer foreign stations who call "CQ DX contest" (i.e., USA stations would not be permitted to call "CQ DX test").

Yes, I know that overall scores would be lower and records could not be broken on this basis. However, in addition to reducing QRM, this concept would exercise, to a much greater extent, the operating skills of the USA operators. Everyone would be on more equal footing; rudeness, muscle tactics, and the number of super-power stations would be reduced.

This idea has as much chance of taking hold as a snowball in hell! I wanted to put it out for thought, anyway.

Gary Legel N6TO
Fullerton CA

Oh, let's compromise, Gary, and let 'em call CQ as long as it is above 14,300 kHz. Okay?—Wayne.

VOLUNTEER EXAMINER

As you know, Wayne, the ARRL has requested that the FCC delay any action on a codeless amateur license on the grounds that the amateur community cannot handle the training and examining job. I suspect that it is the ARRL that can't handle the job or prefers not to handle the job.

In your position as a member of NIAC and publisher of *73*, I urge you to assist in finding someone who can handle the job. Most large, well-organized radio clubs could handle the examining and training job if they chose to do so.

Provided I am not bogged down by outside red tape, I will volunteer to handle the job in Lancaster County, by myself if necessary. What I would propose to do is set up training courses through the Adult Education Department of the Lancaster County Voc-Tech schools. I would schedule a Novice class in the fall term, a General class in the winter term, and an Advanced/Extra class in the spring term. I would propose to give the FCC license exam as the final exam in each case. Voc-Tech school courses are supervised by the school administration and the Pennsylvania State Board of Education. I see no need for multiple certified ARRL examiners. In the interest of uniformity, I would prefer to have the FCC supply the exams, but this is not a necessity.

Many communities have education facilities similar to ours. I suspect that most of these educational institutions are eager to add to the scope of their programs. They are subsidized by state and local funds so the tuition is generally low. If anybody would like information on how to approach such an educational organization, I will be glad to advise on the approach.

George S. Gadbois W3FEY
141 Maple Lane
Lancaster PA 17601

Good show, George. My own approach is to push to get Congress to pass a law permitting the FCC to charge for ham licenses, set up a modest fee of, say, $10 for five years of license, and then we will be in a position where we are paying for our keep, so to speak. The next step would be to have ham clubs interested in issuing licenses ante up $1,000 to the Commission which would be put into a special investment fund... perhaps in Treasury Certificates. The interest from this investment would more than pay for our costs to the FCC. The fee would separate the serious clubs from those not truly interested in issuing licenses better than most other criteria and would be a simple test of interest. The clubs would then organize classes for those interested in licenses, ending with both an oral test on rules and theory and a proof of operating competence. Those passing could get their call letters immediately via a desktop computer and a modem connected to the FCC computer in Gettysburg. Indeed, I have discussed this concept with the Commission and not run into any serious resistance... except for the need to get authorization for the fee from Congress. Clubs could bring the deposit fees up to the $1,000 level once or twice a year as they are debited for each new licensee. I suspect that we might be able to embark on a whole new era in amateur radio enthusiasm with such a scheme.—Wayne.

LITTLE BOMBSHELL

I wonder how many hams read the little bombshell, "The Optical Computer," in the February issue of *Scientific American*? The authors have developed an optical analog of the transistor, a device which controls light in a manner analogous to the way a transistor controls electricity. As the title indicates, the authors are primarily interested in applications to digital logic, and with good reason. They have achieved switching times on the order of a picosecond in their prototypes. Would you like a computer that runs at 100 gigahertz?

The device also functions as a linear amplifier and could have profound implications for communications technology. Light energy could be manipulated with the sophistication we now apply to rf. The primary advantage is that the short wavelengths and fast switching times imply tremendous channel capacity. In principle, hundreds of millions of signals could be multiplexed on a single beam. The potential for satellite operations is especially interesting.

Maybe we should get a foot in the door for a ham band at 5 micrometers!

Mike Hughes W7KCB
Rapid City SD

SCHOLARSHIPS OFFERED

The Foundation for Amateur Radio, Inc., a nonprofit organization with headquarters in Washington DC, plans to award ten scholarships for the academic year 1983-1984. The Foundation, composed of fifty local area amateur radio clubs, fully funds two of these scholarships from the proceeds of the Gaithersburg (MD) Hamfest. It administers, without cost to the donors, two scholarships for the Quarter Century Wireless Association and one each for the Richard G. Chichester Memorial, the Radio Club of America, the Young Ladies' Radio League, the Edmund B. Redington Memorial, the Amateur Radio News Service, and the Columbia (MD) Amateur Radio Association.

Licensed radio amateurs may compete for one or more of these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college, or technical school. Most of the scholarships require the applicant to hold at least an FCC General class license or equivalent. The scholarship awards range from $300 to $900 with preference given in some of them to residents of specified geographical areas or the pursuit of certain study programs.

Additional information and an application form can be requested by a letter or QSL/postcard postmarked prior to May 31, 1983, from the below-named scholarship committee chairman.

The Foundation is devoted exclusively to promoting the interests of amateur radio and to the scientific, literary, and educational pursuits that advance the purposes of the Amateur Radio Service.

Hugh A. Turnbull W3ABC
6903 Rhode Island Avenue
College Park MD 20740

RTTY MANNERS

For many years, Wayne, you have been in the forefront in the ongoing fight for law and order among amateur radio operators, for more recognition, better operating conditions, more frequencies, and especially for us to clean up our act and be more considerate and gentlemanly—and ladylike—while on the air. It's this last for which I am appealing to you and your publication for help.

I don't know how much RTTY or CW you work. I have never had the pleasure of a QSO with you on any mode, and I was first licensed in 1955. But I am one of those who likes all modes and most of the bands. At present, I operate mostly RTTY, and have since 1958. But I also work a lot of CW and SSB and utilize the 160-acre band down through 2 meters. It is through my diversified operating habits that I have become aware of an increasing problem which only education and awareness can help. This problem is the growing number of "shoot-outs" occurring between RTTY and CW stations.

As you know, for more than thirty years there has existed between RTTY and CW operators a "gentlemen's agreement" setting aside certain portions of the HF bands for each mode. The simple reason for this, of course, was the incompatibility of one for the other. Naturally, the FCC neither recognizes nor has any interest in these self-imposed restrictions, so we can look only to ourselves for help.

It is the rare ham indeed who operates anything besides an SSB rig on HF. And traditionally these are operated on upper sideband in the CW mode and lower sideband in the RTTY mode. Without going into all the technicalities involved, and which you are already aware of, a CW station on the low-frequency side of a RTTY station really

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clobbers the latter, and without even knowing the RTTY station is there. The reverse is true, also. This, then, is where all the shootouts are taking place. One interferes with the other. Tempers flare. Each station then begins jockeying for position, cranks up the power, and starts blasting away at the other. Just listen around a bit and you'll see what I am alluding to. This is total insanity and would never happen if the traditional band-use agreements were observed!

It is not all that rare to find a CW station blithely calling "CQ DX" at 14.090, or a CW rag-chew or traffic net in progress between 3.600 and 3.650. It is a bit unusual, also, to tune across a RTTY QSO around 14.065, but I've certainly heard it. There are more CW violators than RTTY, but only because of two basic reasons: There are more people operating CW than there are operating RTTY; and most hams who get into RTTY are soon made aware of this gentlemen's agreement thing I've been referring to. Neither I nor most of the RTTY bunch I work would even think of moving outside the traditional RTTY turf. On the other hand, when I am operating CW, I stay well clear of the RTTY turf.

Looking at it strictly from the CW man's side, the picture is totally different. Many brag that they've never owned a microphone and that any "deedle-deedle" station is fair game. After all, one holding an amateur Extra ticket can legally operate on all the HF bands, from one end to the other, can't he? You bet, and some do. Not all, of course, for despite the growing evidence to the contrary, there still remains a goodly number of polite and considerate hams whose philosophy is "live and let live" and "everybody to his own taste." Thank God for these!

Most—not all, but most—of the stations interfering with each other in the two modes bear relatively recent callsigns. This, to me, is a sign of ignorance rather than deliberate animosity. A great many newly-licensed amateurs are initially interested only in operating phone or CW. Only a small percentage of newcomers to this wonderful hobby have even heard of amateur radioteletype and enter that facet right off. Therefore, they have little need to acquaint themselves with time-honored traditions not covered in their FCC study guides.

It is for this reason I am appealing to you, as well as to other publications in the hobby, to help. You are in touch. People read what you print. They respect your publication. They respect you. They look to you for new ideas and suggestions. I'm not asking that this letter appear in print, specifically. If you would like it to, go ahead. But it's not enough. Even a mention of the problem in "RTTY Loop" won't be enough, since it will reach only a few RTTY enthusiasts and maybe a smattering of CW people. No, it needs to be brought to the attention of the general ham population, and more than once. An in-depth discussion of the situation in one of your editorials would give you material to write about as well as help enlighten those who need enlightening. Subsequent editorials could contain brief recaps, reaching newcomers as well as reminding others of the situation.

You ask for comments. Here are mine. And thank you for listening.

Bill Skipper K0ARG
Greeley CO

Bill, I sure hope you sent a copy of your letter to QST and that they print it so your thoughts can reach the CW fanatics out there. I doubt if many CW fans still read 73, despite an occasional article on a keyer. I'm not exactly of the mind-set which believes that if God had intended us to whistle at each other he would have built us that way, but I will never be a big fan of CW until it is no longer mandatory by government edict. Once the government no longer forces me to learn the code, I think you'll find me psychologically better able to cope with it. I really hate anything I am forced to do. But trying to reason with CW ops isn't the real answer to your problem. Bill, you are working with a technologically advanced mode of communications, so I suggest that you and all of the other deedle-deedle nuts start designing circuits which CW folks can't bother. Hell, you know that's perfectly possible just as well as I do. In fact, I set up a RTTY station recently using one of the new commercial units and I couldn't believe how susceptible to interferences it was. Why, compared to the circuits we were building in the late 40s, over 30 years ago, this was junk. Bill, it looks to me as if we've gone downhill in 30 years technically. Oh, we had our percentage of bad converters then, too, so perhaps I am over-reacting. I do have to admit to more enthusiasm for the new Tono unit which I got my hands on in Bangkok. Drake is selling it here. Now, that was a lot easier to tune, and it ignored interference fairly well. Oh, it could be a lot better . . . we can design circuits which will just plain reject almost anything that happens in jamming if we work at it. I'd sure like to see some articles submitted to 73 for publication along this line. Remember, a CW station can jam only one frequency at a time, so a good converter should check out both channels, looking for either a signal or a lack of signal in each, and then integrate the results, keeping in mind the asynchronous pattern. It is also getting high time that we started working with higher speed transmissions, developing our 9600-baud techniques and making them work. We might want to go back to 850-Hz shift, too, in order to allow the circuits to check each channel separately and to further eliminate any problems of CW interference. Let's see some work on this. If we are able to work through any attempts at jamming, we will have a nice backup for the gentlemen's agreement.—Wayne.

BASH QUICKIE

I feel that I must respond to your comments concerning Bash books and courses as a method for passing FCC exams.

To begin with, this type of activity has been around for quite some time. Those of us who are former broadcasters remember the days of the First-phone "quickie schools." The schools filled a definite need for an industry to have licensed personnel in a situation where everyone admitted the license was unnecessary.

Now, it is true that amateur radio does not fall completely in line with this reasoning, but it seems to me that if the FCC is going to set up its tests so that someone can sell the answers, then it has only itself to blame. Furthermore, the FCC publishes study guides that a person can use, and if he knows the answers and the reasoning behind the answers, he is likely to pass the test. Is that so different from someone selling the answers?

I think that you are plugging your anti-Bash stand in order to justify a proposal for a code-free license. You point out that it is hypocritical to require code and not technical knowledge, but the two are completely different. Morse code can be quite easily learned, but technical prowess doesn't come easily. Many people still struggle to understand solid-state theory, and while I can build simple transistor rf amplifiers from scratch and I can tell you when a transistor is on or off given certain bias conditions, I couldn't begin to design a transistor amplifier.

Technical knowledge comes at different levels of understanding. It is one thing to know that a basic antenna is a quarter wavelength long, but it is quite another to know how that antenna works with its ground system and how to match it to a 50-Ohm coaxial cable. And I don't think that there are too many hams who would know how to design a ground-mounted vertical system complete with radials and matching network and then put it all together and make it work. I think that in any technical field related to ham radio you will find people who have different levels of understanding, and I think that, quite properly, some of us may have no technical understanding.

I agree with James Burke, author of *Connections*, that any person has the ability to understand something technical as long as the explanation is made simple enough. But has the explanation been made simple? Is understanding how it works worth the time if it is not directly related to your particular interest in amateur radio?

While it may be true that CW scares many people off from ham radio, I think that the technical requirements scare some also. It just happens that of the two requirements, it is easier to "bash" the technical. I do not think that it follows that because we are not overly strict on the technical requirement we should drop the CW requirement. Again, the two are entirely different. One can easily understand Newton's Laws of Motion, but one may not be able to perform the mathematical gymnastics to derive the laws. Furthermore, I do not think that technical knowledge equates with ability to work on equipment. Most hams might understand how their PLL synthesizer works in the hand-held, but I don't think that too many would want to jump in and try to fix it. Is that wrong? Of course not; it's just prudent!

For the record, I am a lawyer. I hold an Advanced license and have flunked the Extra CW once. I have successfully built many antennas, an antenna tuner, simple rf power amplifiers, and a dummy load, all from scratch. I read many technical articles and basic theory articles, i.e., *Solid State Design for the Radio Amateur*, etc., but I certainly can't design that stuff!

Kiernan Holliday WA6BJH/4
Springfield VA

Yep, you're a lawyer.—Wayne.

OPTIONAL CW

I've been receiving your magazine for several years and can honestly say it doesn't lack for controversy. However, I have not seen anything in years to compare with the no-code license hullabaloo in these pages lately.

The no-code license proposal does have its merits, in that it would encourage those with an interest in learning more about radio but deficient at CW skills to pursue that interest on a limited basis in a small part of the radio spectrum.

Opponents maintain that anyone can learn CW. Well, that may be true, and if so, it doesn't screen out the lids. With the Bash books available, anyone can get on the air with only the faintest idea of what they are talking about. Other opponents don't want newcomers to have any easier time of it then they did (a classic argument). How many of you, then, can honestly copy CW at your tested speed?

Perhaps what is needed is some sort of skill examination in conjunction with a standard test of basic theory and radio

laws. This would serve two purposes: First, it would ensure that any exam is cheat-proof. Second, it would encourage the applicant to pursue a "hands-on" learning session about ham radio. Such a skill could be to build a kit. Perhaps the applicant is one of many with an interest in computers and could design a logging program. Maybe even build a small antenna!

Of course, CW could be retained as an elective skill. The point is to get the applicants off to a good start by encouraging an early desire to learn more about radio, and carry it through the rest of their days—not to approach the CW test as a nuisance to be forgotten once the ticket is in hand.

I'm not calling for the abolition of CW. It is an international requirement, and I found it possible to master 20 wpm with some work. It's my favorite contest mode! But, I like chocolate; others prefer vanilla. For an entry-level test, perhaps there is a way to get more newcomers into a dynamic hobby, and I feel that a skill exam may be just the way. If we got more builders instead of OX chasers on 20 as a result, it wouldn't be a bad move.

After all, no-code licenses work well in Europe and Japan. I have yet to hear one good reason why they won't work in the USA.

Peter H. Putnam KT2B
Morris Plains NJ

Troublemaker.—Wayne.

RIDGE RAVE

Just wanted to let you know of the fine customer service afforded me by one of your advertisers.

After having purchased a RTTY interface unit for my computer from Ridge Systems of Acton, Massachusetts, I experienced some difficulty in putting it into operation. I called the Ridge factory, and in a couple of days Dave Beverage, factory engineer, and "Franco," also of Ridge, appeared at my front door.

In a short time they discovered the problem to be in the computer and not their interface unit. They could have stopped right there and left, but instead they proceeded to disassemble my computer, remove the internal PC board, find the problem (a Tandy factory-wired short), and reassemble the machine (a color computer).

After a thorough checkout of the equipment, Dave then gave me extra instruction on using the interface. When he was sure all was well, he and Franco picked up their tools and left—no charge!

The RTTY unit has been operating perfectly ever since, and I not only recommend it to other color-computer owners but find that I can also recommend the company behind it.

Joseph F. Ferullo W1HFF
Revere MA

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

THE POSTMAN GETS MAD

Sometimes, I get the feeling that this yearly FUN! poll is getting out of control. Each year, more ballots come in and the work gets harder. Take this year's poll for example, 1,190 of you sent in ballots. This time around it took four people and three computers to tabulate the results (a TRS-80 Model III, an Apple IIe, and an Atari 400, for those of you who care).

This time, for the first time, my mailman spoke his mind. Now, for all of you who addressed your envelopes "Attn: FUN! Poll" or wrote "FUN! Department" in the lower-right corner, let me point out that I live in a rather small, one-family home lodged in an area of New York City that one of my friends calls "Archie Bunker land." My home does not have a mailbox; it has a tiny slot next to the front door. This means that my mailman had to slip each of the letters (up to one hundred a day) through the slot one or two at a time. By the third day, the poor man finally gave up, rang the doorbell, and with a firmly set snarl said, "I don't know what this fun stuff is, but it ain't no fun for me." Before I had a chance to answer, he turned on his heel and trudged away. From there on in, he would merely ring my doorbell, hand me my mail, and say, "Here's your fun mail!" Funny he didn't even answer me when I asked if a mail sack would help.

Here's what you had to say:

ELEMENT 1—BACKGROUND

1) Sex:
- A) Male—89%
- B) Female—11%

A two-percent increase in female amateurs over 1982 and a five-percent increase since 1981. A definite trend is developing.

2) Age:
- A) 15 or below—4%
- B) 16-21—6%
- C) 22-39—37%
- D) 40-59—36%
- E) 60 or above—17%

As the numbers show, not many young respondents to the poll. Either amateurs are getting older or the kids have forgotten how to write.

3) License class:
- A) Novice—7%
- B) Technician—8%
- C) General—26%
- D) Advanced—44%
- E) Extra—15%

More Advanced and Extra holders, fewer Novices, Techs, and Generals compared with last year.

4) Number of years licensed:
- A) 1 year or less—1%
- B) 1-5 years—32%
- C) 6-10 years—12%
- D) 11-20 years—30%
- E) 21 years and up—25%

A breakdown similar to last year's results.

5) Do you have a new (post-March '78) call?
- A) Yes—46%
- B) No—54%

Somehow, those "new" calls just don't seem so strange anymore.

6) How many hours a week do you devote to amateur radio?
- A) 0-1 hour—4%
- B) 2-5 hours—30%
- C) 6-10 hours—42%
- D) 11-20 hours—18%
- E) 21 hours or more—6%

Pretty much the same results as last year.

7) Which HF band do you use most?
- A) 80-75 meters—18%
- B) 40 meters—23%
- C) 20 meters—22%
- D) 15 and/or 10 meters—25%
- E) Don't operate HF—12%

A big dip in 15/10 operation—down 18% in two years.

8) Which VHF-UHF band do you use most?
- A) 6 meters—1%
- B) 2 meters—75%
- C) 220 MHz—4%
- D) 420 MHz and/or up—2%
- E) Don't operate VHF-UHF—18%

Same old story, 2 meters or nothing.

9) Which mode do you use most?
- A) SSB—45%
- B) CW—18%
- C) FM—28%
- D) RTTY—6%
- E) Other—3%

CW is down for the third year in a row.

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues and other incidental expenses.)
- A) 0-$250—45%
- B) $251-$500—29%
- C) $501-$1,000—20%
- D) $1,001-$2,500—4%
- E) $2,501 and up—2%

Depressing figures, depressing economy.

ELEMENT 2—SOCIAL CHARACTERISTICS

11) Has amateur radio influenced your career choice?
- A) Greatly—27%
- B) Somewhat—24%
- C) Not at all—49%

Static figures.

12) Do you answer QSLs that include a self-addressed, stamped envelope?
- A) Yes—75%
- B) No—25%

No big change here, either.

13) Politically, how would you define yourself?
- A) Conservative—48%
- B) Middle-of-the-road—49%
- C) Liberal—3%

Even more of a conservative tilt than last year.

14) Do you think amateur radio will exist 20 years from now?
- A) Yes—91%
- B) No—9%

More optimistic than last time around.

15) How old were you when you first became a ham?
- A) 15 or below—14%
- B) 16-21—49%
- C) 22-39—23%
- D) 40-59—9%
- E) 60 or above—5%

Just goes to show, you gotta get 'em when they're young.

16) Were you a CBer before you became a ham?
- A) Yes—62%
- B) No—38%

Give me a break.

17) Do you own a home computer?
- A) Yes—41%
- B) No—59%

Someday, 100% yes.

18) Do you think hams, when compared with computer hobbyists, are:
- A) More technically inclined in their hobby—23%
- B) Less technically inclined in their hobby—41%
- C) Both are about equally skilled in their hobby—36%

I think there was some confusion between hobbyists and home-computer users.

19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
- A) Yes—71%
- B) No—29%

Noting the obvious.

20) Did you ever use a "cheat book" (not counting the *ARRL License Manual*) to upgrade your license?
- A) Yes—22%
- B) No—78%

The "yesses" are growing.

21) If someone offered you ten million dollars, tax free, on the condition you give up amateur radio forever, would you?
- A) Yes—83%
- B) No—17%

In three years we've gone from one to five to ten million bucks. When we raised the ante from one million to five million, we got 20% more positive replies. Now that we've upped things by another five big ones, we only received a two-percent increase. Guess we hit a ceiling.

22) Do you belong to a local ham-radio club?
- A) Yes—40%
- B) No—60%

A little down from last year.

23) Have you ever attended a ham flea market?
- A) Yes—81%
- B) No—19%

A little up from last year.

24) Do you think the new ARRL leadership is better than the previous administration?
- A) Yes—71%
- B) No—29%

Good news for Newington, but many voters said we should have included a "no opinion" choice. Mea culpa.

ELEMENT 3—OPERATING HABITS

25) Should Novices have phone privileges?
- A) Yes—64%
- B) No—36%

As long as they know the code, right?

26) Do you think US phone bands should be expanded at the expense of foreign-station-only bands?
- A) Yes—81%
- B) No—19%

Are you listening, FCC?

27) Have you ever used a personal computer in connection with your amateur radio activities?
- A) Yes—19%
- B) No—81%

Seems a little low.

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
- A) Yes—55%
- B) No—45%

Not a mandate by any means.

29) Where do you think the future of ham radio lies?
- A) On the HF bands—9%
- B) On the VHF-UHF bands—91%

So what's holding everyone back?

30) Should we get rid of, or reduce in size, the CW subbands?

A) Yes—66%

B) No—34%

Time to trim the band chart.

31) Do you think religiously-oriented nets have a place in ham radio?

A) Yes—42%

B) No—58%

Amen.

32) Do you think politically-oriented nets have a place in ham radio?

A) Yes—70%

B) No—30%

Free speech lives!

33) If, while tuning across a band, you heard a net of gay hams in progress, would you:

A) Jam it—5%

B) Ignore it—62%

C) Complain to the FCC or some other organization—12%

D) Listen—19%

E) Join it—2%

I think that's a healthy attitude.

34) If, while tuning across a band, you heard a net called "The American Communist Radio Society" in progress, would you:

A) Jam it—7%

B) Ignore it—61%

C) Complain to the FCC or some other organization—15%

D) Listen—17%

E) Join it—0%

See the above comment.

35) If required, could you solidly copy CW at the speed at which you were licensed?

A) Yes—77%

B) No—23%

Either our readers keep in shape or are hopeless liars.

36) If required, could you pass the FCC theory test for your license class without consulting a "cheat book"?

A) Yes—74%

B) No—26%

See above comment.

37) Have you ever purposely operated in an amateur subband you weren't licensed to use?

A) Yes—13%

B) No—87%

These figures have remained about the same over three years.

38) Do you think the FCC affects amateur radio in a positive manner?

A) Yes—15%

B) No—85%

The positive reponses have been creeping upward.

39) Do you ever speak to foreign, non-English-speaking hams in their own language?

A) Always—4%

B) Sometimes—17%

C) I attempt it—23%

D) Rarely—4%

E) Never—52%

No major change here.

40) Do you feel competent to replace the finals in a tube-type rig?

A) Yes—94%

B) No—6%

Tube pins are generally tougher to bend than IC pins.

41) Do you feel yourself competent to replace the finals in a transistor-type rig?

A) Yes—83%

B) No—17%

No pins on transistors.

42) Have you ever built an electronic project from a kit?

A) Yes—97%

B) No—3%

Heath, Radio Shack—take note.

43) Have you ever "home-brewed" an electronic project from a book or magazine?

A) Yes—71%

B) No—29%

Lots of fun.

44) Have you ever designed your own electronic project?

A) Yes—57%

B) No—43%

How about an electronic frequency clearer?

45) What do you think of contesting?

A) Great—15%

B) Good—20%

C) Okay—14%

D) Don't like it—23%

E) Despise it—28%

A sleepless night, sore throat, frazzled nerves—what's not to like?

46) What do you think of DXing?

A) Great—43%

B) Good—29%

C) Okay—11%

D) Don't like it—7%

E) Despise it—10%

The quest for the Honor Roll.

47) What do you think of repeaters?

A) Great—30%

B) Good—13%

C) Okay—37%

D) Don't like them—11%

E) Despise them—9%

Ham radio's answer to Channel 19. Only joking.

48) What do you think of traffic handling?

A) Great—7%

B) Good—31%

C) Okay—28%

D) Don't like it—11%

E) Despise it—23%

In Sam Morse's footsteps.

49) Do you plan to use Phase III Oscar within a year of its launch?

A) Yes—30%

B) No—70%

If Ariane doesn't land in the drink again.

50) Do you plan to use the new 10.1-MHz band within one year of its opening?

A) Yes—12%

B) No—88%

The FCC jumped the gun on this one and actually opened the band before the question got into print. In any event, the question was still valid and 12% of you should be enjoying your new privileges right now. By the way, 40% of you said "yes" last year. What happened?

SELECTED COMMENTS

I think that non-code exam-type licenses should not be allowed. Ham radio has always revolved around CW and should continue to do so.—N6BWJ.

I work in a large ham store and, frankly, the helplessness of today's "Bash" ham is embarrassing. I had a General-class ham ask me if longwave was more powerful than FM.—N6BPL.

Fun, John, Fun! The best part of this response is that I get to cut up Wayne's "NSD" column. Hi!—N1BLL.

A full life is possible without amateur radio. Only a dinosaur becomes too specialized—hobbies are swell but are not essential to life.—Mary MacKenzie, Portland OR.

The FCC plan to have ham clubs handle licensing is the poorest idea they have ever had. The abuse by Bash of the license system would look like harmless child's play compared to the certain sale of licenses to people who don't know the code or can't pass even the simplest technical exam. If amateur radio is to survive, this will not be the way. Ham licenses for a $100 donation, anyone?—KJ7F.

The only foreign language I took was Latin.—K8BNO.

Religion, politics, gays, and reds don't have a place in ham radio. Please forward information to me about anyone who answered "E" for 33 and/or 34.—KA2NNQ.

Amateurs are an unusual class of people. You run into them in a crowd and they stand out as being conservative—serious about their hobby—and willing to help—especially people interested in amateur radio. This is true the world over.—W9MGQ.

This quiz is a good reminder to me of how I've changed my opinions and operating habits over the years.—AJ2X.

How about a hundred questions next year?—KB7WL.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

party publisher to bring unbiased information to users, I can't honestly recommend it.

Remember when you see these great prices that without good software and user information as supplied almost exclusively through system-specific magazines, you are asking for a lot of grief.

SOLVING THE JOBS PROBLEM

With about half of the steelworkers out of work and half of the auto workers looking for jobs, one reads the papers and attends the television panel discussions exhaustively investigating the jobs subject with a growing conviction that things are a bit out of kilter.

On the one hand, I read that the reason our car manufacturers are unable to compete with Japan is that our auto workers are averaging double the American wage, while the Japanese workers are making the average Japanese wage. The immediate response is to wonder at the greed of the unions which pushed the wage scale so out of balance. It appears that if the auto workers who are still working were to accept the average American wage level, there would be no unemployment in that industry. And apparently the same goes for the steelworkers.

Of course, both of these industries have problems more deep-seated than just union-escalated wages. In addition to American auto workers getting double the average wage, they are taking almost double the amount of hours to make a car. The finger here seems to point again at union pressures to prevent automation because it takes away jobs.

I watched this line of "thinking," if that is the right word for it, in the printing business. Unions fought viciously to prevent the modernization of typesetting and printing, with the result that printers have now lost most of the typesetting business, which has been taken over by far more efficient departments in businesses which need the printing. The printing unions, using strikes and terrorist tactics, have managed to cripple what was once a major industry.

Union pressures forced printers to employ hopeless incompetents at incredible wages for years, all the while preventing changes in equipment or systems which would bring economies. When I worked in television, I saw the same union pattern in the theatrical business. Territorial disputes between unions were often vicious. The wages of stage hands, not a terribly exacting job or one calling for much in the way of experience or intelligence, were kept incredibly high by iron control of the union. One had to virtually be born into the union to join, and the theater which did not pay the stage hands between the first and second acts on Friday did not have a second act.

With the era of fast communications and transportation making this a world community, national unions are at a disadvantage trying to control industries. The original idea for unions was wonderful. . . as a bargaining group to counter the tendency of manufacturers to take advantage of workers. And they did. But there was nothing to stop the unions once they got going. They built up money, which is equivalent to political power, and some went right past equity into severe greed, possibly putting to shame the greed of the manufacturers which started the whole thing.

One of these days a whole new concept may emerge. . . one equating to some degree the contributions of people to their income. Yes, I realize that this is anti-socialist and anti-communist and thus probably likely to earn me a lot of scathing replies. The concept of taking as much away from the rich as possible, no matter what they have contributed to the country in exchange for the riches, is deeply rooted. England has done a darned good job of that, with the observable result that the country is a mere shadow of what it was when they had both rich and poor people, not just mostly poor people.

Hams who use their hobby to learn more about electronics are sitting pretty if a concept of getting paid for value ever emerges. The opportunities for working with digital communications is wide open for us these days. I see every sign that the FCC is finally going to break loose and allow us to experiment and develop new communications systems. This means working with RTTY, ASCII, error-correcting systems, packet radio, and so on.

Repeater groups will want to start working with secondary digital relaying systems, possibly using a store and relay memory system in them and interconnecting repeaters for extensive links. The people who use this excuse to gain personal experience in working with and designing circuits will, I suspect, never have to worry about a job. And many will be able to take

this experience and escalate it into the start of a new firm of their own.

There have been a lot of ads looking for support for black colleges, with the headline that a mind is a terrible thing to waste. Well, it isn't just black minds which are being wasted here. A frightening part of America is made up of people with good minds who have been pushed into a life pattern which makes little use of their minds. In school, it is managing to get by via memorizing enough to pass tests and spending most of the waking time screwing around, drinking beer, and so on.

Out of school, one takes a job and gets married, goes home to some more beer and the ever-present television. Going out means McDonald's or Burger King. . . or a bar and an occasional movie. Television takes care of most of the need for entertainment. You've read how many hours a week the average person is in front of the TV set. There's nothing in that schedule for advancing one's education and expertise.

The kid who gets involved with a high-tech hobby in school has a tremendous advantage. There are no bread lines for electronics or computer technicians, only thousands of jobs advertised in the papers from coast to coast. The microcomputer field could easily provide handsome incomes for at least 50,000 people with the ability to repair computers. For a ham with any background in digital work, such as RTTY, getting the hang of computer repair is a snap.

And I don't think I would have much problem in finding work for at least 100,000 programmers. That wouldn't even begin to scratch the surface which is developing in software needs.

There is no easy way to get out of the fix the country has gotten itself into. Unions and other groups who have gotten an edge on the rest of us are protecting that edge with vigorous political power, putting the pressures on the weakest of senators, and you know who I mean. We see them bowing and scraping to the pressure groups every day on the news broadcasts, championing the poor on the one hand, and with the other making sure they stay poor by giving as much as possible to the groups which are getting more than their share and keeping the politicians in office.

Hams, if they don't screw up by wasting their golden opportunities to learn (and that is what *73* is all about), will never have to worry about jobs. I get a bit discouraged when I run into hams who spend 100% of their time wheezing over repeaters or on nets on the low bands, never making any effort to try something new. . . and, at best, writing in angry letters when we present new ideas and technologies in the magazine.

The fact is that despite the slight growth of amateurs, fewer than ever are reading *any* ham magazines at all. Please tell me of what value a ham is to himself or to the rest of us if he not only has no understanding of technology, but isn't even interested enough to read about it? You want to see something interesting? At the next club meeting ask for a show of hands of members who are getting a ham magazine. I think you'll be surprised at how many are not only ignorant about amateur radio, but also have no real interest in learning.

Clubs are a key to not only rejuvenating amateur radio, but also to getting our whole technology moving ahead. Few ham clubs are so dead that at least one member of the club isn't into RTTY, ASCII communications, packet radio, slow-scan television, ATV, OSCAR, or *something* different from rag-chewing or DXing. Get these chaps to give a talk on the fun they are having. . . with some hints on how to join in the fun. If someone is into building, be sure they have a chance to show off what they've built. You could just get some more club members interested. Maybe someone in the club has started a small electronics, ham, or even a computer-oriented business. . . well, get 'em to tell everyone about it. Help them and infect the group with the enthusiasm.

We have enormous potential. We have one of the most fascinating hobbies there is. . . though this is one of the best kept secrets in the country, if not the world. And with the coming need for people who understand communications, never have the prospects been better for using a hobby to provide a stepping stone into business. Thousands of new businesses are needed and will be formed, making thousands more millionaires. Are you going to be part of the fun or one of those watching the next Super Bowl game with a cold six pack at your elbow, wondering how come so many of your ham friends are getting rich?

THE ULTIMATE EMERGENCY

Nuclear war is still more of a science fiction concept than one which has to be faced as a reality. Yet, if you've seen some of the recent evaluations of the situation, it is getting obvious that whether we want to believe that such a war is possible or not, we can no longer just refuse to face the problem.

About five years ago there was a film on television which showed a comparison of the US and the USSR as far as a nuclear exchange was concerned. The SALT agreement set up a situation where both countries agreed not to pursue civil defense protection of the cities, resulting in a sort of mutual hostage situation. Of course, Russia immediately embarked upon a massive development of underground protective areas. We, on the other hand, virtually disbanded our civil defense program. The estimate was that a nuclear exchange between the two countries would probably result in about 100 million Americans getting killed as opposed to perhaps only 20 million Russians.

Not only have they set up extensive protection for their people, but a good deal of their manufacturing has been protected. And their efforts have been continuing, with one recent estimate that their losses might today be down to only five to ten million. Well, these are just figures, so nit-pickers can *argue their validity*, but the basic idea of what has been going on should give us some pause.

Well, the more the USSR outmaneuvers us with missiles and civil defense measures, the more serious is going to be the need for a well-developed emergency communications system. The only thing which can keep us together as a country is the ability to keep some sort of communications between our people and our government. Without that we cease to exist as a country.

The FCC is not unaware of this situation and it has made a major move to do something about this growing need for an emergency communications system which will be available for any emergencies, right on up through a full-blown nuclear war. They started with the National Industry Advisor Committee concept (NIAC), small subcommittees made up of volunteer advisors from industry. These NIAC groups have been around for several years but have not been very active or productive. Perhaps the most active of them has been the amateur radio subcommittee during the last two years.

The Commission in January set up a Long Range Planning Committee (LRPC) made up of top people from our communications industry. This committee has been set up, in essence, as a steering committee for four revamped NIAC subcommittees. The aim for this is the setting up of an integrated emergency communications system.

Though more and more of our government agencies are arranging for intercommunications during emergency situations, nothing has been organized in the way of an overall intercommunications system between government and all civilian radio groups. There seems little likelihood that such an overall system will not depend heavily upon radio amateurs. In this I think we may have a very exciting future ahead of us. Amateur radio is getting to be perceived as needed—by the government, by the communications industry, and by civilian groups.

No matter how bad the battering, when the dust starts to settle, some ham is going to dig his way out of a cave, grab his radio out, and see who is on the air so he can start getting things together. HTs and mobile rigs will be set up for local communications, low-band rigs for area and national communications. The world, what is left of it, will want to know what is happening, and the *chances are that it will be hams* who will be the link.

Rather than wait until we're needed for this ultimate emergency, we'll do better if we get started now setting up the communications systems we may need. We can start with what we've got—improving our repeater systems, linking them through both microwave and low-band links. But if we're going to get very far with this, we're going to have to get going with some badly needed technical developments. Voice communications may do when there isn't much traffic, but if anything serious happens, voice channels will be quickly swamped and we're going to need high-speed digital communications. We won't have that unless we start working on it now.

Over the next few years, I expect that we will be called upon for several things as a group. First, it should not surprise us if both the government and industry start getting serious about the need for the growth of amateur radio. The need for engineers and technicians for the government and industry is getting desperate and no better source of really dedicated technical people has been found than amateur radio. We're going to be called upon to start a big movement to attract the 10-15-year-olds into our hobby. This means new programs for our clubs, cooperation with local schools, and so on.

Amateur clubs are a natural for setting up intergroup communications. In emergencies it is crucial to make it possible for all two-way radio users to have some common link.

As a member of the newly formed LRPC and also a member of the private radio NIAC, I've started a dialog with the communications industry leaders. I have good reason to believe that we can expect to get cooperation with industry and government in developing amateur radio growth. I think we are going to be able to start setting up some repeater-to-repeater communications systems via the commercial satellites, using spare channels. These will start out mostly with voice channels but will gradually change over to digital high-speed channels as we improve our technology.

This isn't anything we can seriously tackle with a bunch of old men staggering around with their walkers. We are going to have to come to grips with the need for youngsters and find out how to attract them. Whether that is going to take a no-code license or what is your problem. You work it out and let me know so we can get some movement ahead. I will say this: Good luck on trying to explain to kids why Morse code is important for the development of the needed high-speed communications system. . . or even for voice communications.

SURVIVING EMP

Electromagnetic pulse (EMP) is a partner of nuclear blasts. Getting the facts about its effects on radio equipment is difficult. We read in some places that solid-state equipment can be expected to destruct anywhere within hundreds of miles of a blast. Then we read that, hell, all you have to do is wrap things in foil to protect them. Truth prabably lies somewhere in between, though more toward ease of destruction than ease of protection. Since it looks as if the government is going to be looking to amateur radio for communications when all else fails, we're going to do our best to get the most accurate information on the subject we can, despite cloaks of secrecy which seem to be thrown up around the subject. We really have to know if we are going to do the job.

When defectors brought us the latest in Soviet fighter planes, our technical people had a merry laugh over the primitiveness of the communications equipment. Imagine being so far in antiquity that they are still using tubes! Golly and har de har har.

The smug chuckles turned sour when someone got to thinking about it and ran some tests. Sure enough, tube gear is able to survive surprisingly large blasts of EMP and still come out working fine. Thus it appears that it is getting time to go back to the old workbench and re-invent tube radios and anything else we want to be usable after a nuclear blast in space.

The transistor came just at the time when we were starting to seriously design truly miniature tubes. Oh, we had some small tubes designed for wartime pocket spy radios and for hearing-aid amplifiers. We made some small "acorn" tubes for VHF purposes such as the 955-9 series. Those came along in the 40s. By 1960, we had even better VHF tubes in the nuvistor, and then tubes were phased out. Today our miniaturization techniques are such that we probably can design some very small tubes to be used in EMP-safe radios, and perhaps this is something in which the government should invest.

In the meanwhile, the rest of us need to know if there is any way to protect our repeater transmitters and receivers, the control circuits, and even our digital RTTY and computer circuits so they will still be around after a surprise.

If we're going to be limited to tube gear after an attack, the type of communications we will be able to provide is going to be totally different than if we can use digital equipment, which would make it practical for us to develop high-speed automatic relaying anywhere in the country. If any readers have good solid information on this, let's start getting it. Please, no conjecture or guesses.

One of the problems involved in getting hard information on these pulses, beyond the restrictions of secrecy, is the difficulty of simulating them for testing. Indeed, there is no test site yet available which can duplicate the short intense pulse involved. A test site in New Mexico has been able to generate an EMP by discharging 160 billion Watts of power, yet this pulse is probably about one-third of what we can expect from a nuclear blast.

The pulse travels particularly well in space, so it is possible that one or two bombs detonated out there could wipe out most of the synchronous satellites. With an increasing amount of our communications being routed via these birds, this could screw things up substantially. That's why, in making long-range emergency communications plans, alternatives to satellites must be considered and developed.

The January/February issue of *Science 83* magazine had an article covering the subject if you want more details.

REVIEW

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

THE AUTEK RESEARCH QF-1A FILTER

Although many active filter designs pass themselves off as "multi-mode" filters, as being equally useful on phone as on CW, very few end up seeing much use in the shack of a dedicated phone operator. One of the few exceptions to this rule is the Autek Research QF-1A filter.

The Autek filter is an active audio filter combining several functions into one package for use in a variety of signal situations. The two-chip filter with built-in LM380 amplifier is capable of driving either a speaker or headphones of any impedance, and it runs on 115 V ac. Two notch filters, a peak filter, and both low- and high-pass filtering is available. And if you like knob-finding, this peripheral device is for you.

Learning to operate the QF-1A is a little like learning how to drive a car with standard shift. All of the controls interact, and like the grinding of gears when you shift without clutching, the ringing in your ears lets you know when you have made incompatible adjustments on the filter. However, the principle behind the QF-1A is simple—it helps you rid the received signal of unwanted components and enhances the remaining desired frequencies. The complexity is necessary to accommodate the wide range of situations found in amateur operating. For CW work, a very narrow bandwidth is desirable, but a wider passband is necessary for SSB. Meanwhile, interfering noise varies from a carrier raging unbridled 2 kHz up from your frequency to the irritating splatter from the back door of kilowatt alley.

Knob Management

In the hierarchy of controls on the filter, the Function Select Switch reigns supreme. This knob allows you to choose between the aforementioned modes of filtering. Peak and notch filtering have opposite effects; the former passes a narrow range of frequencies and rejects the rest, while notch filtering culls out a narrow range and passes the rest. High-pass and low-pass filters remove frequencies from opposite ends of the audio range.

Two of the three remaining controls have different effects depending on the position of the function switch. The Selectivity control determines the bandswitch of the filter while using the peak filter, and it controls the width of the notch when you are in that mode. Peak bandwidth ranges from 14 Hz at a 300-Hz center frequency to 20 Hz at 800 Hz. On the other hand, greater notch selectivity makes the notch shallower and therefore harder to tune.

The center frequency of both the notch and the peak is determined by the Frequency control, which has a range of 250 Hz to 2500 Hz. In operation, it is important to remember that low-frequency filtering creates a narrow passband in the peak filter and varies the signal components rejected by the low- and high-pass filters.

The final control on the QF-1A is the Auxiliary Notch control. This secondary filter is a wide and deep notch, and the control varies the notch's center frequency from 80 to 1100 Hz.

The Bottom Line

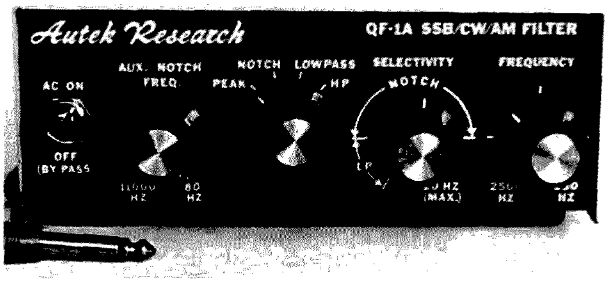
But lest you get wrapped up in all this theory of operation, the bottom line in using the filter is how the signal sounds—and in reaching this objective, anything goes. When using the filter, you are in a double bind of trying to bring a signal out of the mud and trying to keep track of it while the filter changes the signal's quality. Expect some frustration at first, because finding the correct settings requires a practiced ear.

The filter is most effective working against carriers near your frequency. The deep notch can be set on the carrier quickly, and then you can adjust the width to keep other components of the signal. Filtering a nearby voice station is more difficult because a voice signal contains a wider range of frequencies, making it difficult to mask. When attempting to blank another voice station, you may have to settle for simply enhancing the desired signal with the peak filter and ridding the interfering signal of its more irritating qualities.

Splatter is another problematic situation when using the filter; at times there was little I could do, and at other times I could reduce the splatter to a minimum level. Although I did not test the filter in conjunction with SSTV or RTTY transmissions, these are two other areas where the qualities of the QF-1A could be used to their maximum potential.

One of the benefits of using the filter is its built-in amplifier. Whether or not you can clear away flotsam from another signal, the amplifier will help improve the presence of the signal.

Autek includes a full-page table to help get you started with the filter. The table is divided into common interference problems and suggests settings for the controls. These are good starting points, and until you develop an ear for the filter and its controls, it will be necessary to consult the table.



The Autek Research multi-mode filter.

Also included in the manual are alignment instructions and troubleshooting hints, although these units have proved to be extremely sturdy and require little maintenance.

Wrap-Up

I have been very pleased with the QF-1A and its ability to clean up voice as well as CW signals. Several times, I have been forced to use it in deteriorating band conditions, and it made QSOs possible when there would otherwise have been just noise. I also found myself using it with strong stations, not only to clean up the signal but also to put more fidelity in my reception. The filter gives you the opportunity to rearrange the other person's voice to suit the temperament of your receiver and your ears.

The ability to flip the filter in and out with a front-panel switch also proved to be a boon, as I did not have to reach around to the dark end of my transceiver to move it quickly into play. The filter also comes with a full year's warranty for both the components and construction, which is good in comparison to the 90 days other companies provide. After the warranty period, there is a minimum $15 service charge, but I doubt if you will have to take advantage of it.

For further information, contact *Autek Research, Box 302, Odessa FL 33556.*

Avery L. Jenkins WB8JLG
73 Staff

KENWOOD'S PANADAPTER

I was more than excited to walk into the W2NSD/1 shack and see the Kenwood SM-220 Panadapter on the bench. My first thought was that it sure is nice to work for a company that is "in the business."

"This is one of those station accessories that looks nice but really couldn't improve my operation," I thought to myself.

Boy, was I wrong! After only a few minutes of reading the documentation, I was learning more about the band and station signals than I could ever tell from my "experienced" ear. I soon learned that the SM-220 was a lot more than just a monitor for my transmitted signals. The real beauty of this device is its ability to put into a graphic display the signals that you are receiving.

The SM-220 has several standard functions. Number 1 is its ability to function as a monitor scope. This allows you to display your transmitted waveform from 1.8 to 150 MHz (with some power limitations in the upper VHF range). This function allows you to "see" instantly the signal that you are transmitting. If you are on CW, you can view the keyed waveform and watch for anything from dirty key contacts to too soft a signal. In SSB, you can monitor your signal for the "ideal" waveform or watch your signal deteriorate from excessive audio drive.

Also built into the SM-220 is a two-tone generator and ample diagrams to discern between the "ideal" waveform and one from an overdriven transmitter or defective ALC. All the aforementioned functions are for your transmitted signal. The real kick from operating this scope is watching other signals on the band.

For those of you who are Teletype® operators, the SM-220 displays the standard RTTY cross pattern for tuning in other stations. In addition to telling you if you are tuned to their frequency (sure beats a tuning meter), it will tell you if their space or mark frequencies are exact and if your demodulator or TU has low Q.

The pan-display option (well worth the extra cost) is probably the best feature of the whole unit. It is a plug-in and requires no soldering to install. We have all heard the old-timers refer to panadapters fondly. Now I know why! It is a great feature, and I'll tell you why. Just imagine trying to make that sked you and your buddy try (but not so faithfully keep) on 20 meters. You finally make contact with him and a station comes on your pre-established frequency and tells you that you are QRMing a QSO or net already in progress. Instead of telling your friend "stand by and I'll look for a clear frequency," or "up 5" until you are in the 10-GHz range, all you have to do is look at your SM-220 and immediately see where the "hole" in the band is. It's a fantastic feature! The pan-display option allows you to look at either +/−20 kHz from your received frequency. You can determine if there is a carrier up 10 kHz or an SSB station 3 kHz away. Not only can you see these signals, but you can also tell their relative signal strengths.

And after a short time operating the SM-220, you can develop a fairly accurate correlation between the vertical size of the signal on the scope and the actual signal strength as recorded on your receiver's S-meter. Just think of the ease of operation if you are a contester or even a casual DXer. When the desired station says "listening 14.200 to 14.300," you can look at the display and put your transmitter right into a clear spot.

On top of all of the above features, and an excellent instruction manual (complete with schematics), the SM-220 is a standard 10-MHz oscilloscope. As I said to Jeff DeTray WB8BTH as he walked into the shack with lunch, "I want one."

For additional information, contact *Trio-Kenwood Communications, 1111 West Walnut Street, Compton CA 90220.*

Bob Cunningham K1XR
73 Staff

THE YAESU FT-102

Just as the day of the completely homebrewed station has passed, the era of the single-purpose rig has become history. Where once a ham might have had his CW rig for one band and a phone rig for another, today those functions have been integrated into one package. And as technology progresses, more and more functions can be squeezed in.

The Yaesu FT-102 is a perfect example of just how multi-modal today's radios are. This new Yaesu has more modes and filters than Elmer had crystals, which makes it useful for the average ham—the one who sometimes contests (but doesn't necessarily win), sometimes DXes (but isn't on the DXCC Honor Roll), and who exclusively works neither CW nor phone.

Standard features on the Yaesu include

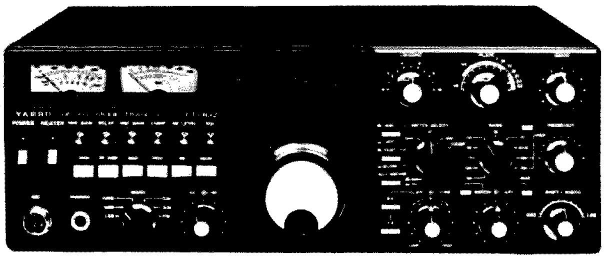
an rf amplifier, speech processor, noise blanker, receiver and transmitter incremental tuning, peak and notch filtering, and i-f passband controls.

Not bad, eh? Optional additions to the rig feature AM as well as 10-meter FM, SSB and CW filters, and an external vfo with push-button frequency input and 12 memories. And the matching speaker possesses two more audio filters for last-minute signal reception clean-up.

All of the WARC bands have been included on the transceiver, which belts 240 Watts into the finals on SSB and CW below 25 MHz and 160 Watts above. With the AM/FM option, the rig has a final input power of 80 Watts on AM and 120 Watts on FM. Frequency is, of course, PLL synthesized, and the audio quality of the transmitter may be tailored for the best intelligibility with your voice.

One of the most obvious features on the front panel of the FT-102 is the series of inset silver knobs just below the dual meters. These knobs operate the lesser-used controls such as the VOX, microphone gain, squelch, and speech compression. The knobs pop in and out so that once set, they are out of the way and will not be inadvertently readjusted. Just below the miniature controls are a series of switches which turn on the rf amplifier, noise blanker, and speech processor, and switch the crystal filters into the circuit. Standard af/rf gain controls are provided as are the agc (fast and slow) and the receive preselector.

A surprising addition is the tone and clarity control, a feature too often overlooked by most other manufacturers. Nobody has ever claimed that ham radio is a hobby for audiophiles, but after four hours of 20-meter cacophony or the crashing of 80 meters in the summer, my ears appreciate the small comfort a control like this offers.



Yaesu's multi-mode FT-102.

Receiving

When I first turned the transceiver on, I thought it was one of the worst-sounding receivers I had ever heard. 14.32 MHz sounded like a thunderstorm in the middle of a drag race, and only the strongest signals could be pulled in with any intelligibility.

That was before I caught the note in the manual which instructs you to turn the rf amplifier off in noisy band conditions. Chalk one up for reading the instructions first. With the amp off, signals became much clearer, but the receiver still possessed fine sensitivity. As I tuned around the band, one of the first things I noticed was the sharpness of the tuning—and this was before the filters were pressed into service. Unlike some other radios, the frequency readout is no more accurate than the selectivity of the front end—what you see is what you get.

As I gained more confidence in manipulating the basic controls, I began trying out the special features. The SSB crystal filter was easy to use and it enhanced selectivity. However, signals were more difficult to tune in because of the resulting sharpness. More difficult to learn were the i-f shift and bandwidth controls. These controls, located on two friction-coupled knobs at the lower left of the front panel, allow you to select the best bandwidth for the band conditons. Width, of course, narrows the passband of the i-f and it is possible to reduce the adjacent QRM without losing too much of your desired signal. Once the width has been set, then you can vary the center frequency of the i-f to focus on the signal. Although extremely useful, I am at a loss as to why Yaesu splined the two together, making two-handed operation a necessity.

When using these controls, be ready to adjust your ears to the changing sound. Together, the two controls have enough range to render unintelligible a previously clear signal.

The peak and notch controls add another level of reception manipulation, this time in the audio portion. These filters are less powerful than the i-f controls and are useful in the less strenuous conditions. Although I do not know if the engineers who designed the FT-102 intended the peak and notch filters to be used in this way, I found that they conditioned the sound to be more pleasing if not necessarily less polluted.

Overall, I found the receiver quality to be one of the best I have encountered. The toughest part of using the receiver is hanging on to a weak signal until you can get all of the controls peaked. While trying to eliminate adjacent QRM, it is easy to mask the signal you want because of the interactive characteristic of the controls. I learned this the hard way in a QSO with a Topeka station who mysteriously disappeared. I thought it was severe QSB working in hand with QRM until I realized that I had put the I-f shift on the wrong side of the signal.

Transmitting

From all reports, the FT-102 has excellent audio, due in part to the adjustments which can be made to tailor the transmitter to your voice. The first step is to cut in the monitor switch to hear your audio as others hear you. Two controls, accessible through the bottom of the rig, adjust high- and low-frequency attenuation. These are set-and-forget controls which need no adjustment unless you start using a different microphone or sell the rig.

The monitor function can also be used to help set the compression on the speech processor and avoid the negative effects of over-compression which void the gain derived from processing. It's no use getting an extra 5 dB if the person on the other end can't understand what you are saying. Short of having another ham tape your transmission and play it back or using an oscilloscope, there is no better way to get your outgoing signal the way you want it. The monitor latches onto the audio in the transmitter i-f so that you get a true indication of quality rather than just amplification of the microphone input.

Another useful transmitting feature is the ALC "peak hold" circuitry. The ALC meter will hold your voice peak for approximately one second to make accurate adjustment of the mike gain control exceedingly easy.

Transmitter tune-up is a variation on the standard drive-plate-loading theme. Instead of varying the plate and loading controls simultaneously for a meter peak, the Yaesu manual recommends moving the load control up in discrete steps and adjusting the plate control until you reach a specified level on the meter.

CW fanatics will be glad to know that they can adjust the pitch of the CW sidetone to suit their taste. The FT-102 provides semi-break in, with the VOX delay controlling T-R switching. Alternatively, the front-panel MOX switch may be used or an outboard switch may be connected to the rear-panel PTT jack. In addition, the instructions for the Yaesu include a section on how to squeeze as much juice as possible from the transmitter when operating on CW.

Accessories

Most notable among the accessories for the FT-102 is the FV-102DM external vfo. Set in a matching cabinet, the vfo expands on the capabilities of the digital circuitry of the transceiver.

The FV-102DM's five-digit display displays kilohertz with a resolution to 10 Hz, and it may be tuned with the tuning knob or by using the built-in keyboard. Scanning speed may be adjusted or you can enter a frequency directly on the readout to move instantaneously to another frequency. The keyboard also offers a stepping rate of ± 20 kHz or ± 5 kHz, and both the keyboard and the tuning knob may be disabled when operating from the frequency memory bank.

Four tuning rates may also be selected for the analog control, and any of these rates may be multiplied by a factor of 10 for super-fast tuning. A series of switches allows you to put the receiver and transmitter on your choice of vfos or place either under the control of the stored frequencies.

A second accessory, the speaker/filter combination, offers the final word in signal conditioning. The two filters used jointly can create a speaker response suited to any environment. You can attenuate highs or lows as well as choose your bandpass width. The speaker itself has been designed for communications responsiveness, and even without the filters the sound is exceptionally sharp and clear.

Finally, the manuals which accompany both the FT-102 and the accessories have been well designed. They include clear and concise operating instructions in addition to tables which outline common control positions for a variety of situations. I am also happy to report that both have extensive theory-of-operation and service sections. Although the sections are certainly far from being comprehensive service manuals, they do cover most of the maintenance and troubleshooting procedures that the average ham would need to keep operating at peak capacity.

Although some would question the need for all of the options which the FT-102 and its accompanying peripherals present, I consider them welcome additions to the shack. Good operating requires access to a variety of techniques, whether you are running a phone patch or chasing DX, and this transceiver offers the necessary flexibility for successful hamming.

For further information, contact *Yaesu Electronics Corporation, 6851 Walthall Way, Paramount CA 90723; (213)-633-4007.* Reader Service number 492.

Avery L. Jenkins WB8JLG
73 Staff

HEIL HC-3 MICROPHONE CARTRIDGE

Bob Heil, 1982 Radio Amateur of the Year, never stops moving. He has more irons in the fire than any other ten people, and most of them are deeply involved with audio and amateur radio. Since 1966, Bob Heil has been a sound manager on the road with such groups as The Grateful Dead, The Who, Dolly Parton, Billy Graham, and many others. He has wide experience with radio- and TV-broadcasting studio audio systems and has written many books on the subject of good audio, including *A Practical Guide for Concert Sound.*

Long ago, Bob discovered that speech intelligibility is a function of clean audio —audio that is not cluttered with distortion. Distortion comes from intermodulation products caused by the combination of audio frequencies whose fundamentals may be below the audible range... say at 50 to 200 Hz. These will pile up on one another and produce combination frequencies that are within the audible range... hence distortion. The effect of this low-frequency rumble is to render the audio less intelligible and "muddier." In addition, as you tune across an SSB signal, it often is heard a long way from the center frequency because of these intermodulation distortion products. A good, clean SSB signal is more sharply defined, and the low and high cutoff frequencies are closer together. The voice sounds more natural... almost as if the person were present in the room with the listener.

Bob is a believer in the fact that good, properly designed and executed speech can be heard over the caterwauling of a DX pileup, just as a singer can be heard over 120 dB of drums and guitar... provided the right things are done. The right things have to do with articulation and sibilants. Articulation is the ability of the mind to hear and clearly understand what is being articulated from a source... such as a transmitting station. Sibilant sounds—s and t sounds—are necessary for intelligibility... and they must be reproduced faithfully; otherwise, grass sounds like grapf, and callsigns become greatly confused.

Bob and his engineers found that there is another quality called balance, which means that there must be a balance between the audio frequencies between 1200 and 1500 Hz, and those at the bottom and top ends of the speech range. The critical frequencies for sibilants and articulated syllables lie in that range... and the microphone or audio system must produce exactly the right level of these frequencies as clearly and cleanly as possible, i.e., without distortion and properly balanced with respect to the rest of the spectrum.

Unfortunately, many hams falsely equate lots of bass response with good audio. While bass is important, it is not everything.

The goal should be to make the transmitted voice sound as natural and as close to the original as possible.

The HC-3 microphone element ($19.95) does just that. . . it reproduces the natural voice as closely as possible to the original by giving proper emphasis and balance to the sibilant range without neglecting the highs and lows. It rolls off rapidly below about 450 Hz and above 2,400 Hz and is designed as a replacement element for almost any amateur microphone.

In my case, I substituted my faithful old Shure 444 dynamic element with the HC-3. The first thing I noticed was that the output level of the HC-3 was not quite up to that of the 444. Bob Heil explained that this was so because the necessary fidelity and frequency balance could not be obtained with high output. The development engineers produced the best possible trade-off between output and articulation for the desired audio quality. The level was taken care of by merely increasing the microphone gain until the output level for the transmitter was correct once more.

I enjoyed SSB contacts on 160 meters, 40 meters, and 20 meters using the Heil element. Most reports were unsolicited, although I did ask several stations to give me critical reports. The consensus was that the HC-3 produced clear, natural-sounding audio that was very crisp and easy to tune. Several stations commented on the sharp tuning of my signal, and complete absence of splatter or distortion. Most of them mentioned that my voice sounded as real as if I were in the same room. . . and they imagined that it must sound exactly like me. Others commented about the "presence," which I took to mean some sort of attention-getting quality or "authority."

In general, the reports were uniformly and unanimously favorable. Since those tests with my Astro 102BX, I removed the HC-3 cartridge from my 444 and replaced the original element. The cartridge was then loaned to Avery Jenkins WB8JLG to play with and use on his own rig in order to see what effect it would have on audio quality and reports. Avery's report:

"My initial reaction as I installed the new Heil cartridge into my microphone was that things sure have gotten smaller since the people at Turner put the finishing touches on my old single-sideband special. Where the original microphone took up the full diameter of the grill—about 1½ inches—the Heil cartridge is about the size of my thumbnail. The size differential was so great between the two components that I had to tape the Heil cartridge to the inside of the grill so it would not just flop around in there. The instructions supplied with the cartridge note that mechanical shock is not healthy for the cartridge, so I surrounded it with foam cushion, although I was not sure what effect the padding would have on my audio.

"I need not have worried; all of the reports received pronounced my audio as healthy. Although I cannot vouch for any gain in my signal strength, I suspect that the cartridge made some effect in marginal signal conditions, particularly when fighting heavy QRM. It is at those times when your audio needs that added presence to distinguish it from all of the other signals coming through the speaker at the other end.

"The audio from your signal encounters many adversities on the way to its destination, so, it makes sense that you would want it to be as clean as possible from the start. And if you are processing your audio, intelligibility becomes even more of a factor as you give some of it up for the added punch of compression.

"One of the more common problems with amateur-station audio is an excessive bass component, a result of both the transmitted audio and the audio response of the receiver and its speaker. With my Turner, this was a problem, so I asked my contacts on 15 meters to give me an honest rating of my voice as they heard it.

"None felt that the signal was too bassy. Some of the stations that I was getting a good signal into also noted an interesting effect; they suggested that I sounded similar to other stations using a linear—apparently, the audio had the kind of power normally associated with a kilowatt or more.

"Those comments are the kind I like to hear. Although the Heil cartridge may not give you the raw strength of a linear, it does rectify one of the more commonly overlooked problems in amateur operating—intelligibility. And in many cases, it is a basic factor like this that can make or break a successful QSO."

For more information, contact *Heil Sound, Ltd., Heil Drive, Marissa IL 62257; (618)-295-3000.* Reader Service number 489.

Jim Gray W1XU
73 Staff

The Moscow Muffler.

AEA'S MOSCOW MUFFLER™ WOODPECKER BLANKER

There are few hams, indeed, who have not been annoyed, enraged, disappointed, frustrated, and driven to blind fury by the Russian OTH radar whose rat-tat-tat-tat-tat pulses have disrupted amateur communications for the past five years or so. The woodpecker has shown up on frequencies below 30 MHz almost at random, except that—more often than not—it stays very close to the MUF. . . and irregularly changes frequency by hundreds of kilohertz. . . up and down the bands where DX communications are the best at any given time. We've all had weak stations obliterated just as something interesting was about to be said, and we've even lost rare ones now and then because of the dratted woodpecker.

From time to time, articles describing blankers that purport to deal with these pulses have appeared in the ham literature, and some of the blankers have been successful. Virtually all have been designed for use in a receiver only, and a few of them have been designed for only one type of receiver circuit. None has been available in ready-made form (as far as the writer knows), with the exception of some very recent equipment whose built-in noise blankers have incorporated variable pulse width and repetition-rate blanking. These—sometimes—effectively get rid of the noise. Most only reduce it from impossible to barely acceptable.

What has been needed is a pulse blanker that will absolutely eliminate the pulses, a blanker that can be used with a transceiver or a receiver, and one that is readily available for anyone at a reasonable price. Until now, that need has not been met.

At the Boxboro Hamfest last fall, Advanced Electronic Applications showed up with the prototype Moscow Muffler™, an affordable and easily-employed woodpecker blanker that could be inserted into the coaxial cable between rig and antenna, which would wipe out the woodpecker with only a few simple adjustments. It was an instant success, not to mention a mild sensation. The demonstration allowed one to knock the pulses down from an S9 + 20-dB level to less than about S2 on the test receiver.

Naturally, it wasn't long after the demonstration that we asked for a unit to test. . . and it wasn't very long after that that the WB-1C showed up on our doorstep—that is, the doorstep of the W2NSD/1 ham shack. Good-bye to frustration and anger, and hello to living with the Russkis' efforts to drive the West bonkers. Come to think of it, I'll bet a few UAs don't like it, either.

Description

There are two models available: the WB-1 and the WB-1C. Either one will interface successfully with any communications *receiver* by placing the blanker between the antenna and the receiver antenna-input terminal. Usually, this is done by means of a short length of coaxial "patch" cable with PL-259 UHF-type plugs at each end to mate with the SO-239 chassis connectors.

The WB-1C model, however, is intended for use with a *transceiver* in which the output power is less than (or can be reduced below) 150 Watts. No internal modifications or changes of any kind are required with either model woodpecker blanker, but the transceiver model has an automatic antenna relay that is actuated by sensing rf power in the transmission line and disconnects the delicate circuitry from the outgoing rf during the transmit cycle.

The woodpecker blanker lives in a black box measuring about 6" wide × 5" deep × 2" high. An attractively-screened front panel contains an on-off indicator (LED) plus an on-off power switch (you must furnish your own source of 12 volts dc or buy the available accessory ac/dc converter available from AEA). Next to the power push-button is a gain push-button that allows you to select an internal 6-dB amplifier for bringing up those weak, hard-to-copy signals. Next to that is the blanker on/standby button, and next to that is the rate-selector button offering a 10-Hz or a 16-Hz repetition rate. Two knobs are provided for varying pulse width and pulse sync.

On the rear panel, you'll see the power-input jack, the *antenna* and *transceiver* (receiver) connectors, and a ground terminal. Also, there is a carrier-operated-relay adjustment (COR ADJ) shaft with screwdriver slot. This permits you to adjust the drop-in/drop-out relay timing so that the antenna is disconnected from the receiver for only as long as necessary during the transmit/receive cycle. The box weighs about 2 pounds and looks mighty nice sitting next to the transceiver. Let's see how it works.

Operation

WARNING! Do not connect your transceiver output to the "antenna" connector; connect it, instead, to the "transceiver" connector. Doing otherwise will ruin the unit and void the warranty.

After connecting the antenna to the antenna terminal of the WB-1C and a patch cord between the transceiver terminal of the WB-1C and your transceiver output, connect the 12-V-dc source. The AEA AC-1 wall adapter will furnish the needed voltage and 575-mA current (center-pin positive). Ground the terminal marked ground to your station ground.

Turn on your transceiver, and if it has its own noise blanker, make sure that it is off. Note that no signal will reach your receiver until you turn the power switch ON (if you have the WB-1 receive-only model). With the WB-1C, you will hear signals immediately. You may now select the wide-band preamplifier, if you like, to bring up the level of weak signals above 14 MHz or so. Frankly, I did not need the preamp, but tried it anyway. It works. . . but more about that later.

When the woodpecker appears, depress the BLANKER button and select the 10-Hz rep rate with the button next to it. Advance the WIDTH control to approximately the 2 o'clock position and slowly tune the SYNC control knob until the woodpecker signal disappears or is much reduced in level. Then, slowly reduce the blanking pulse width by rotating the control counterclockwise, and fine-tune the SYNC control. I found the 10 o'clock position to be about right for WIDTH. Excessive width causes more loss of signal than necessary.

Special Condition

The woodpecker apparently transmits from at least two locations: one in Siberian Russia and the other in European Russia. You will find that in most cases you can adjust the blanking to reduce pulse amplitude by 45 to 50 dB. If it's less, this could be due to poor adjustment, but more likely to multiple-path propagation where the delay or phase lag causes your SYNC control to lock on the primary pulses but not the delayed or out-of-phase ones. Perhaps lack of synchronizing could be due to both woodpeckers jamming at once. Incidentally, the woodpecker sometimes operates at a 16-Hz rate, so it might be wise to try that if you don't get all the pulses at 10 Hz. In my case, I did not need the 16-Hz rate, as every time I heard the woodpecker it was using 10-Hz pulses.

Since I operate mostly CW, I was anxious to find out how much of the incoming signal I was going to lose because of the blanking. (Remember, "blanking" means

just that . . . it knocks out a portion of the received signal in lock-step with the woodpecker. You actually are listening to "nothing" with each pulse blanked out.) At some Morse speeds, parts of the characters are lost, but an adjustment of sending speed will help. The blanking action bothers CW more than phone.

Sometimes the synchronizing may be difficult. If so, try changing the agc control of your receiver from slow to fast, or vice versa. If that doesn't help, turn the blanker OFF and ON again quickly.

Other Comments

I have a wideband, low-Q, multiband vertical antenna system that allows me to operate on the ham bands of 10, 15, 20, and 40 meters. When I tried this antenna with the preamplifier ON, I was assaulted by commercial signals from some other band—possibly forty meters—when listening to the 20-meter band. This was the result of some signal being picked up and amplified by the WB-1C preamplifier. It disappeared when I switched off the preamp. It also disappeared when I changed to a single-band antenna or when I tuned on another band.

I was worried about the problem, so I called Mike Lamb at AEA. He said that he had another report of a similar problem, and found it was due to the presence of a very strong local FM station close to the QTH of the person who complained. This also turned out to be the case in my QTH. Mike's suggestion of a low-pass filter between the antenna and the WB-1C solved the problem by trapping out the high-level energy in the 88-108-MHz region that was mixing with desired signals and amplified by the on-board preamp.

It turns out that I don't have the problem now because the addition of the low-pass filter solved it. If necessary, I could have turned the preamp OFF and solved it, too, but I did want to be able to boost low-level signals on rare occasions.

The use of an antenna tuned to the band you are on and no other band also will reduce the problem greatly. However, spurious response is likely to be a problem only in those rare cases where you have a strong, local, interfering signal from a commercial station and choose to use the preamp without using a low-pass filter in the circuit.

The Blanker and You

Will you like it or hate it? If you suffer from the ravages of the wild woodpecker, you are likely to love it. You will note that it takes some adjustment to make it work properly, and—like everything else—experience and practice pay off. I can't foresee anyone who will hate it. In the case of someone who never operates where the woodpecker is found . . . he won't need the WB-1 or WB-1C anyway (lucky soul). For the rest of us poor, suffering hams, the AEA Moscow Muffler is nothing short of a boon and a delight. The WB-1C is worth every penny of the $149.95 price ($129.95 for the WB-1), and—best of all—it will kill the woodpecker *DEAD!* The AC-1 is $14.95. For more information, contact *Advanced Electronic Applications, Box C2160, Lynnwood WA 98036.* Reader Service number 490.

Jim Gray W1XU
73 Staff

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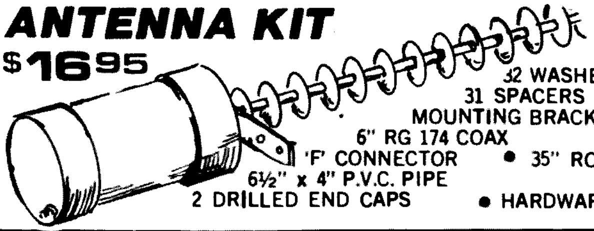
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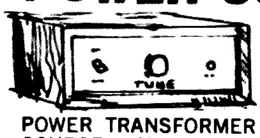

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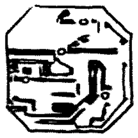
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NEW PRODUCTS

SLINKY DIPOLE TUNING CHART

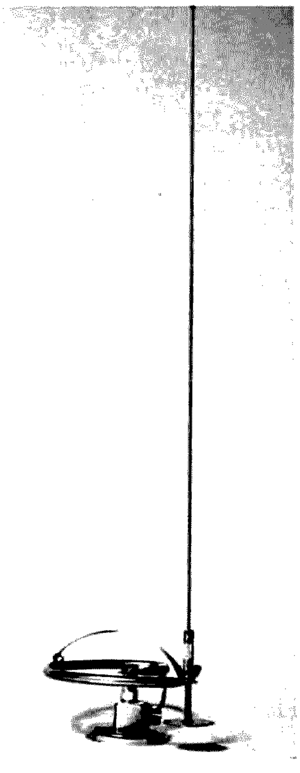
The Blacksburg Group has announced that it has the information necessary for tuning up the Slinky Dipole on the new 10-MHz band. The antenna needs no attachments for use on this frequency, but it does require an additional tuning chart.

The company is offering the chart free of charge to all Slinky Dipole owners, regardless of when or from whom they bought the antenna. Slinky Dipole owners should send a large (#10), stamped, addressed envelope to The Blacksburg Group to receive the information. If writing from overseas, you need only send your name, address, and two IRCs.

For more information, contact *The Blacksburg Group, Inc., PO Box 242, Blacksburg VA 24060; (703)-951-9030.* Reader Service number 477.

COM-RAD'S DDRR WITH RANGE EXTENDER

A unique accessory called the Range Extender now offered by Com-Rad Industries can be added to their very successful DDRR two-meter antenna (a DDRR and Range Extender combination is also available for 220 MHz). The Range Extender is a tapered stainless-steel whip and mounting base that can be attached to the end of the ring element of the DDRR. The unique feature is that the DDRR can be used alone or with the Range Extender without retuning. The transceiver sees no change in load. The use of the Range Extender does not, in any way, detract from the DDRR's ability to reject intermod.



Com-Rad's DDRR with Range Extender.

Tuning is accomplished simply by adjusting the stainless-steel capacity disc's height above its ground plane by turning the threaded stud attached to the disc and tightening the wing nut. The disc system supplements the bronze strap that was formally used and reduces the height of the antenna another two inches from its already extremely low profile. Owners of Com-Rad's DDRR antennas with bronze tuning straps may return their units to the factory for conversion to the disc tuning system at a minimal cost. For more information, contact *Com-Rad Industries 1635 West River Parkway, Grand Island NY 14072; (716)-773-1445.* Reader Service number 476.

SATELLITE-TRACKING PACKAGE

Computer Applications has announced Pathfinder II, the new multi-option satellite-tracking package for Apple computers. Pathfinder II has been designed to operate with a minimum of user-supplied information.

This program will track any circular-orbit satellite from anywhere in the world. Tracking is conducted in real time, and the path may be mapped on either a world or US map, using high-resolution graphics. Maps and tables of data may be printed on the Epson MX™ printer.

Pathfinder II comes complete with satellite-tracking information for OSCAR 8, NOAA 6 and 7, and the RS satellite series 3-8 already on disk. Information for other satellites may be added to the program's data base.

In addition to predicting future orbits and reference orbits, the program will compute and present a summary of orbital characteristics, using an exclusive, high-speed, accurate prediction algorithm.

For additional information, contact *Computer Applications, 3628 A Court, Oxnard CA 93033.* Reader Service number 486.

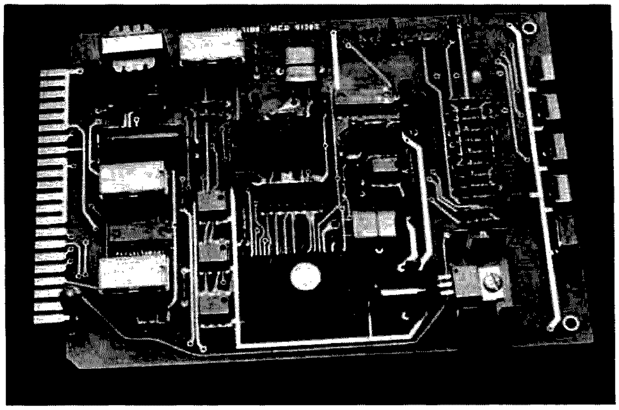
MCD 01 REPEATER CONTROLLER

Micro Concepts and Design Company has released its MCD 01 Repeater Controller, which provides the best quality in repeater control using the highest technology available for controller application.

The MCD 01 utilizes a Motorola MC 68705 microprocessor as the heart of the unit, combined with the latest in programming techniques. The MC 68705 contains 2K of EPROM and 112 bits of usable RAM. The stored program is protected in ROM against loss due to power failures. With this combination, a highly reliable and easy-to-maintain controller can provide a repeater with sophisticated control techniques never before seen at a modest cost.

A single-chip ITT 3201 DTMF decoder is used to decode all 16 touchtones™ used in repeater operation. This gives the repeater owner the capability to use any or all of the 16 DTMF tones. The chip contains both high and low filtering to prevent falsing.

Other features include 4 repeater access modes (carrier, touchtone, touchtone or PL, and PL only) and 3 autopatch/autodial access modes. The autopatch feature includes both touchtone and rotary dial capability. You may use any number of digits for any control or access command, and telephone line or auxiliary receiver inputs may be used for control purposes without disturbing normal repeater operation. The functions may be disabled together or separately.



The MCD 01 Repeater Controller.

A programmable subaudible tone encoder/decoder with 32-tone capability is included in the control unit. The encoder/decoder contains the necessary audio filters for the tones.

The primary design concept in the MCD 01 is to provide needed and practical features with complete operator control and easy-to-maintain circuitry. All components used in the controller are easy to obtain, and they have been mounted on a high-quality double-sided PC board with a 22-pin edge connector.

The MCD 01's compact size, high-quality components, and fine technology make it a perfect repeater controller for the discriminating repeater owner/operator.

For further information, contact *Micro Concepts and Design Co., PO Box 19786, Orlando FL 32814; (305)-298-3026.* Reader Service number 487.

MFJ-1220 RTTY/CW COMPUTER INTERFACE

The new MFJ-1220 RTTY/CW Computer Interface is a terminal unit that provides TTL/CMOS and RS-232 levels for computer interfacing.

Unlike phase-locked-loop demodulators, this is an optimum design using individually-tuned active bandpass filters. It has separate mark and space channel filters, a CW filter, and a post detection lowpass filter for excellent weak-signal and high-interface RTTY/CW performance.

It takes received RTTY/CW audio from your transceiver, demodulates it, and provides TTL/CMOS and RS-232 levels for interfacing with nearly any computer. A program (not included) is used to provide RTTY/CW text.

For RTTY transmission, your computer drives the AFSK generator to provide FSK transmission using the microphone or phone-patch input of your SSB transmitter, or it can directly key the FSK input of your transmitter.

For CW transmission, your computer drives the high-voltage keying currents of the MFJ-1220 which then provides grid-block or direct keying for your transmitter.

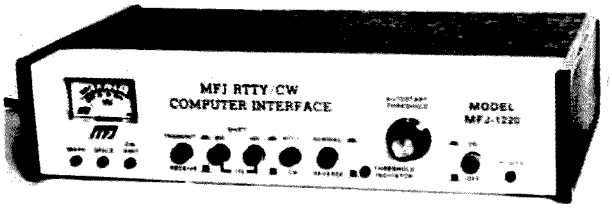
The RTTY/CW Interface transmits and receives all standard RTTY shifts of 170, 425, and 850 Hz to cover all amateur, commercial, and military traffic to over 100 wpm. It uses the standard space tone of 2125 Hz and mark tones of 2295, 2250, and 2975 Hz.

Meter, mark, and space LEDs aid in precision tuning. The mark and space LEDs also indicate mark and space transmissions. A normal/reverse switch reverses the polarity of the mark and space for receiving. A CW transmit LED provides visual indication of CW transmission. A sensitive autostart feature keeps noise from activating the computer or printer when there is no RTTY signal.

The MFJ-1220 operates on 12 V dc or 110 V ac with an optional adapter, the MFJ-1312. The cabinet is eggshell white with walnut grain and top. It measures 10 × 2 × 5 inches.

MFJ provides a 30-day money-back trial period. If you are not satisfied, you may return it within 30 days for a full refund (less shipping). MFJ also provides a one-year unconditional guarantee.

For additional information, contact *MFJ Enterprises, Inc., 921 Louisville Road, Starkville MS 39759; (800)-647-1800.* Reader Service number 479.



MFJ-1220 RTTY/CW Computer Interface.

YAESU HF TRANSCEIVERS

Yaesu Electronics Corporation has announced two additions to its line of HF transceivers.

The FT-980 is a full-featured 160-10-me-

The Yaesu FT-980 HF transceiver.

The HC-200 antenna tuner from Encomm.

ter transceiver which also includes a general-coverage receiver section. Providing a nominal 100 Watts rf output from a low-distortion, high-voltage final amplifier, the FT-980 is set up for full QSK with silent solid-state switching. The receiver section is designed for wide dynamic range and versatility in filter selection. An audio peak filter, i-f notch filter, variable pulse-width noise blanker, variable i-f bandwidth with i-f shift (passband tuning), and an audio-shaping control round out the receiver features. The FT-980 is controlled by an 8-bit microprocessor, which allows storage of frequency and mode into memory while also allowing the programming of subband limits for Novice-, Technician-, General-, or Advanced-class operators. Direct keyboard entry of frequencies provides instant QSY without the need to rotate the main tuning dial.

The FT-77 is an extremely compact HF transceiver for active mobile or space-conscious operators. Utilizing computer-aided design and automated insertion techniques, the FT-77 represents a new advance in manufacturing efficiency and reliability. Equipped for SSB and CW operation (FM optional), the FT-77 includes digital frequency display, CW wide/narrow selection, selectable agc, RIT, and a highly effective noise blanker.

A full line of accessories is available for both the FT-980 and the FT-77. For further information, contact *Yaesu Electronics Corp., PO Box 49, Paramount CA 90723.* Reader Service number 480.

SATELLITE STEREO PROCESSOR

A new satellite stereo-processing component from Channel Master now gives home TVRO users the capability of full stereo enjoyment of auxiliary audio services carried on the "birds."

The multi-mode stereo processor, model 6140, takes audio subcarrier signals from the satellite receiver and decodes them for use with an ordinary home stereo receiver system. It will also allow monaural audio subcarriers to be heard through hi-fi speakers for added enjoyment of satellite video programming.

Decoding of separate, multiplex, or matrix stereo is accomplished via front-panel, push-button selectors. Two independent tuning controls are provided for selecting the subcarrier channel desired in the range of 5.5 MHz to 8.0 MHz. A selectable i-f filter allows reception of high-fidelity programming with low distortion.

For easy tuning of favorite stations, four independently preset positions may be selected using the PROGRAM switch. Popular subcarrier frequencies have been preprogrammed at the factory on all four of these positions. The TUNE position on this switch allows the selection of alternate subcarriers.

The sleek styling of the Model 6140 Satellite Stereo Processor has been designed to match the look for the industry-acclaimed Channel Master satellite receiver. For more information, contact *Channel Master Division of Avnet, Inc., Ellenville NY 12428; (914)-647-5000.* Reader Service number 484.

ANTENNA TUNERS

Encomm, Inc., has announced two antenna tuners from Tokyo Hy-Power Labs: the HC-2000 and the HC-200.

The HC-2000 is a 2000-Watt PEP (500 Watts maximum on 1.9 MHz) HF antenna coupler with a power/swr meter and a versatile 12-position antenna switch (6 through the tuner and 6 bypass). It will tune coaxial-fed antennas, balanced-line antennas (balun included), or endfed wires. The HC-2000 is bandswitched for the 1.9-, 3.5-, 7-, 10-, 14-, 18-, 21-, 24.5-, and 28-MHz (all WARC) bands, so you don't have to experiment to find your inductor setting, plus it has 6-to-1 vernier dials on the capacitors for easy fine tuning. Scales on the dual meters include swr, 2 kW, 200 W and 20 W. Connectors are SO-239s and Johnson terminals.

The HC-200 is a combined 200-Watt HF antenna coupler with a power/swr meter and a six-position antenna switch (3 coaxial/wire positions through the tuner and 3 bypass). It will tune endfed wires, coax, or balanced-line antennas (with optional balun). The HC-200 is bandswitched for the 3.5-, 7-, 10-, 14-, 18-, 21-, 24.5-, and 28-MHz (includes new WARC) bands. Scales on the meter include swr, 20 W, and 200 W. Connectors are SO-239s and Johnson terminals.

Both antenna tuners have high quality ceramic coil forms, well-damped/well-shielded meter circuits, as well as first-class design and layout and there are no ferrite cores in the main inductor to saturate!

For more information, contact *THL Sales Department, Encomm, Inc., 2000 Ave., G Suite 800, Plano TX 75074; (214)-423-0024.* Reader Service number 481.

DB-GAIN ANTENNAS

DB-Gain Antennas of Ft. Lauderdale, Florida, has announced its new line of antenna products with the introduction of its commercial-grade dB-Gain vertical mobile antenna. Available in 450 and 220 MHz and 2, 6, 10, 15, 20, and 40 meters with a power rating of 250 Watts, these antennas were designed primarily for mobile use, but each can be used in a fixed-station application.

Each dB-Gain antenna whip and set screw is made of 17-7 stainless steel. Heavy-gauge fiberglass (.031 wall/spiral finish) coil housings provide strength and durability for extreme weather conditions. Each coil is wound with no. 16 copper, and the remaining hardware is chrome-plated brass. A standard mounting ferrule of 3/8" × 24 thread is compatible with most mobile mounts.

For additional information, contact *Tom Adams W4MTW, dB-Gain Antennas, 2308 NE 20th Avenue, Ft. Lauderdale FL 33305; (305)-566-2200.* Reader Service number 491.

DATASAVER™ AC POWER BACKUP

The Datasaver ac power backup, available in 90- and 200-Watt capacities, is a battery-powered backup unit which keeps many of the popular computer systems and instruments operating during ac power interruptions or transients. Both versions utilize a precision 0.1-percent crystal frequency standard that allows real-time power sensing and prevents video jitter that affects many computer displays.

The Datasaver provides overvoltage transient suppression and EMI noise filtering. Standard features include rechargeable sealed battery, automatic battery charger, solid-state power inverter, ac line voltage monitor and cutout switch, visual and audible alarms, and remote alarm signal for interrupt-driven computer applications. US and foreign power configurations available.

External battery jacks are provided to allow any 12-volt battery (car, motor home, boat, etc.) to become the power source for computer operation. For more information, contact Dave Dickey at *Cuesta Systems, Inc., 3440 Roberto Court, San Luis Obispo CA 93401; (805)-541-4160.* Reader Service number 478.

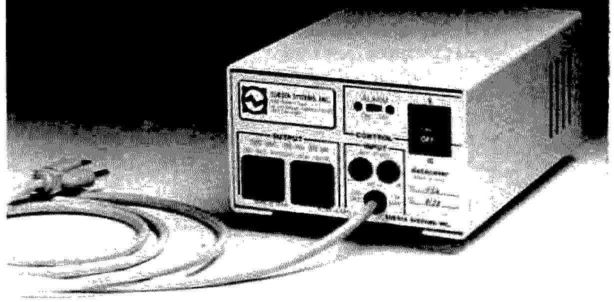
RF WATTMETER

The new Thruline® directional wattmeter expands the usual single full-scale power level of its plug-in element to seven overlapping power ranges.

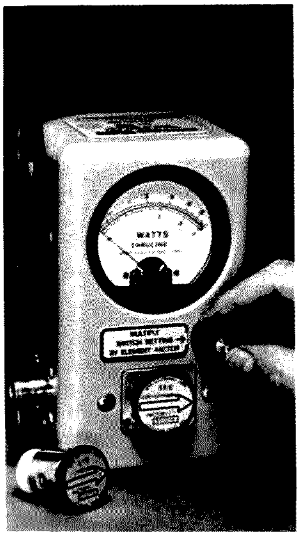
Tailored for design or field service of CW and FM systems from 200 kHz to 1000 MHz and ¼ Watt to 10,000 Watts, the new precision instrument uses special elements providing seven levels instead of one covering either 1/3/10/30/100/300/1000 Watts or 10/30/100/300/1000/3000/10,000 Watts with ±5% accuracy of reading over a full 37-dB power range. The desired range is instantly selectable by a front-panel rotary switch which also includes a battery-level position. Elements are simply rotated for either forward or reflected power measurement.

Model 4410 Thruline wattmeters feature low insertion vswr of 1.05 or less, temperature compensation to maintain full-rated accuracy from 0° to 50° C, 120% over

Channel Master Model 6140 Satellite Stereo Processor.

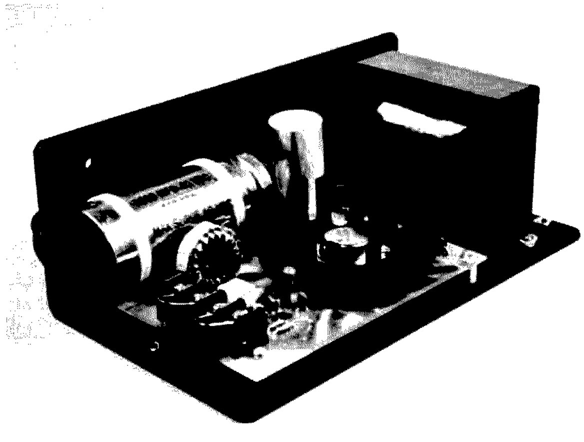


The Datasaver™ ac power backup.



The Thruline * directional wattmeter.

HS-700 microphone/headset from MX Products.



Jameco's JE224 power supply.

range protection regardless of the selector-switch position, and a choice of 18 common rf connectors interchangeable in the field.

For more information, contact *Bird Electronic Corporation, 30303 Aurora Road, Cleveland (Solon) OH 44139.* Reader Service number 483.

HS-700 MICROPHONE/HEADSET

MX Products has announced a new lightweight microphone/headset especially designed to complement Icom HF and VHF equipment. The HS-700 features a comfortable, lightweight headset which permits extended operation without operator fatigue and is ideal for contest-style operation. The microphone employs a miniature electret element with integral preamplifier and frequency compensation to enhance intelligibility and "punch." A wind screen is included to minimize wind and breath noise. The microphone boom is adjustable for optimum speaking distance and noise environments. Total system weight is under 4 ounces.

For more information, contact *MX Products, 1152-169th Ct. NE, Redmond WA 98052; (206)-881-0355.* Reader Service number 488.

ADJUSTABLE SWITCHING POWER SUPPLY

Jameco Electronics has added another new model to their growing family of popular power supplies. The JE224 is a high-efficiency power supply which utilizes the LH 1605, one of the latest switching regulators from National Semiconductor that provides high current output and requires only a minimum number of support components to do the job.

The JE224 is adjustable from 4 to 24 V dc and current rated 5 A at 5 V dc, 4.8 A at 6 V dc, 4.1 A at 9 V dc, 3.3 A at 12 V dc, 1.9 A at 18 V dc, and 0.5 A at 24 V dc. Outputs are regulated with over-current protection. The overall size is a very compact 7.75"L x 4.25"W x 2.75"H; and the unit weighs in at only 3.65 pounds.

For more information, contact *Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002; (415)-592-8097.* Reader Service number 482.

DATA FILE MAINTENANCE PROGRAM

Russ Software has introduced Multi-File, its new data file maintenance program for the VIC-20 and Commodore 64 computers. It will work with either cassette or disk storage media, and you can store up to 100 items per file with an unlimited number of files. The VIC-20 version requires the 16K expansion in order to make full use of the program's capabilities; with 3K, files are limited to 20 or 30 items.

The data file program features search and review functions as well as delete, correct, and print data functions. The search function will look for any data on any line of the file; the more specific your input is, the more specific the search will be.

Multi-File will produce audible notification of error messages and the completion of major functions.

For additional information, contact *Russ Software Ltd., PO Box 378, Northwest Station, Chesapeake VA 23322; (804)-421-3914.* Reader Service number 485.

AWARDS

OREGON TRAIL COUNCIL CAMPOREE

On May 20-22, 1983, the Benton District, Oregon Trail Council, Boy Scouts of America, will hold its annual Camporee. This event is a weekend camping experience involving all the scout troops, most of the Cub Scout Webelos dens, and many of the Explorer Posts in the local area.

This year, the Benton District Camporee Committee has invited members of the Oregon State University Amateur Radio Club (K7UYX) to participate in the Camporee as special invited guests. The OSUARC has volunteered to set up an HF demonstration station, provide VHF communications at the camp, and assist the scouts in earning portions of their communications-related scout awards.

Operation will begin at 5:00 pm PDT, May 20, and end at 1:00 pm PDT, May 22. Frequencies are: SSB—3.940 MHz, 7.240 MHz, 14.290 MHz, 21.360 MHz, and 28.990 MHz; CW—3.590 MHz, 7.030 MHz, 14.070 MHz, 21.140 MHz, and 29.190 MHz.

For more information, contact Steve Aberle WA7PTM, 2751 NW Orchard Ave., Corvallis OR 97330.

NANTUCKET EXPEDITION

The Algonquin ARC will activate Nantucket Island, Nantucket County, Massachusetts, May 21-22. Operation will be CW, up 60 from the low end of the bands, and SSB, up 60 from the low end of the General phone bands, 80-10. We will be using the call W1BK. QSL with an SASE via PO Box 258, Marlboro MA 01752.

MT. SAINT HELENS QSO PARTY

The Clark County Amateur Radio Club, W7AIA, is pleased to announce the third annual Mount Saint Helens QSO Party which will be held May 21 and 22, 1983. This QSO party will mark the third anniversary of the cataclysmic explosion of nearby Mt. Saint Helens. This disastrous volcanic eruption took the life of Reid Blackburn KA7AMF who was an active member of this club. Reid was monitoring a USGS observation station near the base of the mountain at the time of the eruption.

Any amateur station making one contact with W7AIA during the two days from 0001 UTC May 21 through 2359 UTC May 22, 1983, will be eligible to apply for the Mt. Saint Helens Award, a beautiful certificate featuring a photograph of the mountain two years after the eruption.

Look for W7AIA on the following frequencies (plus or minus QRM): SSB—3.895, 7.230, 14.280, 21.360, 28.505; CW—3.705, 7.105, 21.105, 28.105; VHF—various Vancouver and Portland area repeaters.

To apply for the award, send log information or QSL card and $2.00 (or 8 IRCs) to: Award Manager, W7AIA, PO Box 1424, Vancouver WA 98668; (206)-693-0033. All proceeds from the award will go to the Reid Blackburn Scholarship Fund which has been established by the Clark County Amateur Radio Club, W7AIA, at Clark College in Vancouver WA.

HAM HELP

I need technical information on the Intercontinental Instruments model TPG-2 double pulse generator. I would also like information on how to reach engineers for Intercontinental, which was located in Farmingdale, Long Island.

Harold May
428 Phillipps
Hinsdale IL 60521

I am offering a $5 reward for the first offer of data which will make my hamfest purchase a functional frequency counter. The PC board contains 7 MAN readouts, 6 74144 chips, and 1 each, 5474, 7440, 7490, 7475, and 7447. There is no clock or input processor. All letters will be answered and all materials returned.

Horace Eddy W2BU
3 N. Belmont
Oneonta NY 13820

I would like information on the positive matched amplifier model PMA-2, made by Jerrold Electronics Corporation of Philadelphia. It looks like a cable TV amplifier. I will pay for any reproduction or mailing costs.

Carl S. Peterson N6CSI
PO Box 4432
Chico CA 95927

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GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	14	14	7	14	21	21A	21A	21A	21A
AUSTRALIA	21	21	14	14	7B	7B	7B	7B	7B	7A	21	21
CANAL ZONE	21	14	14	7	7	7	14	14A	21	21	21A	21A
ENGLAND	14	7	7	7	7	7A	14	14	21	21	14A	14
HAWAII	21	14	14	14B	7B	7B	7	14	14	14	14	14A
INDIA	14	14	14B	7B	7B	7B	14	14	14	14	14	14
JAPAN	14	14	7B	7B	7B	7B	7B	7	14	14	14	14
MEXICO	21	14	14	7	7	7	7A	14	14	14	21	21
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7	7	7	7	14	14	14	14A	14A	14A
SOUTH AFRICA	14	7B	7B	7B	7B	14	21	21	21A	21A	21	14
U. S. S. R.	14	7	7	7	7	14	14	14	14	14A	14A	14
WEST COAST	21	14	14	7	7	7	7A	14	14A	21	21	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	14	14	7	14	21	21	21A	21A	21A
AUSTRALIA	21	21	14	14	14	14B	7B	7B	7B	7A	21	21
CANAL ZONE	21	14A	14	7	7	7	14	14A	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7	14	14	14	14	14A	14
HAWAII	21	14A	14	14	7A	7B	7	14	14	14	14A	21
INDIA	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
JAPAN	14	14	14	7B	7B	7B	7	7	14	14	14	14A
MEXICO	14	14	7A	7	7	7	7	14	14	14	14	14
PHILIPPINES	14A	14A	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	21	14A	14	14	7	7	14	14	14	14A	21	21
SOUTH AFRICA	14	7B	7B	7B	7B	7B	14	14	14	14A	14A	14
U. S. S. R.	14	7	7	7	7	7B	7B	14	14	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	14	14	7	14	14	21	21A	21A	21A
AUSTRALIA	21A	21A	21	21	14	14	7B	7	7B	7A	21	21A
CANAL ZONE	21	14A	14	7	7	7	7A	14	21	21	21A	21A
ENGLAND	14	7	7	7	7	7	7B	14B	14	14	14	14
HAWAII	21A	21	21	14A	14	14	7	14	14	14A	21	21A
INDIA	14	14	14	14	7B	7B	7B	7B	14B	14	14	14
JAPAN	14	14	14	14	14B	7B	7	7	14	14	14	14A
MEXICO	21	21	14	14	7	7	7	14	14	14	21	21
PHILIPPINES	14A	14A	14	14	7B	7B	7B	14B	14	14	14	14A
PUERTO RICO	21	14A	14	14	7	7	14	14	14	14A	21	21
SOUTH AFRICA	14	7B	7B	7B	7B	7B	14B	14	14	14A	14A	14
U. S. S. R.	14B	7	7	7	7	7B	7B	14	14	14	14	14
EAST COAST	21	14	14	7	7	7	7A	14	14A	21	21	21

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

MAY

SUN	MON	TUE	WED	THU	FRI	SAT
1 G/G	2 G/G	3 G/G	4 F/F	5 F/F	6 F/F	7 F/F
8 F/F	9 G/G	10 G/G	11 G/G	12 P/F	13 F/G	14 G/G
15 G/G	16 G/G*	17 P/F*	18 P/F*	19 P/F	20 F/F	21 F/G
22 G/G	23 G/G	24 G/G	25 F/G	26 F/G	27 F/F*	28 F/F*
29 F/F	30 G/G	31 G/G				

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A Wayne Green Publication

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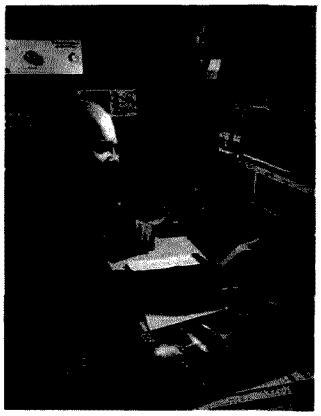
Trindade PY0—74

0 74470 65946 06

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



A KERCHUNK SUBSTITUTE?

One of the more frustrating aspects of repeaters is listening to 'em. This is such a drudge that I've noticed that few repeaters seem to ever have anyone actually monitoring. Notice that? I'll bet I've checked into several hundred repeaters in various cities, only to be met by nothing.

Perhaps it is time for us to hike up our mental skirts and make some progress toward a system which would solve a whole bunch of repeater problems all at once. Yes, *mes amis*, I have a way out of both the boredom of listening to a repeater and not being able to raise anyone on it. The problems go together, of course. If no one is listening, you really have to have a flat final if you think someone is going to answer your call, right?

Suppose we were able to come up with a relatively simple accessory to our rigs which would allow us to monitor the repeater without having to listen to all that garbage (my apologies to the garbage men). Well, of course there are already some simple systems which will work. . .for instance, a tone-encoded system, using touchtones™ to call a specific station and a decoder attached to the receiver. That's easy and should have been put in years ago.

But we're into digital circuits and microprocessors these days, so why settle for something so basic, even if it would be a godsend. Let's get what few brain cells you have left working on something a bit more sophisticated. For instance, suppose we set up a system where the repeater has a computer attached which keeps track of who is monitoring and who isn't. Until someone invents an automatic transmitter identifier system, we can still use the old touchtone pad to identify ourselves. Three tones would take care of about a thousand different stations. . .which should be enough.

Now there you go. . .I've just started to explain what I have in mind and you are already coming up with arguments. There's just no pleasing you. Well, this time I'm ahead of you. Yes, I know as well as you that half of the chaps who check in are going to eventually turn off their rigs, forgetting to check out, or perhaps drive out of range of the repeater so it won't be able to get the signal to cross them off the list of the living. No, a good system will have to check with you every so often to make sure that your rig is still on line. Feel better?

One way to do this is to have the repeater transmitter send out a coded pulse every so often which would be addressed to your particular rig and would trigger a short answer-back, thus assuring the repeater that you are still alive and well and within range. If we start using some high-speed digital addressing and identification, the whole process can take a fraction of a second.

In this way the repeater would know who is monitoring at any moment so that a caller could conceivably check to see if someone specific was on channel or even get a fast list of those monitoring so he or she could call the operator of his or her choice. Like it?

Okay, so I lied about it being simple. That just shows you can't trust everyone all the time. But it *can* be done and with current technology. It will take some experimenting. It will be worth it. . .just think of how this could change two meters for us! Lordy, I might even start checking into a couple of local repeaters if I knew that I wouldn't have to listen to every mobile coming on channel explain at length about where he is driving, where he's been, and where he's going.

Tell you what. . . I've got a $500 prize here for the first article we get on a working system to do about what I suggested. That ought to get some of you soldering-iron jockeys flinging solder and zapping ICs. Further, if you can come up with something relatively simple that does the job, I'm reasonably sure that we could set up a licensing system to get it into just about every two-meter rig being made in short order.

We're going to need such a polling system eventually to handle digital traffic, so we might as well get cracking on developing and using it now for our voice communications. And you can bet that we're going to make a big fuss over the repeater group that gets this system working first. Will it be yours?

CALLING CAPTAIN QUEEG

Old-timers will remember the captain, nervously rolling the big ball bearings in one hand, striving to relive his one great moment of success with the strawberries, no matter how inept the present situation. I'm reminded of this when I read the solemn pronouncements of old-time hams, echoed at times by true-blue youngsters who have heard the refrain but haven't yet thought about it, and it all has to do with the bottom line inescapability of the need for Morse code. We keep hearing that, dammit, when everything else stops working, hams are going to be able to throw together small transmitters and use Morse code for communications.

What a bunch of fecalberry pie! Oh, we could go along with that scenario twenty years ago, but how in the heck is even a diligent ham going to whip up a CW rig out of a carton of AM/FM stereo solid-state radios? Not that our enthusiastic ham is going to be able to find a 12-volt soldering iron to do the work anyway. Come on now, let's try to face the facts. Radios are mostly large-scale integrated circuits these days, not tubes, and these gadgets are not easily remade into anything except trash.

No, the ham who digs his way out of a cellar after a nuclear attack and dusts himself off is not going to look for 30-year-old broadcast sets to rebuild into transmitters; he's going to take the HT off his belt and see who else is around. He's going to dig into his car and start tuning his Drake to see what's going on on 75m.

Commercial radio communications these days is mostly via high-speed digital circuits. Even the high-speed Morse code we are hearing on our ham bands is generated and read by digital circuits, not the operators. Morse code, with its throughput of around ten words per minute and its requirement of two experienced operators *who are devoting 100% concentration* to the job of sending and receiving, is probably the worst possible system we can think of for using radio. Voice is somewhat better since it does not require a lot of training on the part of the operator. Setting up our communications so only we hams are able to use it smacks a good deal of featherbedding, doesn't it?

Since amateur radio has been kept so firmly about fifty years behind the rest of the communications world, about all we can really offer right now in the way of emergency communications message-handling is voice. That's about three or four times as fast as the code, but still medieval when compared to digital communications which start at around 100 words per minute these days and easily go into the thousands of words per minute.

One rig passing traffic at 1,000 words per minute (about 1,200 baud) can do the work of two hundred trained hams using two hundred rigs and CW on one hundred channels. Now tell me about the ham who is going to build a little Morse code rig and get on the air. With some experimentation we can get our rigs to work at 9,600 baud, which gives us about 8,500 words per minute. Think of 850 sweating hams. . .no, make that 1,700, because we need one on each end. . .all trying to keep up with one little box with a couple ICs in it.

How much power will we save by not having to run 1,700 rigs to handle that traffic? Think of the hamburgers and Cokes! The support of this army of dedicated hams would be monumental. Think of the laundry bills! No, it is getting time to think in terms of automation, as abhorrent as that may be to the dedicated key-banger.

When the first radioteletype experimenting began to appear on the ham bands back in 1948, a shiver of panic went through the

Continued on page 126

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D'Arsonval Dossier

How these meters work and how to make them work for you is no mystery. Discover the inner machinations of the D'Arsonval movement for yourself.

This article covers the basic aspects of the panel meters most frequently used by amateurs. These meters indicate voltage and current. The article will not address itself to alternating-current meters and meters combined with electronic circuits that measure values such as FM frequency deviation, resistance, signal strength, and the like. However, a little knowledge of how the simple voltage- and current-measuring devices work may turn your junk box or your next flea-market visit into something very profitable.

Panel meters are made in a large variety of ranges, and when the desired range is not available, it is possible to adapt what is on hand to provide the necessary service. Voltmeters can be bought with ranges from millivolts to kilovolts and ammeters from microamperes to a hundred Amperes. However, by judicious buying at auctions and flea markets, low-current meters (typically, 0-1 milliampere) can be purchased that can be adapted to a wide range of currents and voltages. Read on!

Flea-market meters come in all shapes, sizes, and ranges. Some really large units are frequently seen. Six- and 10-inch sizes make great bench meters; how about an oversize S-meter for your next QRP rig? It may take a bit of patience, but even matching meters can be found if you keep your eye out for them. There are thousands of low-price, high-quality meters like the Weston 301 type available in junk boxes and flea markets.

How They Work

Meters measure current even when they are actually indicating voltage. Their needle deflection is nominally proportional to the flow of current through them. In the case of meters using D'Arsonval moving coil movements, the meter deflection is strictly proportional to the current through them. This is the most popular type of meter and will be the type primarily discussed in this article.

The only other type of meter that is normally seen by amateurs is the iron-vane type. This type is used frequently for ac measurements. It does not deflect strictly proportionally with current through its coil. Its major claim to fame (for amateur use) is its low cost. Unlike the D'Arsonval type, the current in an iron-vane meter flows through a fixed rather than a moving coil. The common, low-cost type is generally plagued with calibration problems caused by magnetic material (e.g., iron or steel) in its vicinity. D'Arsonval move-

ments are relatively but not entirely free of this sort of problem.

Meters deflect when current passes through them because the current creates a magnetic field that opposes a permanent magnetic field built into the meter. The vane in an iron-vane meter is a permanent magnet and is attached to the indicator needle. The metered current flows in a fixed coil that is wound around (but not on) the vane. The field created by the current in the coil opposes that of the vane, and the vane moves until force from its field balances the force from the field of the coil.

Flea marketeer with his meter display. Excellent sources of meters of all descriptions, flea markets and auctions offer the lowest prices. In most cases, meters work properly or do not work at all. Flea-market and auction prices are generally low enough to risk as-it-is purchasing. However, most sellers will honor your request for your money back.

D'Arsonval meters have moving coils that rotate within a permanent magnetic field. In this configuration, the fields can be properly arranged to cause the needle (attached to the rotating coil) to move in a manner that is strictly proportional to the current flowing in the coil. The proportionality of the D'Arsonval meter allows its scale to be divided into equal divisions for equal changes in current throughout its scale. The typical iron-vane meter provides more motion for a given current change at the low end of its scale than at the top end. The scale at the top end of a typical iron-vane meter is crowded and difficult to read.

Meter Resistance

The flow of current through a meter obeys Ohm's Law. The meter itself has resistance and, therefore, the current through it will be proportional to the voltage across it—see Fig. 1(a). If resistance is added in series with a meter—see Fig. 1(b), more voltage will be required to cause the original amount of meter current to flow. It will be shown later that this is the way to turn a sensitive current meter into a voltmeter. If a resistance is added in parallel with the meter—see Fig. 1(c), the input voltage still occurs across the meter, but a portion of the input current is bypassed (or shunted) through the parallel resistance. The parallel resistance is known as a shunt. This is the method for turning a sensitive current meter into a less sensitive (or higher) current meter.

If meters are to be modified with series or parallel resistance, it is obvious that the resistance of the meter must be known. Examination of meter characteristics, as given in manufacturers' catalogs, gives us the ranges shown in Table 1.

Full Scale Currant	Resistance (Typical)
100 microamps	1000-2000 Ohms
200 microamps	400-1000 Ohms
500 microamps	100-200 Ohms
1 milliamp	40-60 Ohms
3 milliamps	20-40 Ohms
5 milliamps	10-20 Ohms

Table 1. Typical sensitive current meter resistances (D'Arsonval type).

In no case should an ohmmeter be connected across a sensitive meter to determine its resistance. The current from the ohmmeter will overrange the meter and may destroy it. A convenient and safe method of determining the resistance of a meter is shown in Fig. 2. It consists of causing full-scale current to flow in the meter and then adding a variable resistance (shunt) across the meter and adjusting it until the meter reads half-scale. If the series resistance (R_{SE}) is much higher than the meter resis-

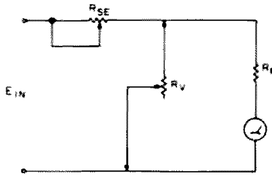


Fig. 2. Determining meter resistance. Set E_{IN} and/or R_{SE} for full scale with R_V disconnected. (R_{SE} should be at least 100 × R_M.) Connect R_V and adjust it until the meter reads one-half scale. Disconnect R_V and measure its resistance with an ohmmeter. R_V will equal R_M.

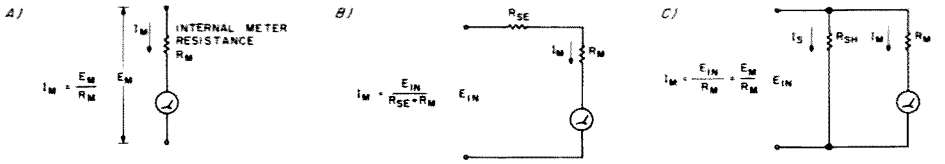
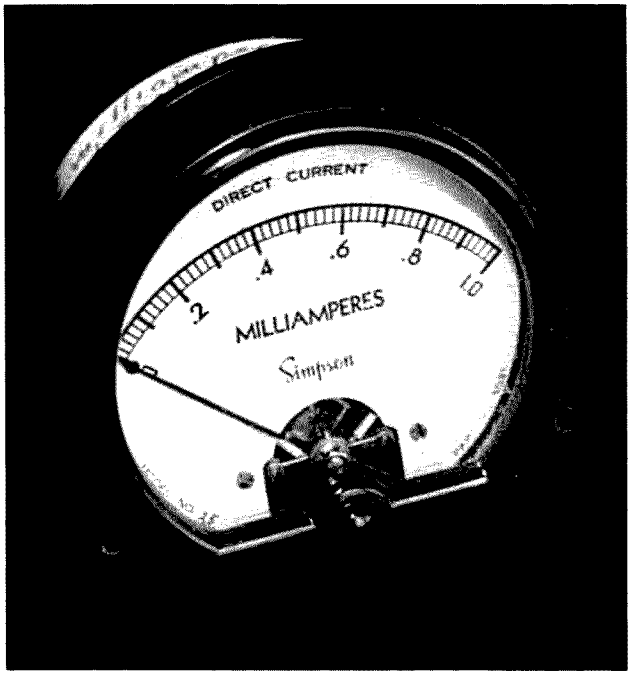


Fig. 1. Basic meter circuits. (a) Electrical characteristics of meter alone. (b) The meter with resistors in series. (c) The meter with resistance (R_{SH}) shunting current around it.



A typical D'Arsonval meter movement is shown above. Note the even (linear) scale. All of the divisions are the same size. This type of meter is the most used by amateurs. The ordinary variety balances the force resulting from a fixed magnet and a moving current coil against a pair of hair springs. Recently, a new type using taut-band springs has been introduced. Both types operate similarly and have linear needle motion with respect to current.

tance (use Table 1 as a guide), the total current will not vary significantly when the variable resistance is added. It can be shown that when the variable resistance is adjusted for half-scale current, the meter resistance is equal to the external shunting resistance. The external resistance can then be disconnected and (safely) measured with an ohmmeter.

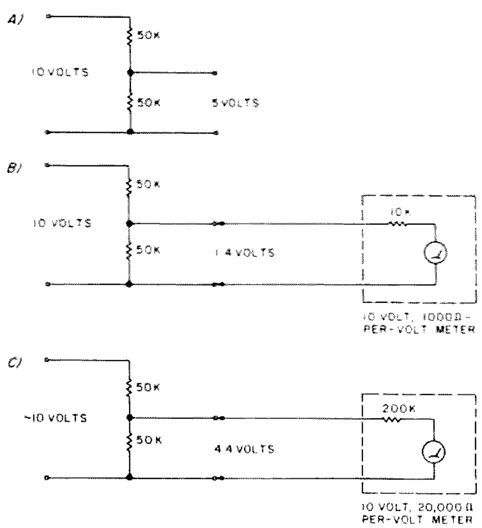


Fig. 3. Voltmeter circuit loading. (a) High-impedance voltage divider. (b) The result of a voltmeter loading down the circuit in 3(a). (c) Using a meter with higher internal resistance gives more accurate results.

Meter Resistance Problems

In the case of voltmeters, the resistance of the meter and its series resistors must be high with respect to the resistance of the circuit being measured. If it is not, the voltmeter will load down the circuit and the voltage measurement will be low. This is illustrated in Fig. 3. Note in Fig. 3(a) that the real divider voltage is five volts and that a 1,000-Ohms-per-volt meter, see Fig. 3(b), loads the circuit down to 1.4 volts (72% low). Even a 20,000-Ohms-per-volt meter as shown in Fig. 3(c) loads the circuit down to 4.4 volts (12% low). If an 11-megohm vacuum-tube voltmeter were used, the indicated voltage would be essentially correct, at about 4.99 volts (0.2% low). The moral here is very clear: Use the highest resistance voltmeter that you can if you want to avoid loading down the circuit being measured.

Voltmeters are rated for their resistance in Ohms-per-volt. Simply, this means that a 10-volt, 20,000-Ohms-per-volt meter will have a resistance of $10 \times 20{,}000 = 200{,}000$ Ohms. In a multi-range voltmeter, the resistance of the meter accordingly increases with the voltage range in use. Electronic voltmeters are frequently an exception to the foregoing statement. They have a fixed input resistance (frequently 11 megohms) regardless of the range they are set to.

However, do not write off the lowly 1,000-Ohms-per-volt meter (made from a 0-1 mA meter). In this day of solid state, circuit resistances (with certain exceptions such as FET circuits) tend to be quite low and quite tolerant of low-resistance voltmeters. Additionally, one should examine one's needs carefully. The 1,000-Ohms-per-volt meter is rugged, inexpensive, and is just the thing for an occasional check of power supply and battery voltages. If general servicing of tube and solid-state circuits is to be done, nothing short of a voltmeter with megohms of input resistance should be considered.

For the most part, insertion of a meter for current measurements does not cause significant circuit change. Milliammeters have resistances of less than 100 Ohms, which is small with respect to resistances (impedances) they are connected in series with. Consideration should be exercised with meters in the microampere ranges. A sensitive microammeter may have over 1,000 Ohms resistance and could add significant resistance to the circuit being measured.

Making Voltmeters from Milliammeters/Microammeters

Voltmeters with convenient scales can be made by adding series resistance to a milliammeter or microammeter, most often to a 0-1 milliammeter or more sensitive meter. It is most convenient to choose a meter range whose scale can be multiplied by a factor of 10, 100, and so on, to give the desired voltmeter scale. For example, say you want a 1,000-volt, full-scale meter. If a 0-1-milliamp meter is

Meter Range	Ohms to Produce One Volt Full Scale (Ohms-per-Volt)
0-1 mA	1,000
0-500 μa	2,000
0-200 μa	5,000
0-100 μa	10,000
0-50 μa	20,000

Table 2. Voltmeter series resistance ratings.

used, the scale is multiplied by 1,000 and a label can be added to the meter face saying: "1,000 volts." Half-scale (0.5 mA) will be 500 volts. Similarly, a 100-microamp meter could be used with a × 10 multiplier.

For most amateur purposes, the series resistors can be 5% tolerance and the meter resistance can be neglected. Table 2 can be used to select the series resistance required to obtain a one-volt full-scale meter from various basic meter movements. If the series resistance is increased by a factor, the full-scale reading will be increased by the same factor. Typically, if 1,000 Ohms is required for one-volt full scale, 2,000 Ohms will result in two-volts full scale and 10,000 Ohms will give 10 volts. The series resistance rating for a basic meter may be calculated by dividing one by the basic full-scale meter reading. Typically, a 0-3 milliammeter would require 1 ÷ 0.003 = 333 Ohms-per-volt.

The accuracy of a meter with added series resistance depends on the meter accuracy, the series resistor accuracy, and the meter's internal resistance. The latter effect is generally small for the accuracies needed by the amateur. For a 1-volt, 1,000-Ohms-per-volt meter that uses a basic 0-1 milliammeter with 50-Ohms internal resistance, the total series resistance is 1050 Ohms (assuming a 1000-Ohm external series resistor). Ohm's Law tells us that 1.05 volts will be required for a full-scale reading. This is a 5% error and could be corrected by using a 950-Ohm series resistor. For high voltage ranges, the error becomes proportionately less.

If you have a means of accurate calibration at hand, the series resistance can be trimmed to eliminate essentially all of the error at *one* scale reading. The remaining error will be the meter's inherent inaccuracy. For the best possible accuracy, the error at various scale values has to be plotted using a highly accurate calibration standard. This discussion of accuracy is included only to satisfy the reader who has special accuracy requirements.

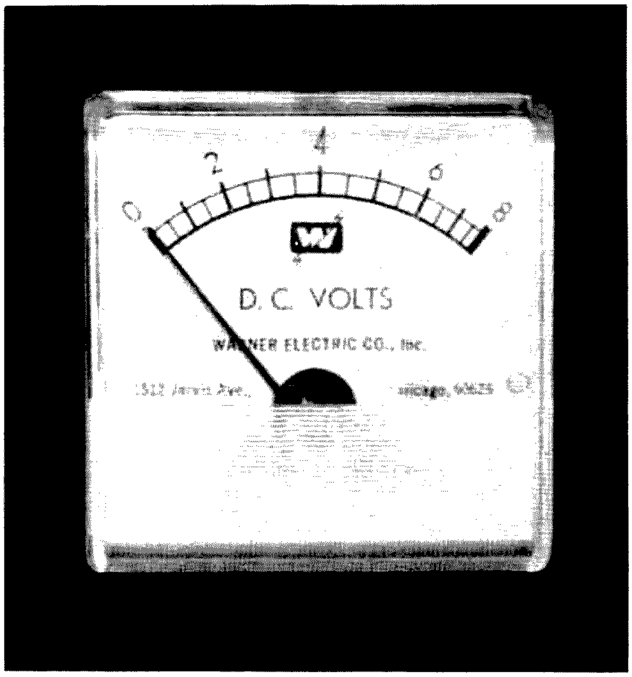
The average amateur can use series resistance values calculated from the basic values in Table 2. He can assume that his accuracy will be roughly that of the series resistance tolerance plus the meter's tolerance, i.e., on the order of ±10%, if ±5% series resistors are used.

Shunting to Obtain Higher Current Ranges

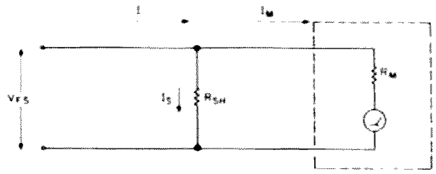
Shunting is just a bit more difficult than adding series resistances to obtain different voltage ranges. First, the resistance of the shunt must be calculated. Then, the shunt resistor must be obtained. Most often, the shunt resistor will have to be wound or otherwise fashioned. This is because the resistance values turn out to be quite low and most often of non-standard value.

The shunt resistance in parallel with the meter resistance must result in a voltage across the meter that will produce full-scale deflection for the desired full-scale current. This voltage is calculated using Ohm's Law as follows: $V_{FS} = I_{M(FS)} \times R_M$. (Here, V_{FS} is the voltage across the meter at full scale, $I_{M(FS)}$ is the basic meter's full-scale current, and R_M is the meter resistance (see Fig. 4). The method of determining R_M was previously discussed. It should be noted that meter resistances can sometimes be found by referring to catalog descriptions. By using the parallel resistance expression and Ohm's Law, it can be shown that the shunt resistance is: $R_S = R_M(V_{FS}/I_{FS})/(R_M - V_{FS}/I_{FS})$, where I_{FS} is the desired full-scale current and R_S is the corresponding value of resistance needed to shunt the meter.

For example, the shunt required to make a 10-milliamp meter from a 50-Ohm, 1-milliamp meter is calculated as follows: $V_{FS} = .001 \times 50 = 0.05$ volts, and $R_S = (.05/.01) \times 50/50 - .05/.01) = 5.56$ Ohms.



This photo shows the face of an iron-vane-type meter. Note that it has an irregular (non-linear) scale. For the same amount of current change, less motion occurs near full scale than at the low end of the scale. In some applications this may have advantages. Most meters of this sort are made for low-cost applications or for use in ac applications. They are frequently found in automotive equipment, both in car instrument panels and in devices such as battery chargers.



a $V_{FS} = I_{M(FS)} \times R_M$, FULL SCALE VOLTAGE

b $R_{PAR} = \dfrac{R_{SH} \times R_M}{R_{SH} + R_M}$, SHUNTED METER RESISTANCE

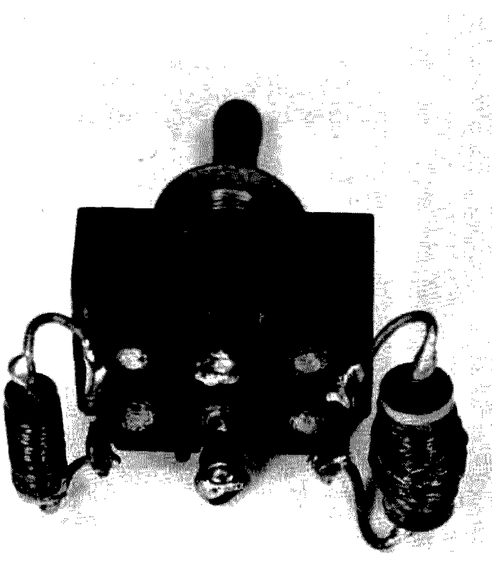
c $R_{PAR} = \dfrac{V_{FS}}{I_{FS}}$, SHUNTED METER RESISTANCE

REQUIRED FOR A DESIRED VALUE OF CURRENT AT FULL SCALE (I_{FS})

d $R_{SH} = \dfrac{R_{PAR} \times R_M}{R_M - R_{PAR}}$, SHUNT RESISTANCE

OR $R_{SH} = \dfrac{\frac{V_{FS}}{I_{FS}} \times R_M}{R_M - \frac{V_{FS}}{I_{FS}}}$

Fig. 4. Shunt value calculation.



Shunts may be wound using resistors as forms. The shunts above are those used in the 0-3, 0-30, and 0-300 milliamp meter described in the text. The resistors should be at least 100 times the resistance value of the shunt. Use a two-Watt resistor if you have room. This gives better cooling and makes construction easier.

If a 100-milliamp range were desired, the foregoing calculation would indicate that 0.505 Ohms was required. Note that in both cases the shunt resistor is in proportion to the amount of current that must bypass the meter. In the latter case, the shunt is about 1/100 of the basic meter resistance. As can be seen from these calculations, the resistances are low and (generally) non-standard.

However, shunt resistances can be constructed easily from copper wire. They also may be constructed from other less available wires such as nichrome if you have the materials available. By using the Standard Wire Tables found in the handbooks, the wire gauge and the length of this gauge wire necessary to construct a proper shunt can be determined easily. As in the case of series resistors for voltmeter applications, the shunts can be trimmed and adjusted if accurate calibration standards are available.

As in the case of voltmeters, the meter can be made truly accurate at one scale reading and must be error-noted at other readings because of the basic inaccuracies of the meter. For amateur use, this sort of accuracy is most often not necessary. Typically, in the 100-milliamp case cited above, a 0.5-Ohm, ±5% resistor will give overall accuracy on the order of ±10%. This would suffice in almost all amateur applications. A 5-Ohm, ±5% resistor would do for the 10-milliamp case.

To make low resistance shunts, choose a convenient wire size and determine what its resistance-per-unit length is. In most tables this is given in Ohms-per-thousand feet. Use the largest convenient wire size to ensure good current capacity, and try not to use very thin sizes (e.g., less then #30) to avoid variations in resistance because of stretching. Many choices may be made depending on the wire size(s) you have on hand. In the two cases calculated above, some of the choices are shown in Table 3.

	Wire Size	Ohms-per-1000 Feet	Ohms-per-Foot	Required Length
5.56 Ohms	30	105.2	0.105	52.4 ft.
5.56 Ohms	33	211.0	0.211	26.4 ft.
0.505 Ohms	28	66.17	.0662	7.63 ft.
0.505 Ohms	24	26.17	.0262	19.3 ft.

Table 3. Typical wire length for two values of resistance.

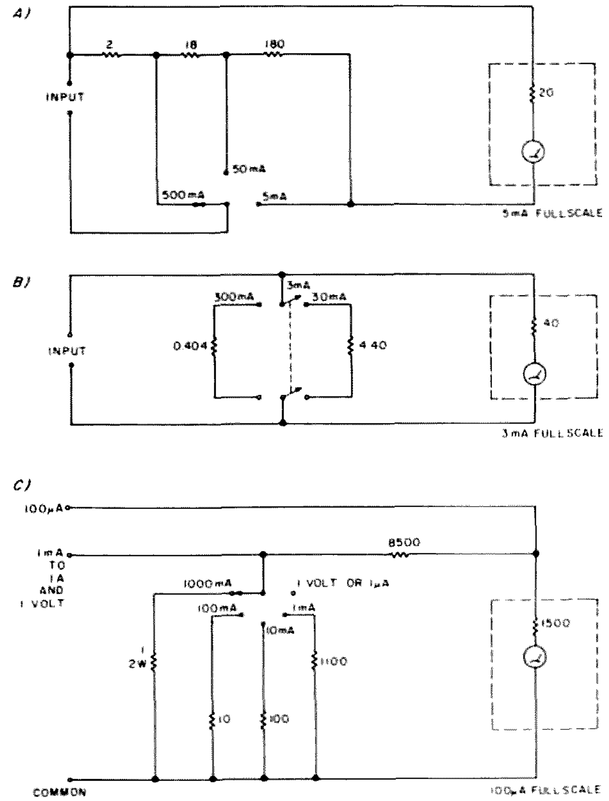


Fig. 5. (a) A multi-scaled milliammeter using an unusual series and parallel shunting scheme. (b) A multi-scaled milliammeter using standard shunting and a DPDT center-off switch. (c) A multi-scaled milliammeter/microammeter that produces less than one volt drop at full-scale current. Resistances are in Ohms.

The determination of the required wire length is made quite easily by dividing the required resistance value by the resistance of the wire in Ohms-per-foot. The latter is determined by dividing the Ohms-per-thousand-feet rating by 1000 (see Table 3 for illustrations). Some trial-and-error calculation is generally required to choose a size that results in a relatively small coil (or spool) of wire of a size you have on hand. Shunts should be wound on forms such as a relatively high-value resistor (100 times the shunt value) and should be coated with varnish or other strong coating that will prevent the turns from moving as a result of on/off current change.

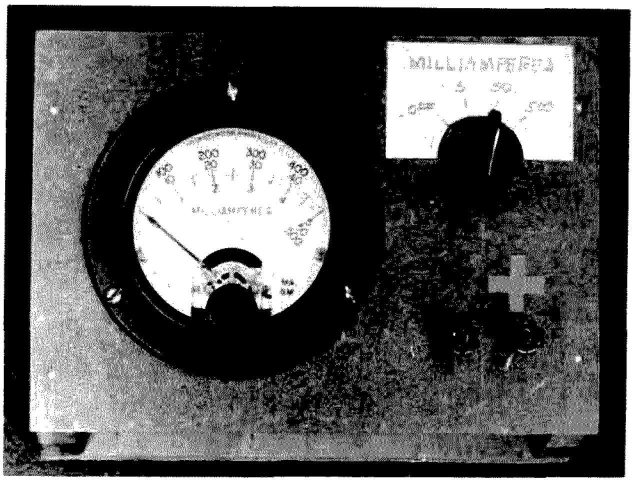
Shunts should be located as close to the meter ter-

minals as convenient. However, low-current shunts can be located "in-circuit" with their meters in remote positions. In these cases, the circuit resistance to and from the meter must be low with respect to the meter.

If you are clever with Ohm's Law, many special cases can be developed for shunts. Fig. 5 shows a neat way of building a multi-scaled milliammeter using a 5-milliamp, 20-Ohm meter. A more conventional multi-scale approach is shown in Fig. 5(b).

Fig. 5(c) makes a lot of use of a 100-microampere, 1,500-Ohm meter. (Incidentally, these appear to be readily available from surplus houses these days.) Ranges are provided from 100 microamperes to one Ampere, and a bonus scale of one volt is provided. A drawback to this circuit in at least the one-Ampere range is the fact that the drop across the meter circuit will be one volt for full scale on all current scales except the basic 100-microamp range.

Examination of the circuit will quickly show that it is a one-volt, 10,000-Ohms-per-volt voltmeter that measures the voltage across shunts that develop one volt for full scale. Note that the one-milliampere shunt is 1100 Ohms. This, in parallel with the meter resistance, gives an input resistance of roughly 1000 Ohms. Consequently, the accuracy on this range is improved. On the other ranges, the shunt resistances are low enough to make the parallel effect of the meter circuit insignificant.



Home-built multi-scaled meters can be housed in metal or wooden cabinets. The example above is a multi-scaled milliammeter built into a Masonite™ and wood enclosure. Care should be taken to protect terminals and circuitry that may carry dangerous voltages. Further, circuitry of this sort should always be protected to avoid accidental shorts that may burn out the circuit under test or the meter itself.

Conclusion

This article has only scratched the surface of the subject of meters and their applications. However, it can serve as a basic reference for the many newcomers to our hobby.

The kind assistance of Robert Foley and Julius Hoffer W1DL is acknowledged. They reviewed the draft of this article and made valuable suggestions.■

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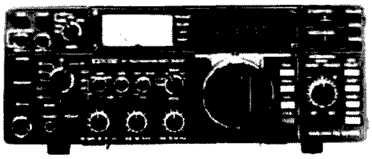

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The prices seen on meters at hamfests these days as compared to list prices can easily make one's mouth water if one is interested in observing the operating characteristics of either transmitters or test gear. Nonetheless, one may shy away from purchases because an inoperative meter may not be worth anything at all.

Fortunately, there are several useful solutions to this problem, each of which has its particular advantages. Probably the more important meters to test, and among the more expensive, are microammeters and millivoltmeters. They are also among the more delicate. The techniques for testing these meters can be applied to many of the other types if changes noted later are taken.

The simplest test, although not necessarily the best, is to compare the pointer damping (sluggishness) with and without a short across the meter terminals. Since use of every bit of space available for the moving coil is essential with meters having full-scale ranges of 100 microamperes or less, the customary aluminum damping frame used for the moving coil in less sensitive meters is often not used. As a result, the movement turns easily when the body of the meter is rotated gently.

When the terminals are shorted on one of these meters, however, the movement of the coil typically becomes sluggish. One can then use a clip lead or a small screwdriver for making a continuity test. A substantial change in the damping characteristics will be noted with or without the short in place. And the test can in no way damage the meter under test.

In making this test, one holds the meter in one hand and rotates the case quickly along the coil axis. Inertia will cause the movement to lag behind the case, and the mass and spring will act like a resonant circuit. The amount of damping in the motion of the pointer will be a function of the effect of the coil frame and the external short.

The best technique I have found for testing current meters is by the use of a constant-current source like the LM-334. This source is used with a control resistance of magnitude (68/I) where the current, I, is in milliamperes, between the calibration terminals. A nine-volt transistor battery, a push-button, a small box, and test leads are required to complete the unit. The normal current range is from one microampere to ten milliamperes, for resistances from 68,000 Ohms to 6.8 Ohms.

The number of current steps you select will depend on your application. The unit I use has test currents of 1, 10, 100, 1000, and 10,000 microamperes. Better testing can be obtained through either ratios of 1:3:10 or 1:2:5:10. These test points will provide a more sensitive test for friction due to filings, etc.

In using this device, start at minimum current and observe the pointer as you change ranges. A rough check of calibration is available (±10 percent) and, more importantly, you will be able to detect mechanical problems as noted above. With a device like this, you can very quickly decide if a meter is suitable for your application.

This unit can also be used to test voltmeters up to its nine-volt maximum. Most voltmeters will deflect at least a little with nine volts, so you simply connect the current source and step the current up until the pointer moves. The nominal voltage will be between eight and nine volts.

If you are looking for either higher-current or higher-voltage test units, then a different approach is indicated. For higher current, the use of a D-cell, a push-button, and a few resistors (or perhaps a rheostat) should suffice. A current-limiting resistance set for approximately the maximum current is desirable, with the rheostat providing varying current values. The approximate maximum is first set, the unit connected to the meter, and the test initiated. The required minimum resistance is approximately 1.5/I, where I is the maximum current in Amperes and the 1.5 is the voltage from the D-cell used for the test.

For higher-voltage voltmeters, either a high-voltage battery or several nine-volt batteries may be used. Since, however, these meters are often designed for external multipliers, first tests should be made with the constant-current source. Up to a meter range of eight volts, the deflection will be current controlled; above, the voltage limitation takes over.

As is explained in my book, *Design of Transistor Circuits, with Experiments*, published by Sams, there are many ways of devising special test circuits that can help you both to understand how some of your circuits and devices are operating and to test them conveniently. ■

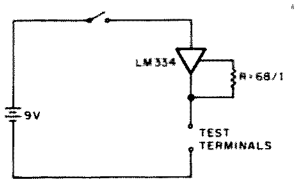

Fig. 1. Meter-testing circuit.

Marvin C. Born WB4EMI
9330 Sunshine Avenue
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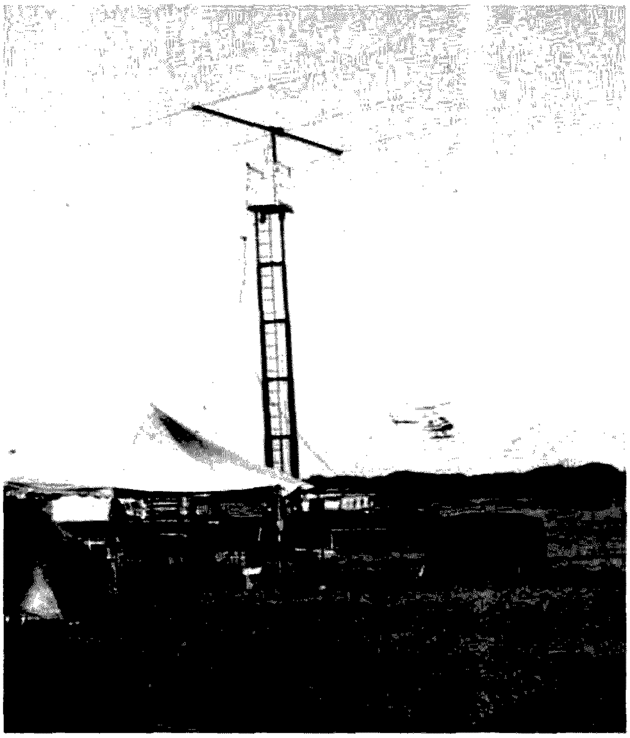
Live, From Across America—It's Field Day!

The Corpus Christi Amateur Radio Club had helicopter TV coverage of its activities. Club member WB4EMI unveils the secret behind their success.

During Field Day, most amateur groups and clubs are scurrying around looking for media coverage for their local Field-Day outing. For the Corpus Christi Amateur Radio Club in Corpus Christi, Texas, things are a little different. The news media literally brings the coverage to them. The amateur community is highly respected by many government and media organizations due to its past performances, and any request by the amateur group is seriously considered. This consideration is especially true of KRIS-TV, channel 6.

Photos by KA5GIA



The KRIS-TV helicopter while shooting live Field-Day coverage.

The founder of KRIS-TV, T. F. Smith, Sr. W5VA, was a pioneer in radio broadcasting and amateur radio in Texas. KRIS-TV still has the .34-.94 repeater on its tower that was installed many years ago. The present owner, T. F. Smith, Jr., though not an amateur, has kept the tradition of amateur radio alive at channel 6. The most outstanding example of this cooperation was use of the station's Jet Ranger helicopter for live coverage during this year's Field Day.

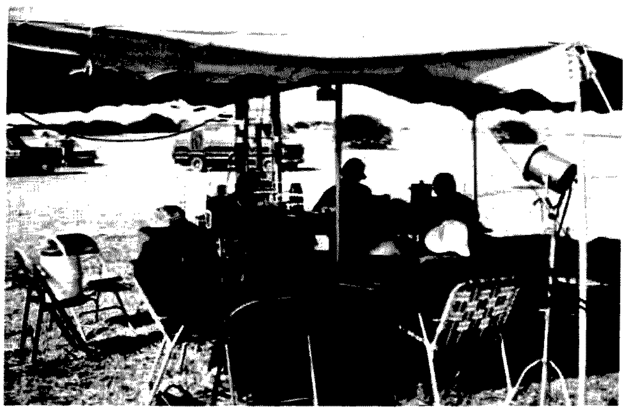
The station has a five-o'clock local newscast in addition to its more formal 6:00 pm newscast. At five on the Friday before Field Day, Bob Douglas W5GEL was interviewed for two minutes on the subject of radio and the upcoming Field Day. At the end of the interview, the newscaster announced that the Field-Day event was open to the public and that the station would do two live remotes from the site including one from Sky 6, the station's helicopter. Since the use of news helicopters is relatively new in this market, great interest is generated by the appearance of the copter.

Sky 6 arrived at about 5:00 pm and landed near the Field-Day site, with about a hundred people there to greet it. The station's mini-cam van had arrived earlier along with a reporter who spent an hour getting all the details correct. The newscast opened with a "bump shot" from the helicopter, promoting the story, followed by national and local lead stories. Then at 6:06 pm, the anchorman at the station introduced the story with special-effects shots of the site live from the helicopter. The next shot was of the same area from ground cameras, which then panned to the reporter and covered a 2½-minute interview with K5OG, the club president. Coverage was repeated at 10:00 pm without the helicopter.

So, for this Field Day, KRIS-TV provided more than 8 minutes of coverage, some of it from a very expensive helicopter.

KIII, channel 3, had sent a videotape crew and reporter during the setup, and they carried a 2½-minute package at 6:00 pm and a 90-second package at 10:00 pm.

The main Field-Day tent getting Sky 6 coverage.



Inside the tent. Note photoflood light for live TV coverage.

One needs to stop and think about what 12 minutes of air time really means in terms of publicity for a club. The combined ratings of both stations are in excess of 60% of the homes with television. In other words, more than 60,000 people saw some coverage of Field Day in Corpus Christi.

Some of the equipment on the helicopter may be of interest to amateurs. Sky 6 is a Bell Jet Ranger with an air speed of 120 mph and a range of 300 miles; it carries a payload of 900 pounds of people and equipment. The aircraft costs about $350,000 and the television equipment adds about $75,000 more. The operating cost to the station is approximately $450 per hour.

In addition to the usual navigation and communication equipment, the helicopter is equipped with a 12-Watt, 2-GHz microwave that is selectable to one of 15 channels in the 2-GHz band. The microwave transmits full-color video and two separate audio channels. One channel is for the program audio and the second is for the cameraman to tell the station director what he is planning to shoot, etc. This one is one way and feeds into the director's headset.

The antenna is a circular polarized beam with either 9-dB gain or 17-dB gain. It can be hand-held or mounted on the aircraft frame. It is usually hand-held in the 17-dB-gain position. An omnidirectional antenna is difficult to use in a coastal area due to multi-path problems over water. The directional antenna eliminated most of these problems.

The antenna is aimed visually from the aircraft to the receiving antenna for local operation and "talked on target" by the control room for longer shots out to 125 miles. The beamwidth of the antenna is such that once on target it is relatively easy to keep it there. Control room people watch the agc of the receiver and talk to the antenna operator, keeping him "peaked up." While this system may sound crude by some standards, it is very effective and removes multi-path problems. The receiving antenna consists of four 90-degree horn antennas which select which quadrant the copter is operating in and require no further attention.

In addition to the microwave equipment, there is a 10-Watt business-band FM radio for antenna positioning, time cues, etc. The three TV crew members listen to this in one half of a dual-headset system with program audio in the other ear. For safety reasons, the pilot can hear only aircraft radio traffic. During news operations with other helicopters in the area, all pilots use a second aircraft frequency to coordinate who will be over the news area. Stations take turns shooting the story then fly to a safe area while the competition takes its turn.

Another feature of Sky 6 is the inclusion of ham-radio equipment on board. Since 75% of the members of the engineering department of KRIS-TV are licensed amateurs and two of the four crew members are always engineers, there is always at least one ham on board. The helicopter has fixed antennas for 2 meters and 460 business-band radios, and there is a 444-MHz antenna available that can be mounted in a few seconds. The equipment is a Kenwood 2500 or an Icom IC-2AT and IC-4AT. One Watt is more than enough power from an aircraft. The rubber-ducky antennas work from the aircraft; however, we elected to use external antennas to avoid possible interference problems.

The full potential of this equipment has not been tested yet. It has, however, been used to assist amateurs on the ground during a parade. The amateur equipment is aboard every flight of Sky 6, and if it is ever needed, the hams of Corpus Christi will have a relay station in the sky.

I once heard a local NOAA weather meteorologist comment, "I just wouldn't want to have a hurricane without the hams here." There is a two-meter radio available at the weather service, and the local civil defense has operators ready almost at a moment's notice to assign to the weather center. One thing that impressed the weather service was the preparation of the hams assigned there during the last hurricane. This crew arrived with radio equipment, spare radio equipment, antennas, food, sleeping bags, emergency power, and fuel. They came to do a job and were prepared to hold out until that job was finished.

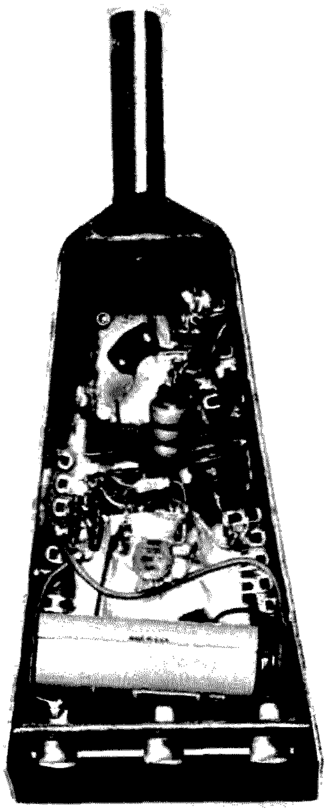
This is the kind of image that amateur radio needs in every community, and the way to get this image is to do a job and make sure the media know who you are and what you did. Tell them what you are going to do while you are preparing, as in a Field Day. Then tell them while you are doing it and make sure they get it right.

The Corpus Christi Amateur Radio Club enjoys a special relationship with members of the news media. This relationship is the result of hard work in times of stress and of knowing how the news media operate. Knowing the interworking of any news operation is the key to getting your story on the air. Some people call this press manipulation, others call it press relations—what term you use depends upon which side of the fence you are sitting on, but the result is the same.■

Construct the Cyclops Dip Meter

W4ATE's unique single-coil design captured an Honorable Mention in 73's Home-Brew II Contest. Now you can build this award-winning circuit for yourself.

Gene Brizendine W4ATE
600 Hummingbird Drive SE
Huntsville AL 35803



Component layout.

The dip meter is clearly one of the most versatile tools for anyone involved with antenna systems or rf-related equipment. Its myriad uses range from troubleshooting tuned rf circuits to locating power lines concealed inside a building wall.

The most evident shortcoming of present-day dippers is the inconvenience of constantly changing and storing a half-dozen plug-in coils. Especially frustrating is the experience of attempting to pinpoint the frequency of a resonant circuit which falls at either end of the dial range. When another coil is plugged in, the meter current requires readjustment, and one often wonders whether the new dip obtained is the same one as read with the previous coil.

Dip-Meter History

These problems have been endured for years and have been attacked from many directions. One commercial design utilized a coil of flexible wire which was reeled from one nonconducting coil form onto a metal shorting form as the dip meter was tuned through its continuous range. The product was cosmetically attractive, but not entirely practical, and appeared only briefly on the market.

I at one time built a prototype dip meter with all coils

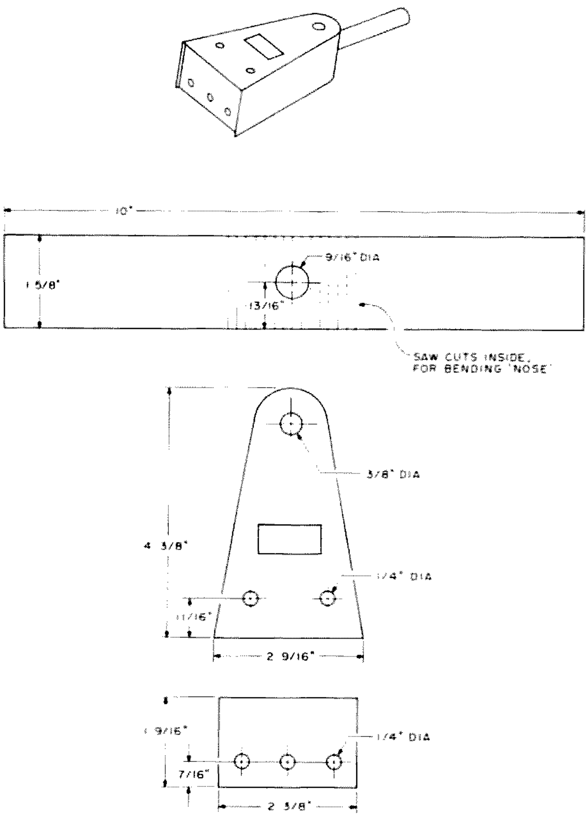


Fig. 1. Meter-case construction for the one-coil dip meter. Material is glass epoxy double-clad PC board.

Completed meter.

mounted on a turret and enclosed within a non-shielding case. The unit performed well, but was too bulky to reach tuned circuits located within high-density packages. Other wide tuning range tanks are possible, but may involve mechanical complexes which simultaneously tune a variable capacitor and move a ferrous coil slug. In the dip-meter application, the proximity of the slug would disturb the tuning of the measured tank; also, the arrangement becomes too large.

The Single-Coil Concept

Most "new" devices are the happy result of divorcing and remarrying existing arts into combinations not previously joined. So, a wide-range tank used in a previous design[1] was recalled and set up in prototype for study. The type of variable capacitor which utilizes plastic sheets between the plates provides maximum capacity per cubic centimeter. However, in this application, rf heating of the dielectric occurs, resulting in unacceptable frequency drift. Suitable compact air-dielectric units are listed in the parts data.

To provide the widest tuning range, a capacitor with the highest maximum-to-minimum tuning capacity ratio is required. For this reason, select one with the widest gap when adjusted to the wide-open plate setting. All parallel padders must be removed completely. To further ensure the widest tuning range, the lightest loading of the tank by the active device is necessary, which also points to the use of an FET. Reduction of loading by tapping down on the coil usually introduces false dips; therefore, a low-value gate coupling capacitor is used instead. The inductance of the coil between the source tap and ground resonates well above the design coverage and therefore causes no erroneous indications. The coil is shaped with a high length-to-diameter ratio to allow probing components located in close quarters.

The Circuit

The wide-range tank was joined to the vigorous Hartley oscillator in a simple one-

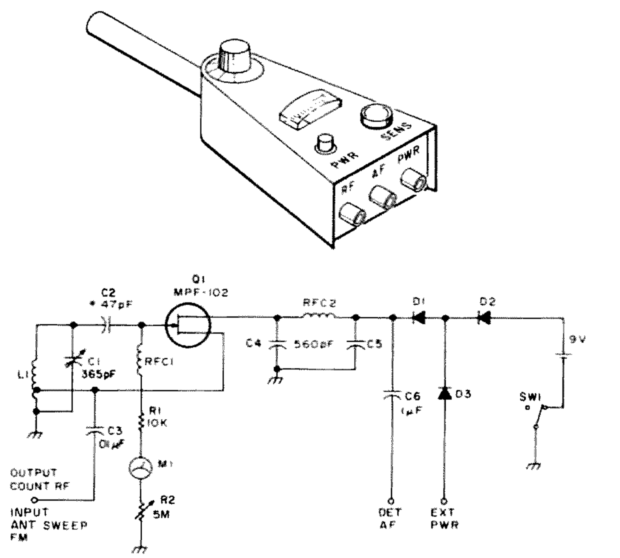
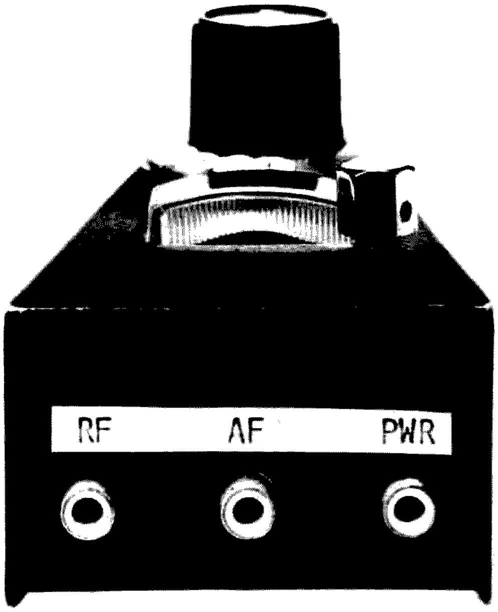


*Fig. 2. Circuit schematic and details of control mounting. *Polystyrene or silver mica. See Parts List.*



End view.

ring ceremony. The most critical items for minimizing minor spurious dips are the two rf chokes. The small 3-pi winding type has been found to be a good choice. Chokes with metallic cores are not recommended. To a minor degree, the gate resistor may cause ripples. Values between 3 and 10k Ohms are suitable. The gate-current potentiometer value of 5 megohms was chosen so that conditions of regeneration or near-oscillation may be easily controlled for use in the detector mode.

Construction

The case used for the one-coil dip meter is not critical. The LMB type 425 or Econobox type CU-124 enclosures are suitable and will permit a larger dial. The case I used was formed of glass epoxy printed circuit board with the copper stripped from the outside surfaces while applying heat. Copper is also removed from inside the "nose" area, which is also sawed halfway through for forming the curved portion. The forming should be done outdoors to avoid breathing fumes generated by heating the material. Apply heat from a propane torch and bend the curved portion around a suitable piece of pipe. The heated board should be held in the desired shape by a C-clamp and allowed to cool for 5 minutes.

The meter and tuning capacitor are epoxied in place for simplicity and to avoid screw heads showing on the finished exterior.

Wind the tank coil onto a suitable form such as the shank of a drill bit, after wrapping the bit with waxed paper. Coat the coil with epoxy cement and allow it to harden overnight. If carefully slid off, the coil will remain in one rigid unit. The coil protector may be a plastic pill box, dime coin holder, or the container in which semiconductors are shipped. This item is epoxied in a hole cut in the nose section of the dipper case and allowed to harden.

The dial (Radio Shack 274-391) may be calibrated using a receiver. Decal labels may be applied. Page numbers punched from a magazine were used in my dipper.

All small components are soldered to three 5-lug terminal strips which are located inside the case sides. Wiring requires two precautions: Locate the FET as near the tank terminals as possible and wire the rf chokes with the shortest leads possible to the FET. This care will minimize minor unwanted dips.

Additional Features

Three I/O ports are provided at the front panel. From left to right, these are labeled RF, AF, and PWR. The rf phono jack output may be used to drive a frequency counter, a mixer, or other equipment.

Conversely, an antenna may be fed in at this point or a sawtooth waveform may be applied to provide a wide-range, swept test signal from the dipper.

The af port may be used to monitor AM signals or to detect ripple on carriers.

The power jack permits the use of an external power source. Isolation diodes prevent conflict between battery and the ac power source and also protect against damage from accidentally applying incorrect polarities. Any of these features may be omitted if only a basic dip meter is desired.

Operation

With power on, set the dial to the highest frequency and adjust the meter indication to about 3/4 of full scale using the potentiometer. No further adjustment of the meter level will be required. It is normal for the meter indication to decrease as the frequency is decreased (due to the low value of the gate-coupling capacitor). This drop is of no consequence because generous dips are available across the full frequency range. Small meter fluctuations across the range also are not of significance.

Granted, tuning is sharp in the high-frequency portion of the coverage. But the chief usefulness of a dip meter is not in precise frequency measurement but in the rapid scanning of a wide range of frequencies.

Now it is a pleasure to quickly scan the 3.9-to-21-MHz range in one uninterrupted swing without all those loose coils, meter adjustments, and recoupling! ■

Reference

1. G. Brizendine W4ATE, "Wide-Range Field-Strength Meter," *Radio & TV News*, November, 1958.

Parts List

C1	Tuning capacitor, 365 pF, Poly Paks No. 7060	$1.00
C2	47-pF dipped mica, Jameco No. DM15-470J	.35
C3	.01-uF disc ceramic, Jameco No. DC.01/50	.08
C4,5	560-pF dipped mica, Jameco No. DM15-561J	1.24
C6	.1-uF disc ceramic, Jameco No. DC.1/12	.12
D1,2,3	1N103 or 1N56	.30
M1	200-uA meter, Poly Paks No. 7021	1.00
L1	41 turns #16 enameled on 7/16-inch form	1.00
Q1	MPF-102 FET, Digi-Key	.54
R1	10k, 1/2-Watt resistor, Jameco	.05
R2	5-megohm pot, Allen-Bradley Type "W" Mini, Napco No. POT-34	.69
RFC1	500 uH, Miller No. 4649	2.10
RFC2	56 uH, Miller No. 4629	1.32
SW1	SPDT subminiature switch, Jameco No. MSL34	.25
Miscellaneous:		
Case	Bud "Econobox" Type CU-124	3.50
Dial	Radio Shack Stock No. 274-391	.69
	Total Cost	$14.23

Be the First on Your Block with a 2-Meter Dipole

A few safety pins, some wire, and a little rod stock will make a portable antenna perfect for the traveling ham.

Paul L. Schmidt W9HD
PO Box 105
Bloomfield IN 47424

A dipole on two meters! You've got to be kidding. That is often the response I get when I explain that I use a dipole antenna on two meters.

Then I ask what kind of element excites a yagi beam. It is called the driven element, but it is a dipole, nevertheless. The number of dipoles on two meters is considerable.

Dipole antennas work fine on two. I have had one for at least five years, mounted in the vertical plane some two-thirds of the way up my fifty-foot TV mast. My dipole is made from two pieces of rod stock fastened into a chunk of cylindrical polystyrene. The center is firmly clamped to a five-foot angle-iron support attached at right angles to the mast. It is fed with RG-8/U coax. The pattern is quite circular. I regularly contact repeaters, full-quieting, fifty miles distant with 20 Watts. These repeaters are situated on the unfavorable side of the antenna, where the TV mast is between the antenna and the desired station.

For several years I had a traveling job and spent many nights in motels here and there in the midwest. My GTX-200, its power supply, and a portable dipole antenna all fit neatly into an attaché case. Thus, I spent many an evening in QSO with friends.

Due credit must be given the ground-plane antenna. It is every bit as good as a dipole. But I would not take a ground-plane-type along for portable work; in a motel room, those ground-plane rods can be dangerous. About the only place you can put a ground-plane antenna is on top of the TV set. Then two of the rods are pointing at the wall while the other one or two are pointing into the room to poke you in the nose, ribs, or whatever as you walk about the room.

My portable dipole might have been made from two pieces of rod stock fed at the center, but I had been experimenting at that time with inductive loaded elements. I decided to try an inductive-loaded dipole.

The two radiating elements of this dipole are formed from lengths of insulated #12 house-wiring wire, each approximately 23 inches long at the start. 3 inches from the center feedpoint, each wire is made into 5 turns of a coil wound on a 3/4" mandrel. Each coil is then stretched to approximately 4 inches long, evenly spaced, and epoxied to a cardboard tube or whatever light-

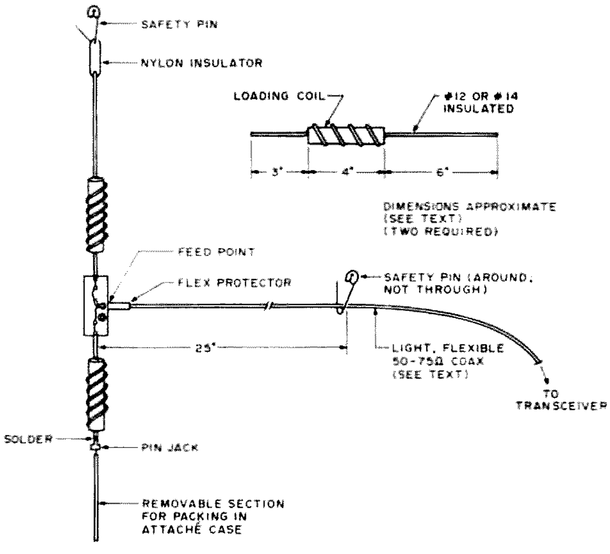


Fig. 1. The traveler's friend.

weight nonmetallic object can be found. See Fig. 1. Incidentally, modern house-wiring insulation exhibits good dielectric properties at 146 MHz, so leave the insulation on. Also, bear in mind that one must use a heavy 100-Watt, or better, soldering iron on wire this heavy.

A substantial insulating material block is used at the feedpoint to hold everything together. Each of the two radiating elements is securely bolted to the block. The coax center conductor is soldered to one of the elements, the shield to the other. Light, flexible 50- to 75-Ohm coax is recommended for feedline, unless you prefer to stuff 20 to 25 feet of RG-8/U into your attaché case day after day. Use a cable clamp to secure the coax to the block at the feedpoint. Maybe you can slide a few inches of protective tubing over the coax there under the cable clamp because frequent handling of your gear involves a lot of cable flexing. You don't want wear and tear to kill it before its time!

Find the dipole element connected to the center conductor of the coax. This is to be the top member of the dipole. Take about 1/2" of insulation off the very end. Form the bare end into a hook. Next, use scissors to make a strap 2" or 3" long by 1/2" wide cut from the top of a margarine container. Burn a small hole in each end of the strap using a pencil soldering iron (don't mind the smell). Then epoxy one end of the strap to the bare hook. Epoxy doesn't bond well to smooth nylon, so roughen up the surfaces a bit.

Remember, this dipole antenna is vertically polarized. This means that instead of hanging horizontally, it hangs vertically from one end.

Now put a diaper-type safety pin through the top hole of the insulator strap. This is to hold the antenna vertical while attached to the motel drapery. Some 25" away from the feedpoint, attach a safety pin to the coax, putting the pin around the coax, not through it. This is used to attach the coax to the drapery so that the antenna is fed 90° from its axis. Between this last pin and the transceiver, the routing of the coax is not critical.

As described so far, the antenna will not fit lengthwise into standard luggage. So, cut off the bottom element just below the loading coil and solder a pin jack at the recently cut coil end. Next, remove 1/2" of insulation from the piece cut off and insert it into the pin jack. Trim for symmetry.

Check the swr during construction, before the epoxy goes on. Hang the antenna from a rafter and, with tape, compress or expand the coils, searching for the lowest swr. If that doesn't work, house wire is plentiful; make another one. If you can improve this design, be my guest. Using it as described, I have had excellent results, so I did not try to improve it.

The best installation is where the drapes cover a picture window. You should try to place the antenna midway between the top and bottom, as well as midway between any vertical supports. Beware of windows with small panes. If metal-framed, these could upset your swr.

After your antenna is built and tested, don't be timid. On checking into motels, I would express my desire for an upper-floor room because I carried a two-way radio which reached out further from higher locations. No desk clerk ever gave me a hard time; their business is to fill the rooms with guests. ■

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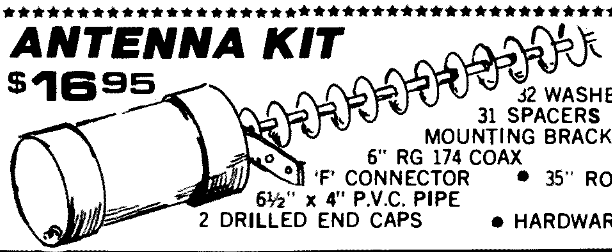

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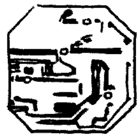

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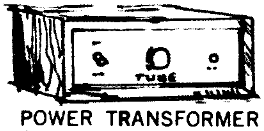

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Two Meters for the Price of One

The oft-ignored shunt principle will turn an everyday junk-box meter into a surprising supermeter. The key is a piece of solder.

The philosopher William James was a champion of empiricism. Paraphrasing his definition of that awesome word: If I want to know if my pipe is lit, I will not perform endless rational operations examining cause and effect; instead, I will stick my finger in the bowl.

I became an empiricist recently (although not at such cost to my fingers) when confronted with the problem of using a 200-milliamp current meter to measure 2 Amperes of current. I knew there was a way, from years ago in tech school; it's called a shunt.

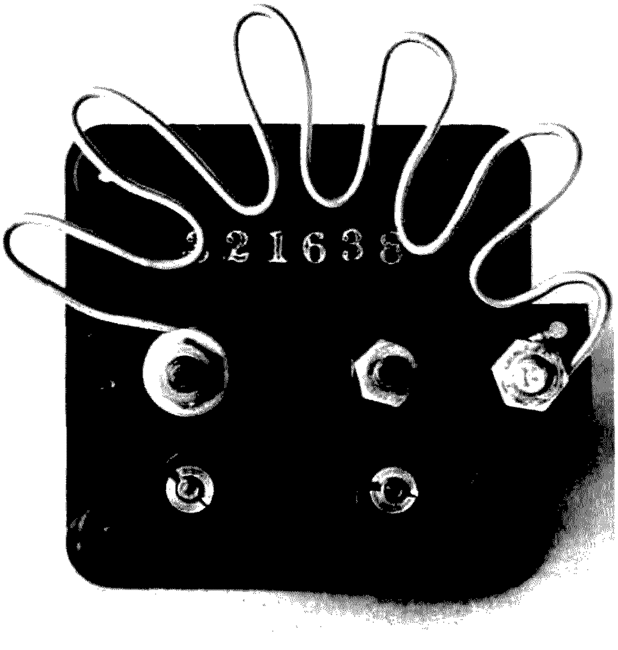
The shunt principle is nothing more than an expression of Ohm's Law. Current meters have a very low internal resistance, which we usually call negligible. It is some small fraction of an Ohm. Although current flowing through a resistance always generates heat, meter resistances are so small that the heat generated is carried away by the body of the meter.

If you place another resistance in parallel with the meter, current to the meter splits; part goes through the meter and part goes through the shunt. This split follows Ohm's Law faithfully. If the resistance of the shunt is precisely the same resistance as the meter, the current splits down the middle, and the meter indicates exactly one-half the true current flowing through it.

This sounds like a great way to make a meter tell lies. True, a 50-50 current shunt accomplishes little. The process gets interesting when the split becomes 90-10 with 90% of the current passing through the shunt and only 10% passing through the meter. In this arrangement, you multiply the apparent current reading on the meter by ten to get the true current. The numbers on the meter face still read true—all you have done is shifted the meter's decimal point! (I should point out that the various current ranges on VOMs force you to do exactly the same thing.)

Simple enough in concept—and very attractive since I had a good 200-mil meter in hand and a 2-Amp specimen would cost me six or eight bucks. Furthermore, by switching the shunt into and out of the circuit, I could have both current ranges with one meter. Since I was building a battery charger, I could indicate both fast charge current and the much smaller float charge current.

Fine—now, to build the shunt. My moth-eaten tech books had the theory, but the theory required that I know the resistance of the meter and be able to measure the resistance of the shunt. Since both values hovered down in the bottom quarter of an inch of the lowest resistance scale on my VOM, I realized that that method would not serve real-life needs. Rather than measuring or calculating at all, I decided to become an empiricist.



The empirical shunt, finished and in place.

The idea is disarmingly simple: Set up a shunt which is easily variable. Then pass the same current through the shunted meter and a VOM and vary the shunt until the reading is the same on both meters. At that point, the resistance of the shunt is correct because the results are correct, and calculation be damned! That's empiricism.

The setup I used is outlined in Fig. 1. An old-timer once told me of winding loops of solder around wooden spools for meter shunts. Solder is good shunt material because it has a relatively high resistance compared to copper. A copper shunt would be possible, but it would be much longer than a solder shunt.

I didn't even cut a length of solder off the roll. (You folks know what solder goes for! I wasn't going to waste a single inch.) I screwed the end of the solder roll under one meter terminal, pulled about a foot off the roll, and then pinched the solder under the other screw terminal leaving a loop of about ten inches in parallel with the meter movement.

Using clip-leads, I passed a current of two Amps through the two meters. The shunted meter went off the scale. This told me that not enough current was going through the solder. I reduced the resistance of the solder loop by shortening it by half. The next reading on the small meter was 110 mils. I had gone too far; now the solder loop was taking too much of the current. By pinching the solder loop off at different points under the terminal screw, I finally found a point at which the reading on both meters was exactly 2. The solder loop was about eight inches long. I cut the loop at that point and wasted no solder at all.

If you follow this process, the rules are simple. Shoot for full scale on the shunted meter. If your meter pins, shorten the shunt. If you fail to reach full scale, lengthen the shunt. This assumes, of course, that you have a current source adjustable to full scale on your meter. Full scale will give you the most accuracy, but if you can't rig just the right current, match readings and make the best of it.

Eight inches of solder seemed too little to wrap around a spool, so I compacted the loop by bending it back and forth into a number of smaller loops. I drilled two holes in a small piece of bakelite and clamped one end under the meter terminal. The other end of the loop I clamped through the other end of the bakelite with a small screw. I needn't mention the futility of trying to solder to a piece of solder. This arrangement allows me to switch the shunt out of the meter circuit to measure small currents.

The idea of having all those loops of bare conductor flapping around inside my charger bothered me, so I dipped the solder into the plastic insulation material normally used for dipping the handles of electrical pliers. You might also sandwich the solder loops between two pieces of thin plastic, which would also provide some mechanical support.

The solder I used was rosin core Kester 44, .062 inches in diameter. Smaller diameter solder could be used, but it is much flimsier and would have to be wound around something more substantial than thin air. Also, small solder melts more easily, so don't use it unless your total current through the shunt-meter combo is less than one Amp. Remember (and this is the only fly in the ointment) that if your shunt melts, full current will again flow through the meter, and unless you catch it quickly, you can kiss that meter good-bye.

Using this method, you can make a low-current meter read practically any larger current, within reason, all without calculation and the hair-tearing associated with all that sticky math stuff. You don't even have to stick your fingers in anything! ■

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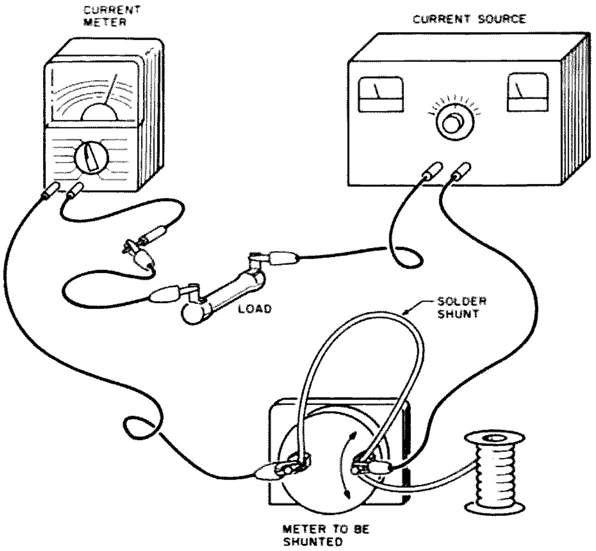

Fig. 1. Shunt calibration setup. If a variable current source is not available, a husky rheostat may be used to vary the load resistance.

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Strangle QRM with Your TS-830S

Simple filter modifications will help your Kenwood choke out interference. KA2R gives you the lowdown on how to do it.

The Kenwood TS-830S transceiver contains a fine receiver. It has numerous features and most of them work quite well. The two features that I find most useful in the TS-830S are the "VBT" and "IF Shift" controls. These two controls vary the i-f passband width and position respectively. When there is QRM on both sides of a desired signal, the VBT control can be used to move the skirts on both sides of the i-f passband inward, and when there is QRM on just one side of the desired signal, the IF Shift can be used to move the i-f passband away from the offending signal.

I found that these controls would perform their respective functions reasonably well but not as spectacularly as I had expected when I ordered the rig. I found that troublesome adjacent SSB signals could be moderately attenuated but not eliminated. I was especially disappointed to find that CW performance without optional CW filters installed was quite poor. The minimum practical passband setting was 500 Hz, and signals within 2 kHz of the desired signal were attenuated but not eliminated. This article describes a relatively straightforward modification to the TS-830S that significantly improves selectivity and increases the effectiveness of the VBT and IF Shift controls.

After owning the rig for several months, I went inside it to determine if I could improve the controls by optimizing the alignment. There was only one adjustment that would have any effect on VBT or IF Shift performance, and it wasn't far from its optimum setting (more on it later). I then studied the circuit diagram in detail to better understand the operation and the reason the controls were not performing as well as I had hoped they would.

VBT and IF Shift Circuit Details

The VBT operates by

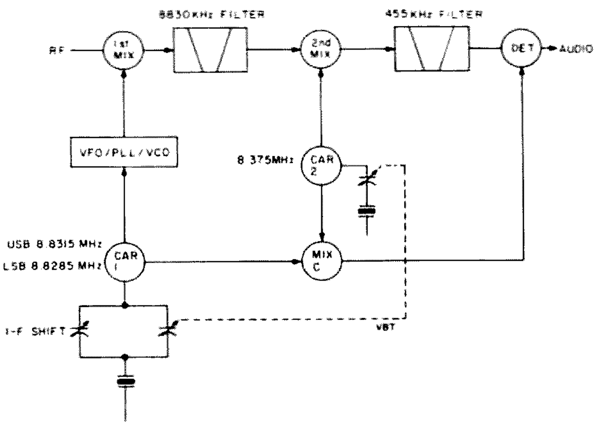

Fig. 1. IF Shift and VBT control details. Note that the IF Shift affects only the first mixer and the detector, thus shifting the i-f signal in both filters. The VBT increases the i-f signal frequency in one filter and reduces it in the other, effectively narrowing the i-f passband.

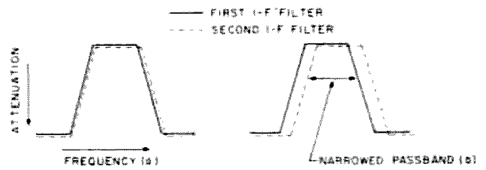

Fig. 2. The VBT control effect on overall i-f passband. The two filters are aligned as in (a) when the VBT is not in use. The VBT control effectively misaligns the two i-f filters, thus reducing the passband width as in (b).

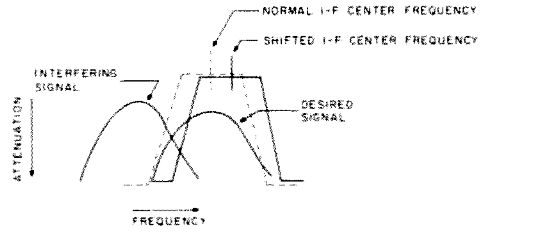

Fig. 3. Demonstration of IF Shift action in reducing QRM. Note that some of the desired signal is moved out of the passband along with the interfering signal.

shifting the frequency of the signal in the first i-f in one direction and the signal in the second i-f in the other direction. This is done by shifting the frequency of two of the oscillators that control the frequency of the signals in the i-f chain (see Fig. 1). The VBT control changes the frequency of an 8.83-MHz carrier oscillator and an 8.375-MHz i-f conversion oscillator (this oscillator converts an 8.83-MHz i-f signal to a 455-kHz i-f signal). Effectively, the two filters, normally in close alignment—Fig. 2(a)—are moved in opposite directions—Fig. 2(b). One filter provides the cutoff on one side of the passband while the other filter provides the cutoff on the other side. (For the purposes of Fig. 2, two identical, typical, filter characteristics are used. We will examine the actual filter characteristics provided in the TS-830S in a later figure.)

The IF Shift control changes only the carrier-oscillator frequency. This moves the signal the same direction in both i-f filters, cutting off the signal on one side or the other, as shown in Fig. 3. The VBT and IF Shift controls can be used simultaneously to select just one part of the incoming signal (the part that is not covered by QRM).

From the circuit details it would appear that, given ideal filters, the controls should work wonders at reducing QRM. Since their performance was less than spectacular, I examined the characteristics of the filters used in the TS-830S. I found the following:

- The 8.83-MHz i-f filter is a monolithic 8-pole crystal filter. Kenwood's specifications for it indicate a −6 dB passband width of greater than 2.7 kHz and a −60 dB passband width of less than 5.0 kHz. These specifications indicate a shape factor (−6 dB to −60 dB) of somewhat less than 1.85. The stopband attenuation of the filter is listed as 80 dB or more.

- The 455-kHz i-f filter is an 8-pole ceramic unit. It is specified to be 2.7 kHz or more at −6 dB and 4.5 kHz or less at −60 dB, for a shape factor somewhat less than 1.67. The "guaranteed" stopband attenuation is indicated to be 60 dB or more.

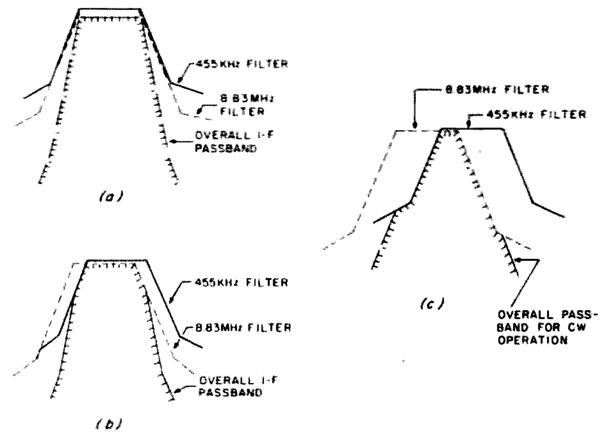

Fig. 4. At (a), the combination of the two filters provides a respectable overall i-f passband characteristic. At (b), the VBT is used to reduce −6-dB passband width; it only slightly reduces the −60-dB passband width. Use of the VBT and SSB filters for CW operation results in shoulders on the passband skirts as shown in (c).

Some tests on the TS-830S showed that the filters meet their specifications but that the 8.83-MHz i-f filter stopband attenuation is not achieved due to leakage past the filter on the i-f board. This, combined with the modest stopband attenuation of the 455-kHz ceramic filter, clearly explains why CW signals within 2 kHz of the desired signal are not fully attenuated when the VBT control is used to bring the passband width down to something suitable for CW operation.

The reason for the modest performance in both SSB and CW modes is demonstrated in Fig. 4. Fig. 4(a) shows the characteristics of the stock Kenwood filters in the TS-830S, along with the overall passband characteristic provided by the two filters when VBT is not in use. Fig. 4(b) shows how the passband skirt steepness is reduced when the VBT is used to bring the passband width down to about 2.0 kHz (my usual setting for operation on 20 meters). Note that the passband skirts are not nearly as steep as they are when the VBT is not in use. The shape of the passband in the region from −6 dB to −60 dB approaches that of a single filter as the VBT is cut in. Additionally, when the passband is narrowed by more than about 800 Hz, "shoulders" are formed on the passband skirts due to the limited stopband attenuation. This is shown in Fig. 4(c). The close-in stopband attenuation is limited to about 75 dB on one side (the 8.83-MHz filter side) and just over 60 dB on the other side (the 455-kHz filter side). Strong nearby CW signals are clearly audible if they fall within the region of limited stopband attenuation. And, of course, signals within the skirt area are going to be even louder than those in the shoulder area.

Improvement

From this analysis, it was clear that all I needed to make the TS-830S really perform well in the selectivity department were two ideal filters (i.e., filters with a 1.0 shape factor).

At this point, I recalled the successful "16-pole" modification I made to my TS-820S in 1979 (see the May, 1980, issue of the *Users International Radio Clubs Kenwood Newsletter*, published by N8RT). Even with VBT, the TS-830S was not providing the selectivity that my TS-820S provided after I added a second filter to it; since the TS-830S has two filters, it should be able to do at least as well as my old TS-820S. I decided that since the most significant difference between the modified TS-820S and the stock TS-830S was in the filters, upgrading of the TS-830S filters would surely be the key to improving its performance.

In previous similar projects, I have used filters purchased from the Fox Tango Corporation (Box 15944, W. Palm Beach FL 33406). This firm offers 8-pole, 2.1-kHz discrete-crystal filters in both 8.83-MHz and 455-kHz center frequencies. I have found their filters to have steeper passband skirts and higher stopband attenuation than the original equipment filters they are designed to replace. Since the TS-830S i-f skirt steepness and stopband attenuation are maximized when the two i-f filters are aligned (VBT not in use), I felt that the narrower passband width available in this line of filters would be particularly advantageous. Since I was operating the TS-830S with the VBT set for about 2.0 kHz most of the time anyway, I felt I might as well have filters that would provide that passband without the skirt steepness degradation that results from use of the VBT.

The original 2.7-kHz SSB filters in the TS-830S provide a −6-dB passband width of just over 2.4 kHz (VBT out) and are largely responsible for the reputation Kenwood has for excellent audio qual-

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"...Completely eliminates my need for a CW filter..."
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ity. I knew that two 2.1-kHz filters would reduce the −6-dB passband width to about 2 kHz and recognized that the audio quality would be affected. However, Heath, Collins, and others have long used 2.1-kHz SSB filters without owner complaint. Further, I applied cascaded 2.1-kHz filters in a Heath SB-102 transceiver some years ago and never regretted it for a minute.

Results

I installed the two Fox Tango filters in the TS-830S and found the results very gratifying. The following summary of my conclusions is taken from an earlier report published in the April, 1982, issue of the *UIRC Kenwood Newsletter*.

- The effect of the modification on audio quality is noticeable in a side-by-side comparison but is not bothersome in day-to-day use.
- The audio quality is far better than that provided by the optional 1.8-kHz filter offered by Kenwood and several other transceiver manufacturers.
- The VBT is now used less often and to a lesser degree when it is needed because the basic passband is closer to the ideal for today's crowded bands. The shape factor (−6/−60 dB) of the modified rig is 1.19 compared with 1.45 for the stock rig set for a comparable passband width.
- The VBT control, when used to combat QRM during SSB operation, is now generally used to bring the passband down only 200 or 300 Hz, leaving the shape factor quite high (i.e., the skirts remain relatively steep and shoulders are not formed on the skirts).
- The IF Shift is significantly more effective because of the steep, deep skirts provided by the two 2.1-kHz filters.
- The VBT can be used to bring the passband down to about 300 Hz, making CW operation with only SSB filters installed quite practical. With the VBT set at 300 Hz, the CW passband shape approaches that of the optional Kenwood 8.83-MHz, 250-Hz CW filter.
- With the VBT set at 500 Hz, the passband shape factor is considerably better than that of the optional Kenwood 500-Hz, 8.83-MHz CW filter.
- With the two 2.1-kHz filters installed, I found I could run the rf clipping higher without complaints of audio quality degradation.
- In most on-the-air tests I have been told that the combination of the new filters and a Shure 444 mike provides impressive punch. No one has yet observed any unusual quality in my transmit audio when I am using a Kenwood MC-50 mike.

Replacing the 8.83-MHz i-f filter with an improved unit does not eliminate the 8.83-MHz i-f board leakage but significantly reduces its effect on SSB operation since less VBT must be used to fight QRM. In CW operation, the limited stopband attenuation in the 8.83 i-f is still sometimes noticeable. However, the stopband attenuation of the new 455-kHz filter appears to be greater than −100 dB and provides nearly this level of attenuation when installed in the Kenwood 455-kHz i-f circuit, reducing the effect of the more troublesome of the two shoulders.

Installation

Both replacement filters are larger than the original filters (the 455-kHz filter is about 10 times larger than the small ceramic filter it replaces), but there is plenty of room for mounting them above the i-f board in the TS-830S. The discrete-crystal filters have built-in isolating transformers and thus, unlike the monolithic crystal and ceramic filters used by Kenwood, require isolating capacitors. These can be mounted right on the new filters. Short pieces of RG-174 coax can be used to bridge between the i-f board and the new filters.

I will not go into detail on the physical installation of these filters here; the manufacturer now offers the two required filters in a kit complete with coax, capacitors, and instructions. The kit instructions detail several installation options. Those who have no CW filters installed can have automatic or manual switch selection between the original filters and the new 2.1-kHz filters and can select the desired filters independently for receive and transmit operating modes. Incidentally, the 455-kHz crystal filter is a rather expensive item at $125. However, I understand that the kit will continue to be offered for some time at its current introductory price of $150.00 plus $3.00 shipping.

The minimal alignment required during the modification is readily facilitated by the built-in calibrator oscillator and the S-meter. For those who have a frequency counter handy or can borrow one, the 8.375-MHz oscillator can be trimmed to put the two 2.1-kHz-filter center frequencies in perfect alignment. This step maximizes the −6-dB passband, bringing it up to about 2050 kHz. It also maximizes the steepness of the passband skirts.

Conclusions

I have been living with the modified TS-830S for over 6 months now and still get a kick out of foiling the QRM in a way I couldn't before making the modification. I've talked with several others who have made the modification, and all have been very pleased with the results. I will be happy to respond to anyone with questions on this modification. Please ensure my reply by sending me an SASE! ■

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Smart Meters: The New Movement

Turn your passive meters into active error-correction systems. W4RNL's innovative circuits make it a snap.

The housewife doing laundry and the ham have much in common. Both depend upon indicators to tell them when their equipment is doing a good job, and their indicators often fail them. The housewife does not see the light on the clothes dryer go out, and the wash-and-wear sits in a wrinkled pile for an hour. The ham does not notice the current climb on his plate meter, and finally a fuse blows—or the final does.

Both cases illustrate a limitation in our thinking about monitoring the operation of our equipment. For the most part when we think about monitoring our gear, we picture meters or other indicators that tell us the current status of things. Then it is up to us to make the proper moves to resolve any problems. Too often, however, we fail to keep an eye on the indicator and the problem gets out of hand before we can step in with corrective action.

There is a solution to this difficulty. The first step is to change our thinking about monitoring. The second step is to put together a few handy circuits which will both reflect our new way of thinking and take some corrective action for us. Although there are many ways to control conditions that are straying, we will limit ourselves to some variations on circuits using just a few components. The heart of the circuits will be two common ICs: the 555 timer and the 339 voltage comparator. Both are very simple to use and subject to nearly limitless variations in the functions we can get them to perform. But first, a few words about thinking.

Monitoring—Detect and Control

The solution to the housewife's problem is simple: To the clothes dryer we add a buzzer which sounds off at the end of the drying cycle. Then she can come promptly to remove the clothes before they wrinkle. What has been added to the situation is a method to ensure that the harmful condition—namely, the clothes sitting and wrinkling—will not proceed unchecked for very long. The control system is not perfect, of course, but few things are. The lady may leave the house or be out of earshot of the buzzer. But to a large measure, we have brought the undesirable situation under control.

Household appliance manufacturers have long recognized the problem and built buzzers into appliances (and added bells, whistles, lights, and other control signals). Hams have not been nearly so up to date in their methods. We continue to think of monitoring our equipment almost solely in terms of a few meters to provide us with status reports—if we are in a position to see them or take the trouble to look. But meters and other indicators are only one half of the job of monitoring. Monitoring consists of two parts: detection and control.

Once we understand this fact, it is easy to see why meters can do only half the work. They provide an indication of both normal and abnormal operation, but they do nothing to control the abnormal condition. They sit there happily indicating that our equipment is going to pot without lifting a finger to help.

Unless we have unlimited time and money, developing a perfect control system to correct any and all undesirable conditions is not a practical solution to the second part of the monitoring problem. Neither does the housewife have a dryer that will remove and hang the wash-and-wear clothing when the cycle is complete. She depends on the monitoring device—the buzzer—to ensure that something appropriate gets done. And that is the task we should have in mind when we try to design effective monitors for our ham equipment. We may not be able to have every circuit self-adjust, but we can take steps to make sure that when the gear acts up the monitoring system will

take an action that will protect the equipment.

There are several types of control actions at our disposal. Let's list them by categories as a convenient way to decide for each case we run into what the best system may be.

1. *Self-adjustment.* Although this step is not practical for every monitor, it is relevant to many and much more common than we might believe. Automatic gain control and automatic frequency control are just two of the many self-correcting control actions that occur in ham gear. But in most of the places around the shack that call for detection and control, automatic adjustment would be too complex and costly, and often simply unnecessary.

2. *Automatic Switching.* In some cases, an out-of-spec condition can be controlled by switching to a safe mode of operation—perhaps a lower power setting. We can go so far as to switch the equipment off, but let's save this possibility for a special category.

3. *Warning.* If we can detect a harmful condition while it is on the borderline of trouble, we can take preventive action manually. However, we need to catch the problem promptly, which requires a warning method that we cannot ignore. Bells, buzzers, lights, and sirens are all quite effective in waking most of us. These are some of the easiest and most important systems to design.

4. *Shutdown.* Ultimately, the final safety measure is to have *our monitor* shut down the equipment before a problem has the time to cause a catastrophe. In most instances we would prefer to keep the equipment going if we can, but some conditions call for total removal of power. Thus we have a new way to look at the common fuse: It monitors current and, in the event of serious overload, it protects the equipment by sacrificing itself—poor fellow. Nonetheless, the fuse is a clue to when we should think about shutdown as *our* control step. We pull the plug when the condition is dangerous or destructive.

These four categories cover almost all the types of detection and control systems you will encounter or develop. Translating these general ideas into practical ham designs may seem to be a complex task. However, with just two or three ICs, we can make a good start toward effective monitoring.

Some Basic Methods for Monitoring

Since we need both a method of detection and a method of control, let's start with separate devices for each job. For our detector, we can use the LM339 voltage comparator. Our basic controller will be the ubiquitous NE555 timer. We may add a few chips along the way, but together these two inexpensive ICs will allow us to design a large number of useful monitoring systems for both the ham shack and the home.

The LM339 voltage comparator is but one of a vast array of op amps that could perform the detection role well. I chose the 339 for several reasons. First, unlike some op amps, it requires only a single power supply and it operates in the 5-to-15-volt range of the 555 timer. This is also the range of voltages we may need for other devices we add to the system, and it is also the range we are likely to find or can derive from existing power sources in the equipment to which we add the monitor. Second, the 339 comes four comparators to a DIP for a low cost per section. Fig. 1 shows the pinout. Finally, for basic comparator work, the chip is easy to use.

Fig. 1 also shows the basic circuit for voltage comparison work. The 339 will drive

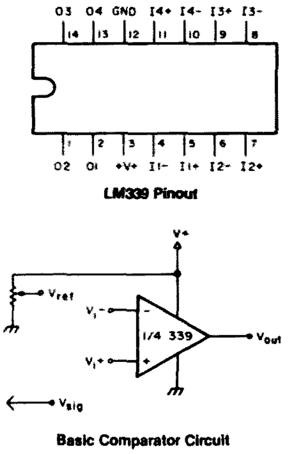

Fig. 1. Pinout and basic comparator circuit of the LM339.

either CMOS or TTL chips. For a non-inverting comparator, that is, one that changes its output from low to high as the input voltage rises, connect the reference voltage to the inverting input (Vi−) and the signal voltage to the non-inverting input (Vi+). To make an inverting comparator, reverse the input connections and the output will drop from a high to a low as the signal voltage rises above the reference level.

Fig. 2 shows more practical circuits recommended by National Semiconductor. Each adds feedback for hysteresis in order to prevent oscillation and chatter. Since many of the applications of the comparator as a detector for monitoring will be faced with noisy or slowly-changing voltages, the

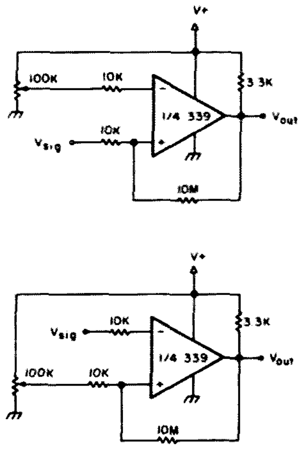

Fig 2. Two practical comparator circuits for the 339. Inverting and non-inverting (bottom) comparators.

feedback is wise and inexpensive. Too, the exact values are not critical.

Although the input voltage should not exceed the supply voltage by much (as a general rule of thumb, not at all), we are not limited only to monitoring voltages from 0 to the chip's supply voltage. We can drop high dc voltages through a series-resistance voltage divider, using high-value resistors to minimize the current load on the monitored circuit. Fig. 3 shows a sample case (a) lowering the nominal 1000-volt supply to 10 volts. The voltage at the op amp input will proportionally track the changes in the 1000-volt line.

As long as the input voltage to the comparator is

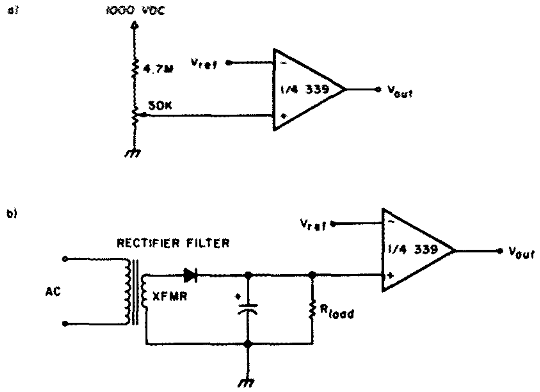

Fig. 3. Deriving input voltages from high ac and dc sources. (a) Using high dc sources. (b) Using high ac sources.

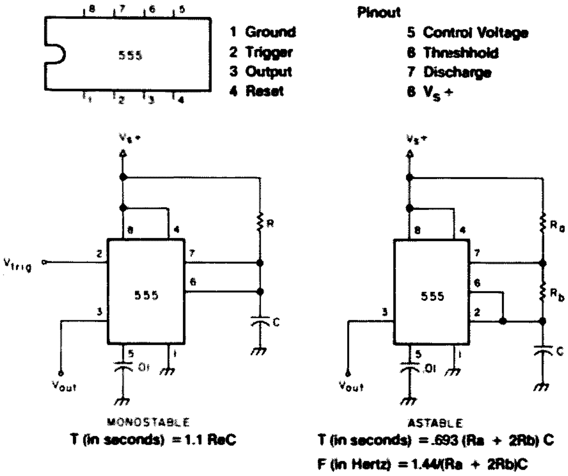

Fig. 4. The basic 555 configurations.

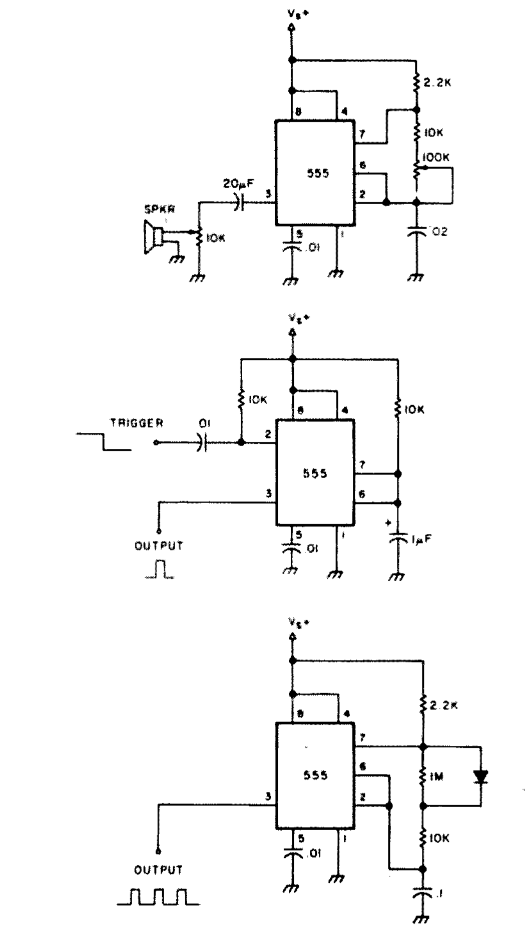

Fig. 5. Three typical 555 circuits. Top to bottom: audio oscillator, one-shot pulser, pulse generator.

within safe limits and tracks the line it samples, we need not be too concerned in these applications with the exact voltage. In each case we will set the reference voltage for the other input to cause the comparator to change its output state at the proper level of the line we are monitoring.

Similarly, by converting ac voltages to a safe level of dc, as shown in (b), we can use the comparator to monitor ac levels. The only precautions in this case are these: First, have a steady minimum load on the transformer so that it will track correctly, and second, the more sensitively you want to track, the more filtering you will need in the ac-to-dc conversion.

The 339 detector portion of our system is most applicable to the last three categories of monitoring. For cases in which we need automatic adjustment, the comparator is not often the best way to achieve our goal. However, for automatic switching, warning, and shutdown, the definite change of state of the comparator is ideal to trigger control devices such as the 555 timer. Moreover, since changes in voltage, current, resistance, and power can all usually be converted into changes of voltage, we can effectively monitor most of the important functions within our equipment.

The 555 timer has become an instant legend as a versatile timing and control device. Fig. 4 shows the pinout, the basic monostable and astable circuits, and the timing formulas for the IC. Since the output stage will supply up to 100 mA of current, it is ideal for driving lamps, relays, small buzzers, sirens, and a host of other units. By chaining 555 stages, we can build delays into the control system to allow for self-correction or other factors. Too, the 555 makes a excellent square-wave oscillator for audible warnings, and it can be used to generate pulses for various applications. Fig. 5 shows an audio oscillator, a one-shot pulser, and a continuous-pulse generator as samples of what the 555 can do.

With all these tools at hand, we are now ready to look at some practical circuits. In one form or another, all of them are at work in pieces of equipment around the shack and house here. A few have actually prevented some expensive disasters, and one is at work keeping my wash-and-wear shirts from being wrinkled in the dryer.

Some Practical Circuits

Let's begin with a pure ham application. On occasion, the plate current to my final amplifier has risen to dangerous levels—at least to levels which threaten to shorten the lifetime of the tubes. This has occurred as the tubes aged and lost their perfect balance, as well as in the case of a number of careless retunings. Noting that the high voltage dropped with the rise in current, I added the circuit in Fig. 6 to warn me of excessive current. The resistor divider samples less than 4/10 of a percent of the high voltage. When the voltage drops due to excessive current, the 339 triggers the oscillator and a transistor switch for the warning lamp. The 100-μF capacitor in the signal-voltage line counteracts brief voltage drops caused by normal peak demands of speech or CW keying. You may have to experiment with this value for your system. The object is to have the monitor respond only to the relatively slower changes of current. I set the reference threshhold of the comparator by monitoring the current levels at which the comparator triggered the system.

The circuit is placed well away from heavy rf fields, with only the low-voltage signal line emerging from the amplifier. The line is shielded and well filtered to keep rf out of the monitor itself. The unit is in a small box of its own behind a panel directly in front of me, so that I cannot miss the warning light—or sound. Perhaps the most significant event in the life of this little monitor was when it sounded off to

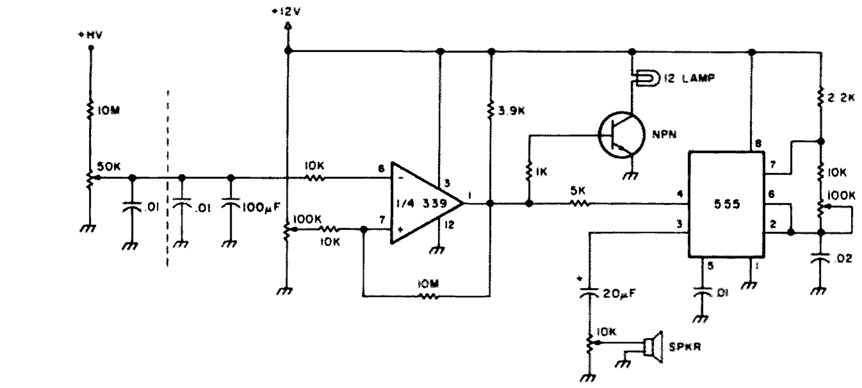

Fig. 6. An excess-current-warning monitor.

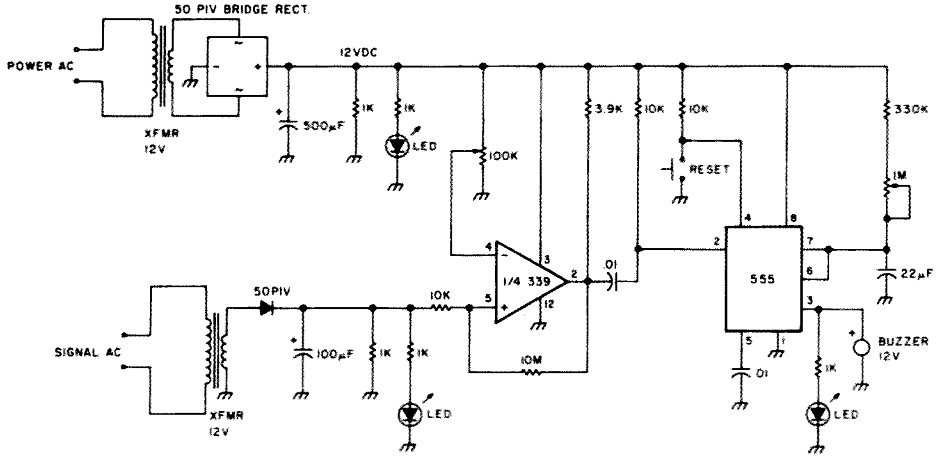

Fig. 7. An end-of-cycle monitor for ac equipment.

warn me of an over-current condition, and the fuse in the high-voltage line refused to blow. What that might have cost me had the monitor not been in place, I shudder to think about.

In case you may be wondering about my shirts, an old but perfect clothes dryer lacked a warning buzzer to signal the end of its cycle, although a light in the timing wheel did go off. Fig. 7 shows the answer to the problems created when someone did not see the light go dark: Another 339 responding to the shutdown triggers a 555 monostable, which in turn lights a light and sounds a buzzer that can be heard throughout the house. The monostable has a variable duration of 10 to 40 seconds (it calculates at 8 to 32 seconds, but most electrolytics are a bit leaky and extend the time period). A reset button allows one to cut the sound if nearby. The input circuit uses the smallest 12-volt transformer I could find, since the current requirements are minimal, most going to the 1k bleeder resistor and to the LED. The reference potentiometer setting is non-critical: about midrange does well. The goal is to convert the slowly decaying voltage from the ac-to-dc converter to something sharp enough to trigger the 555 reliably. By setting the reference low enough, the circuit will not falsely respond to line-voltage drops occasioned by the central air conditioner compressor when it starts to compress.

Fig. 8 shows a variation in the dryer theme. Comparator #1 senses a drop in voltage and triggers the first 555. This timer acts as a delay so that the condition has time to correct itself before the second 555 begins a control cycle. If the condition does correct itself, comparator #2 cancels the control action by bringing the reset line of the second 555 to ground. For ac applications, the second comparator might be set at about 50 volts so that a generator will not start with even some of the power company's voltage on the line. The second 555 output can be tied to the starting circuitry of the generator through a relay. Other applications of this circuit for both ac and dc conditions can readily be imagined.

As a variation on this two-level circuit, Fig. 9 shows a 339 coupled to a 7400 NAND latch. Section #1 of the 339 pulls the latch output high as its input voltage drops below the threshhold, while section #2 pulls the output low as the voltage climbs again. For reverse action, take the output from the other NAND gate. The input to the two comparators can be ac- or dc-derived, with the two sections having any desired differential. The NAND gates are separated from the comparator so that they respond to pulses created by the capacitor discharges; hence, the latch never faces dual low inputs. The output of the latch, unlike the 555 timers,

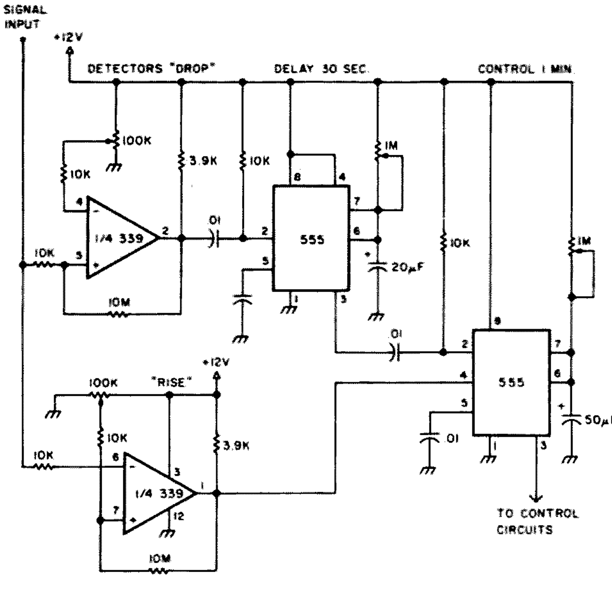

Fig. 8. A monitor with delay and cancel features.

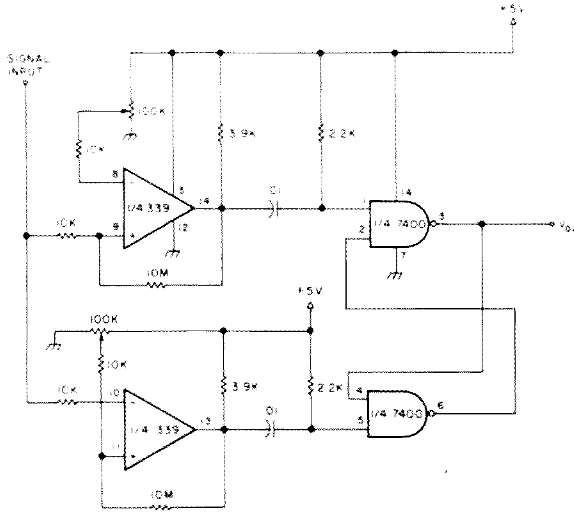

Fig. 9. A monitor with a latched output.

remains high as long as the low- or 0-voltage condition persists.

By reversing the positions of the inverting and non-inverting comparators, we can use essentially the same circuit to detect and control voltages which exceed safe levels. As an alternative, we can keep the comparators in the same order but use NOR gates for the latch. Any IC handbook will provide a number of circuits that the voltage comparators can trigger for various types of control or warning purposes.

For instance, adding a simple counter to the latch shown in Fig. 9 will reveal the number of times each day that the power company drops its ac part or all the way out.

These few samples should provide you with ideas of your own for monitoring circuits to use around the shack and house. (I add "the house" because putting my ham experience to work in the laundry room earned me several points toward the new rig I wanted.) There is little magic in the 339 that some other comparator (or a more general op amp pressed into comparator service) could not provide. However, to the extent possible in today's morass of proliferating ICs, I try to master a few chips well and use them extensively. Hence, the faithful 555 serves many purposes in my shack.

More important than the particular circuits and components we use for our systems is the general conception of monitoring. The presence of meters and even of lights may not suffice to protect our equipment from dangerous or harmful conditions. Monitoring must have a control function as well as a detection function. It is not always necessary for our control systems to correct the situation as long as they at least protect the equipment from its effects. And if the system requires action on our parts, the warning must be undeniable in its effort to capture and direct our attention to exactly the right place to make adjustments.

Hopefully, these circuits and ideas will bring us a few steps beyond mere metering (as important as that may be) toward more effective monitoring. What we save in the long run just might be more than money. ■

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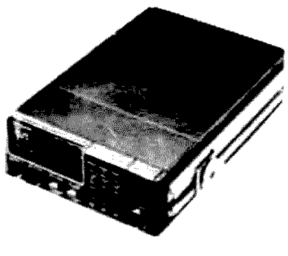

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The problem: a stack of QSL cards as high as Mt. Everest. The solution: a program that will make your TRS-80 climb the mountain.

After a recent contest, I got started on the job of filling in the QSL cards for all the contacts with foreign stations that I had worked, as is my policy. As soon as I started, I knew that there was something wrong—I was slaving away filling in the QSL cards and the TRS-80 was only watching.

Instead of giving Wayne all my money for QSL cards, why don't I use the TRS-80 and the line printer to print my own QSL cards and have the computer fill them in while it is printing them?

It seemed like a good idea to me, so I set out to write a program to do it. Sometime later, the program was finished in Level II BASIC and I happily began printing QSL cards.

After I had finished the

Program listing.

```
10 POKE16425,0
30 CLS
40 CLEAR 30000
42 X$="!"
45 DIMA$(99)
50 INPUT"CALLSIGN";A$:IFA$="END"GOTO154
70 INPUT"GMT";B$
80 G$=""
90 PRINTC$" ";:INPUT"DATE";C$
100 IFG$<>""THENC$=G$:G$=""
110 PRINTD$" ";:INPUT"BAND";D$
120 IFG$<>""THEND$=G$:G$=""
130 PRINTE$" ";:INPUT"RS/T";E$
135 IFG$<>""THENE$=G$:G$=""
140 PRINTF$" ";:INPUT"MODE";F$
141 IFG$<>""THENF$=G$:G$=""
143 A$(I)=A$+X$+B$+X$+C$+X$+D$+X$+E$+X$+F$+X$
145 CLS
147 PRINT FRE(Z$)
151 I=I+1
152 PRINT"THE NUMBER OF QSL'S TO PRINT NOW IS   ";I
153 GOTO50
154 I=0
155 INPUT"NUMBER OF QSL'S TO PRINT";P
157 IFI=PGOTO500
170 LPRINTTAB(20)"AMATEUR RADIO STATION"
190 LPRINTTAB(10)CHR$(31)"W B 8 J E Y"
210 LPRINTTAB(10)"W B 8 J E Y"
211 LPRINTTAB(10)"W B 8 J E Y"
212 LPRINTTAB(10)"W B 8 J E Y"
230 LPRINT" "
231 G$="":K=1
232 FORJ=1TOLEN(A$(I))
233 H$=MID$(A$(I),J,1)
234 IFH$<>X$THENG$=G$+H$:GOTO245
235 ONKGOTO236,237,238,239,240,241
236 A$=G$:GOTO244
237 B$=G$:GOTO244
238 C$=G$:GOTO244
239 D$=G$:GOTO244
240 E$=G$:GOTO244
241 F$=G$
244 G$="":K=K+1
245 NEXTJ
250 LPRINTCHR$(30)TAB(10)" Confirming The QSO With : "
260 LPRINTSTRING$(57,CHR$(240))
270 LPRINTCHR$(255)TAB(15)CHR$(255)TAB(25)CHR$(255)TAB(
     35)CHR$(255)TAB(42)CHR$(255)TAB(49)CHR$(255)TAB(56
     )CHR$(255)
290 LPRINTCHR$(255)TAB(5)"Station"TAB(15)CHR$(255)"  G
     M T  "TAB(25)CHR$(255)"  Date"TAB(35)CHR$(255)" Ba
     nd "TAB(41)CHR$(255)" RS/T "TAB(46)CHR$(255)" Mode
      "TAB(53)CHR$(255)
310 LPRINTCHR$(255)TAB(5)A$TAB(15)CHR$(255)"  "B$TAB(25
     )CHR$(255)" "C$TAB(35)CHR$(255)"  "D$TAB(42)CHR$(2
     55)"  "E$TAB(49)CHR$(255)"  "F$"  "TAB(53)CHR$(255
     )
331 LPRINTSTRING$(57,CHR$(195))
350 LPRINTCHR$(29)TAB(15)"Operator & QTH: Bob Scott WB8
     JEY"
370 LPRINTTAB(30)"1310 Cheshire Road"
390 LPRINTTAB(30)"Delaware,                 (DELAWARE
     County)
410 LPRINTTAB(30)"OHIO 43015   U.S.A."
430 LPRINTTAB(30)CHR$(30)"Tnx QSO 73    Pse QSL"
470 LPRINT" "
479 IFK=PTHENGOTO500
480 IFPEEK(16425)=>50THENGOTO551
485 I=I+1:GOTO157
500 LPRINTCHR$(11):END
501 END
551 LPRINTCHR$(11):GOTO485
```

contest logs, there seemed to be two improvements needed. One was that it took 45 seconds to print each card, which meant that I had to wait for the printer to finish so that I could enter the data for another QSO. The second was that the date, band, mode, and report were quite often the same for each QSO, in which case I wanted to hit only the Enter key instead of having to type in all of that info for each QSO when it was the same as for the previous one. The first problem was solved by using arrays in the input statements, and the second was done with line 143 in the program listing.

Let's go through the program so that you can modify it according to the amount of RAM and graphics ability of your printer. On power-up of your TRS-80 you are allowed 50 spaces for strings. This will not be enough for this program. In line 40 I have increased to 30000. This line will have to be adjusted according to the amount of RAM that you have available. It will be very easy to see when you have made the number too high—you will see "overflow in line 40" when you try to run the program. If this happens, just reenter line 40 using a lower number. In line 45 I have set the dimensions of the array to enter 100 QSL cards to be printed at one time. However, I would not suggest printing that many at one time, as the more you enter into memory, the longer it takes for the callsign prompt to return. What I do is enter one page from the log book at a time, then print the QSL cards before going on to the next page.

Lines 50 through 140 input the log data for each QSO. After the info for the first QSO is entered, you will see a number in the top right-hand corner of the screen. This is the amount of string space left. Do not take this number down to zero unless you want to crash the program. Under the amount of string space available is the number of QSOs that you have entered into memory. This number will be needed later.

After you have the string memory available and the number of QSOs entered, you are prompted for the next QSO's callsign, then GMT. On the next line you will see a number which represents the date on the previous QSO logged and the date prompt. If the date is the same for this QSO as for the previous one, then all that is necessary to do is to hit the Enter bar. If the date is different, type in the new date before hitting the Enter bar. Use the same procedure for band, RST, and mode.

After you have entered the log data for all the QSLs you want to be printed or the number in the top left-hand corner approaches zero, it is time to print the QSL cards for the QSOs in memory. This is done when you have the callsign prompt by entering "End." You will then get a prompt asking for the number of QSLs to be printed. This number is available from the top right-hand corner of the screen. Just enter that number and the printer takes over, and you can go back to the receiver while the printer is busy printing.

If your printer does not have graphics or elongated or condensed print, you will want to make the following changes in the printing routine. Omit lines 260 and 331. Delete the CHR$(31) in line 190. Next take out all of the CHR$(255) in lines 270, 290, and 310 and delete the CHR$(29) in line 350. If your printer does have graphics and elongated and condensed print, it is possible that the software command, CHR$(N), is different

AMATEUR RADIO STATION
W B 8 J E Y
W B 8 J E Y
W B 8 J E Y
W B 8 J E Y

Confirming The QSO With :

Station	G M T	Date	Band	RS/T	Mode
XX1XX	0000	DD.MM.YY	NN	NNN	XX

Operator & QTH: Bob Scott WB8JEY
1310 Cheshire Road
Delaware, (DELAWARE County)
OHIO 43015 U.S.A.
Tnx QSO 73 Pse QSL

Sample QSL.

than mine. I suggest you check your printer manual to be sure.

At first I bought 3" × 5" tractor-feed forms to print my cards on, but I soon learned that they were too large and bulky. Most of my cards go via the ARRL Outgoing Bureau, and they now charge by the pound, so I am using the lightest weight paper that I have and using the scissors to trim after the printing is done.

This program was written by a novice programmer. I am sure that many of you more experienced programmers can make vast improvements on it. The purpose was to get the seed planted, in hopes that you experienced programmers might come up with some real exotic cards (how about a computer-generated QSL contest, Wayne?), and also to show other novice programmers that perhaps they might be able to come up with a useful program.

This program should be convertible to the BASIC used in other computers. ■

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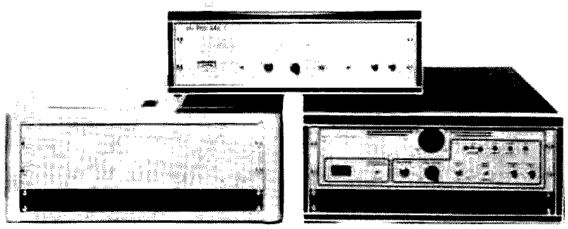

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FCC regulations still require measurement of the input power to a rig. This is normally accomplished by multiplying the plate voltage times the plate current and adding to it a few Watts for screen power and drive power if these are applicable.

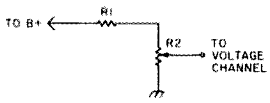
The LED power meter, whose faceplate is shown in Fig. 1, provides a direct readout of the plate or collector input power not only in the tune or key-down position, but also as you either talk on SSB or key the rig in CW. I would not go so far as to claim that it shows peak envelope power—PEP—on SSB, but it comes very close!

The meter operates in a single simple mode. After connection and calibration, simply find the highest LED energized in both columns, trace to the intersection, and read the input power directly. For example, if LED 8A (on the voltage scale) and LED 5B (on the current scale) are the two highest LEDs energized, their intersection tells you that the input power is 400 Watts.

A block diagram of the meter is shown in Fig. 2. Two similar LED voltmeter channels are used, one to measure plate current (or collector current) and the other to measure plate or supply voltage. Each channel is independently calibrated so that the maximum voltage or current it will see corresponds to the highest LED shown. The unit pictured here had the highest LEDs corresponding to 1000 volts and 1000 mA.

The LED voltmeter connected to the voltage-monitoring channel consists of a simple zero-to-1.2-volt sensor. An adjustable voltage divider is used to scale the plate or collector supply voltage to the 1.2-volt range. A similar circuit is used for the current channel, but the LED voltmeter sensitivity is increased so that the approximately ¼ volt (250 millivolts) is the full-scale sensitivity.

A schematic of the meter is shown in Fig. 3. Resistors R1 and R2 are selected according to Table 1 for various supply voltages. Note that R1 is shown mounted in the rig. In this way if the lead from the rig connecting R1 with R2 accidentally shorts



R \ B+	1000V	50V	20V
R1	1 MEG 2W	5K 1/2W	300Ω 1/2W
R2	10K 1/2W	500Ω 1/2W	100Ω 1/2W

Table 1. Voltage channel divider and calibration resistors.

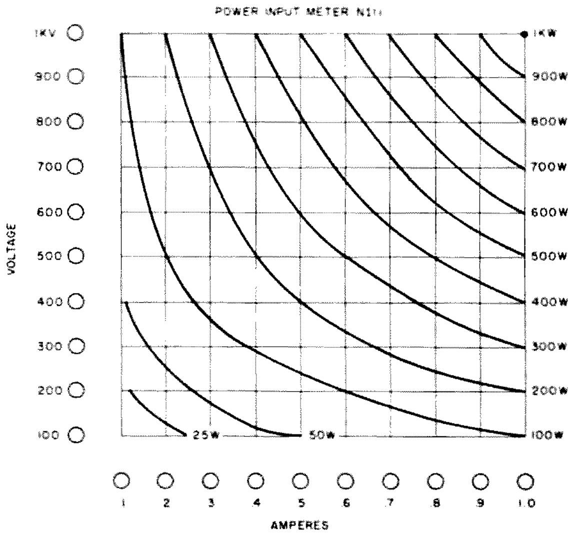


Fig. 1. Faceplate of power input meter.

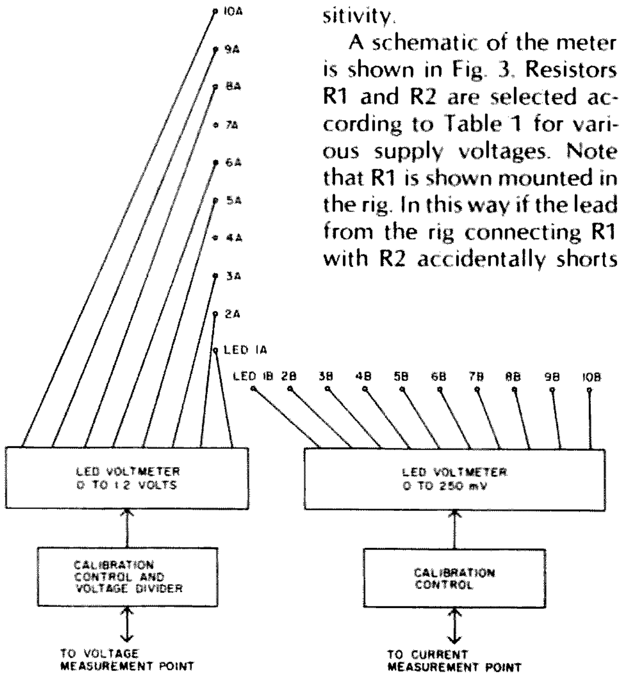
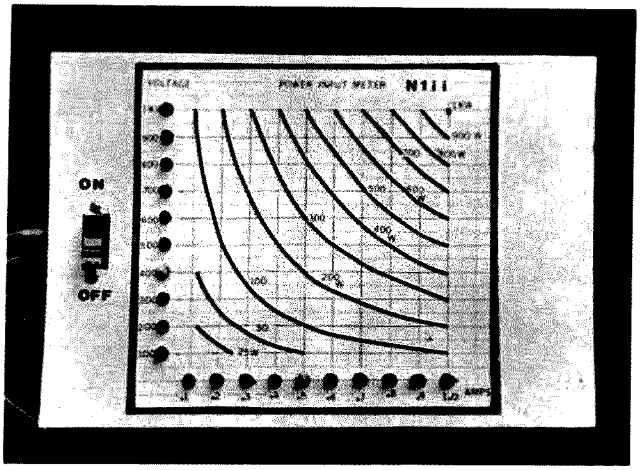


Fig. 2. Block diagram.



Front panel of the LED power input meter. (Photo by Jerry Goldman K1NPE)

to ground, the current drawn will be limited by the value of R1. If you are using a tube transmitter: *CAUTION—HIGH VOLTAGE!*

You will have to look at the schematic of your rig to figure out where to connect the current channel. Most rigs, tube or transmitter, use a meter with one side connected to ground, in which case the current connection lead probably goes to the top (non-grounded) side of the meter. A typical connection is shown in Fig. 4. To check that the connection point you have selected will work, connect a voltmeter between the point and ground. No current should correspond to zero volts and maximum current to at least ¼ volt (250 millivolts).

Construction of the meter is not critical. A 6½" × 6½" plastic panel was used as the faceplate with the two sets of LEDs mounted on ½-inch centers (Fig. 5). To avoid the use of a custom PC board, a general-purpose board such as Radio Shack 276-170 provides a good chassis for construction. As usual, sockets for the two ICs are recommended to aid in troubleshooting, if necessary. The layout used for the breadboard of this meter is shown in Fig 6.

After drilling the holes for the LEDs on the front panel, a piece of graph paper marked with half-inch intervals (such as K & E 10 × 10 to the half inch) is glued onto the plastic for the scales. A clear plastic spray or drawing fixative can be applied to protect the writing.

You can scale the meter to match your rig. As an example, for a typical vacuum-tube rig using 800 volts and around 250 mA, the voltage scale should be left at 1000 volts maximum but the current scale changed to 500 mA maximum. To do this, simply relabel the current scale so that LED 1B corresponds to 50 mA, 2B to 100 mA, 3B to 150 mA, and so on until 100 corresponds to 500 mA.

When you divide the current scale by 2, you must divide the power curve labels by 2. Therefore, the 100-Watt curve is now labeled 50 Watts, the 200-Watt curve relabeled 100 Watts, and so on. If you reduce both current and voltage scales by 2, the power curves go down by 4 (i.e., 400 Watts is relabeled 100 Watts).

After construction, the checkout and calibration should take only a few minutes. Double-check your wiring and look for extra solder splashes, especially around the IC sockets. Disconnect (unsolder) the wires at points X and Y (Fig. 3) and connect both TP1 and TP2

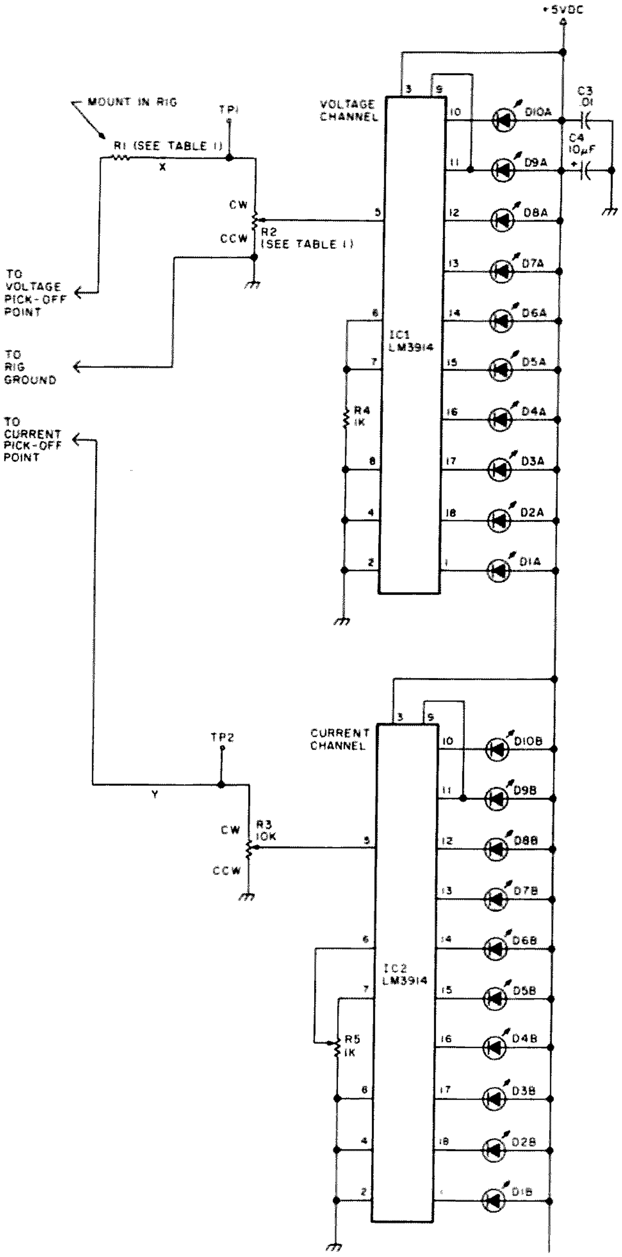


Fig. 3. Schematic. IC1, IC2—LM 3914 (Radio Shack 276-1707). All other resistors ½ Watt. All capacitors 50 V dc.

to the 5-volt supply. Set R5 to its midpoint.

Now apply the 5-volt supply and check that you can sequentially light each of the LEDs in each of the channels by turning R2 and R3. Assuming that you can, it means that each channel works and you are ready to calibrate the system.

To calibrate the voltage channel, turn off the 5-volt supply, disconnect the jumper from TP1 to the 5 volts, and reconnect the lead at point X which you previously disconnected.

With the rig off, attach both the ground lead and the B+ end of R1 to either the high voltage of your rig or any other similar high-voltage supply. Take a standard voltmeter and also connect to the same high-voltage supply. Next, turn on the high-voltage and +5 supplies and adjust R2 so that the proper LED is ener-

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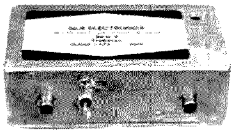

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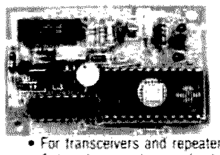
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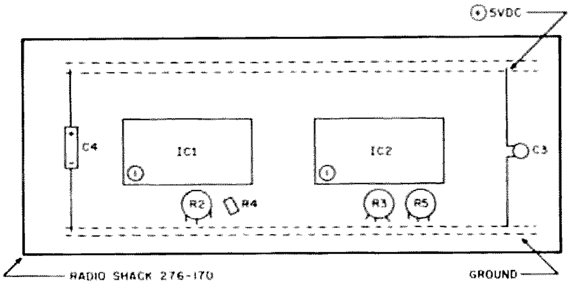

Fig. 6. Top view, mechanical layout.

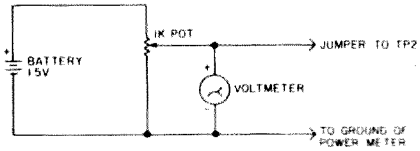

Fig. 7. 250-millivolt source.

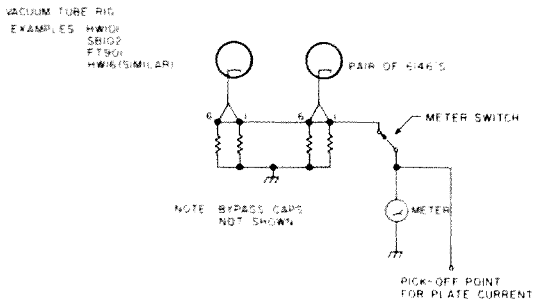

Fig. 4. Typical connections for current pick-off.

gized. As an example, if you use an 800-volt supply, LED 8A (for the scale shown in

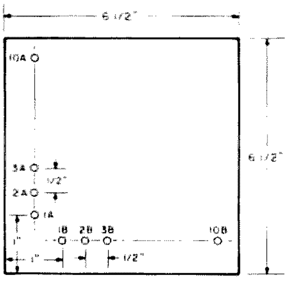

Fig. 5. Front panel layout.

Fig. 1) should be on. Finally, turn off the rig and the 5-volt supply. The voltage channel is now calibrated.

Calibration of the current channel is very similar, but first the sensitivity must be set since the current channel is a 250-millivolt unit rather than the basic 1.2-volt sensitivity of the voltage channel.

Remove the jumper you previously connected from TP2 to the 5-volt supply and jumper TP2 to ¼ volt by building the circuit in Fig. 7 and adjusting the 1k pot so that the voltmeter reads the needed ¼ volt. Turn R3 full clockwise and adjust R5 so that the last LED (10B) is energized.

Finally, turn off the 5 volts from TP2, reconnect the lead at point Y, and connect the current input to the meter on the rig or wherever you are going to measure current.

The final step is identical to the one you already did for the voltage channel. Turn on both the rig and the 5 volts. Key the rig and measure the plate current using the existing plate-current meter. Set R3 so that the LED corresponding to the current is energized. As an example, if the meter reads around 300 mA, then LED 3B (for the scale shown in Fig. 1) should be on.

Checkout, installation, and calibration are now complete. Simply talk or key the rig, look for the highest LEDs lit, and read input power directly.

If you insist on being very precise, this meter does not account for drive power and uses the plate voltage instead of the screen voltage in measuring the tiny contribution of the screen-input power. However, in most cases you will be within a few percent for vacuum-tube rigs and within 10 percent for transistor finals.

On some rigs the voltage regulation is very poor and you might notice the energized voltage-channel LED changes under current peaks. In this case, the lower of the voltage LEDs shows actual voltage under load corresponding to the power input. Use the highest current LED and the lowest voltage LED to determine the intersection on the scale.

This write-up almost never got finished. The integrated circuits used (LM 3914) are much more fun to play with than to write about! As examples, they can be "chained" or put in series so that 20 or more instead of 10 LEDs can be used to better show the current or voltage. Expanded scales are also possible. If your rig uses about 500 volts, the LED voltmeter in the voltage channel can be set to show 10 or 20 points between 450 and 550 volts for better measurement resolution.

The display can be blinked or can trigger an alarm for over-voltage or over-current; black displays are possible, and either bar- or dot-display modes are available. For further information, you can look at the manufacturer's data sheets from National Semiconductor, and possibly others. ■

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Diary of a Partially-Sighted Ham

Eyesight is not a black and white issue.
Here are some tips for hams in the grey area.

"Stand by a second; let me get my nose down to my S-meter and I'll give you a signal report."

As a partially-sighted ham, I've said this and several other standard phrases many times as I've gone to special lengths to operate my gear. Just for reference, my vision is rather limited. I am totally blind in my left eye and have about 20/400 vision in my right (that's with glasses; without them, forget it).

In amateur radio, as in everyday life, most people think of eyesight in a binary way: either a person has it or he doesn't. The issue of eyesight, however, is not black and white. It is, in fact, a continuum of greys. Partial vision can range from slight nearsightedness to resolution loss so severe that the person can read only foot-high letters at eight inches. Much has been written for the blind ham, and that is as it should be. I write here for the partially-sighted ham, the one who, even with glasses, cannot read easily, cannot drive, or cannot recognize people at any distance.

The partially-sighted, as a rule, do not like to be treated as though they were totally blind, because they are not. At the same time, they cannot function as a fully-sighted person, because they are not. Being an amateur with partial vision has presented some rather unique problems and some rather intriguing solutions.

There are five basic areas where the partially-sighted ham needs assistance: reading meters, reading frequencies, reading controls, logging, and QSLing. There are two methods for making these easier to deal with for the amateur with partial vision: Make it larger or make it brighter. Let's look at each of the areas of difficulty with these solutions in mind.

Reading Meters

It seems as though the entire hobby revolves around what any one of several meters reads. There are antenna-rotor meters, S-meters, swr meters, etc. With few exceptions, one must be able to read them to practice the hobby successfully. To read the meters on my Yaesu FT-101B and my rotor, I use a large five-cell flashlight, a police model equipped with a very bright beam. That extra illumination is enough for me to judge the relative position of the needles. If, however, I need an exact reading, I use magnification. At the Rand Corporation, about twelve years ago, Dr. Samuel Genensky developed a simple method for the partially-sighted person to get a lot of magnification at distances from six inches to many feet. This is useful if you cannot or don't want to get your nose right next to something. The idea is to take a small hand-held telescope or pair of binoculars and bring the focus much closer than it normally is. To do this, you simply place a positive lens over the objective end of the instrument. What I have done is take a Bushnell Minocular telescope, which is an 8×20, only four inches long, and mount a positive three diopter lens at the end.

I took the supplied lens cap and cut the entire top of it out, leaving just the sides and a one-eighth-inch lip at the top. I obtained a lens of the proper size from Edmund Scientific Co., glued it on the cap, and slid it over the end of the telescope. Now I have an eight-power telescope that is in sharp focus at seven inches. Exactly what the optometrist ordered. As you vary the power of the lens you place over the end of the scope, you change the distance where it comes into focus. I have another telescope that fits the same purpose; however, it is a ten-power and manufactured especially for the partially-sighted. This instrument focuses from nine inches to infinity with a very long-range focuser. It is available from Sam Walters Optical, 412 West Sixth Street, Los Angeles, California 90014, and costs about $75.

Back to meters. Using my scope I can read any meter as accurately as I need to. There is another way to read a meter—bring it closer. An swr meter with a remotable head is particularly useful.

Reading Frequencies

On my rig, with no digital readout, I use my flashlight or telescope. The newer digital rigs are of special advantage to the partially-sighted ham. With these there is no guesswork as to your frequency. The transceivers with green displays are more visible than ones with red digits. Green is much easier to see. Some of the digital rigs are also broadbanded; it

is wonderful because tuning up a radio is one of the more difficult tasks for the partially-sighted operator.

If your vision is bad and, like me, you are stuck with an older non-digital rig, you can use either more light or more magnification. Calibrating the radio accurately is a bit tricky, but with the telescope it is easily accomplished. I cannot emphasize enough the value the telescope with the add-on lens has been to me and many other visually-handicapped people I know. I strongly urge hams with visual difficulties to get one.

Reading Controls

Here the partially-sighted ham can come into his own. Any person with limited eyesight has had to memorize many different things that a normally-sighted person never thinks about. For instance, I have memorized the touchtone™ pad on my telephone. No big deal, you say. Well, I am the only person I know who can dial one without looking at the phone. If you have vision problems, you have probably already memorized all the controls on your radios. It's easy and a little operating time will let them into your mind. Again, the telescope or magnifying glass will make them large enough to see and memorize.

If you want to know the position of a rotary control, simply place a small piece of tape on the mark on the knob. This will allow you to feel the control's position without having to strain and look.

Logging

Thanks to the FCC's relaxed logging requirements, logging is not too difficult. You must always log all third-party traffic, though. What I did was get a printer to prepare me a pad of paper with very heavy lines that were spaced about three-quarters of an inch apart. They are ruled the long way on fourteen-inch paper. You may be able to use a regular log book, but if not, try this alternative.

This brings up reading and writing. There are a number of ways a partially-sighted amateur can write and read books and QSLs. The most inexpensive and easiest is to use a magnifying glass of some sort. I wear glasses, so I found a small jeweler's magnifier that fits over my glasses. It is eighteen power and allows me to read anything I want or need. Magnifiers come in a plethora of sizes and powers. The Jensen Tool Company of Mesa, Arizona, and US Business Specialties, 34848 Yucaipa Blvd., Yucaipa, California 92399, both carry a large line of jewelers' loupes for use with and without glasses.

Another key to logging and writing in general for the partially-sighted amateur is to use a writing instrument which produces writing you can see. I cannot see pencil writing at all and cannot see ball-point very well. The new generation of broad-line pens is just the item for us. Pens like the Flair, Pentel, and Pilot are heavy-lined and easy to see. If you still have difficulty, use a marking pen and have the printer make even wider lines on your log forms. It's nice to have the printer make up some forms for traffic handling, too. I cannot use the standard ARRL traffic forms, so I had one blown up four times as big. They are a bit cumbersome, but they get the job done.

QSLing

The problem a partially-sighted ham is most likely to run into with a QSL card is size. Most of the cards are just too small for you to write your information on the back if you write with large letters or use a heavy-lined pen. My solution was to get my local printer (he gets a lot of business from me, as you can guess) to make me some cards with large enough spaces to write in. The maximum size a card can be and go through the US Mail is 4.25" by 6". That's a pretty good sized card.

If you have a computer, you might get creative and have the computer place all the information on your card, leaving no writing for you. By the way, the telescope I mentioned earlier is perfect for reading a CRT or computer printout.

VHF and UHF

For the partially-sighted ham, VHF and UHF are a virtual snap. It is now rare to find a rig for these bands that doesn't have a digital readout. Beware, though, for some radios have automatic dimmers; if you get too close and cast a shadow over the display, it will dim, making it even harder to read. I've found that the best radios for two meters are those with separate controls for megahertz and hundreds and tens of kilohertz. With these you don't even have to see the display—just count the clicks! The radios with one-knob frequency control aren't as easy, but they still have clicks to count for the person who cannot easily see the display.

For the visually-handicapped ham, the hand-helds are a boon. Since we, for the most part, cannot drive, we don't have mobile rigs. Don't hesitate to use your HT in others' cars and on buses.

Speaking of HTs, some of the new synthesized ones are wonderful for the partially-sighted ham and others are a real pain. The ones with the LCD and LED displays are fine rigs (many features, etc.), but they are hard to read if you have low vision. Much easier, although with fewer functions, are the synthesized hand-helds with thumbwheel switches. Even though I cannot see the numbers on my Tempo S-5, I have no trouble dialing up frequencies by counting clicks (as long as I remember where I was when I started clicking).

Construction

I have only ventured into the areas of construction a little. There are some drawbacks to using a soldering iron an inch from your nose. I have found, however, that wire-wrap methods are quite useful and can be handled by someone with low vision. Dealing with high voltages can be a problem; if you are careful, *very careful*, you can handle the problem. The new digital multimeters are great for the partially-sighted ham. One other thing: Keep especially good tabs on polarities; if you mix up plus and minus with several hundred volts dc, you've got problems.

When it comes to construction, I have little real advice. I do very little but I know totally-blind *and* severely-handicapped hams who do a large amount of building. You must judge your own vision limits and act accordingly.

Conclusions

The world of amateur radio is particularly suited to the partially-sighted and blind. They cannot participate in other forms of entertainment as readily as those with normal vision. There is nothing wrong with their ears or voices, however. From AM to SSTV, the entire spectrum of ham radio is open to the partially-sighted ham. In emergency work, ARES, RACES, and with Red Cross, we make wonderful base stations. If you are partially-sighted and have been limiting yourself, stop it! Your only limit is what you make it.

If you know someone who has low vision, interest them in amateur radio; they will discover an entire world that they don't have to strain to see. ■

Hot-Spot Metering–Automatically!

Here are money-saving designs that will let one meter do the work of several. Keep in control and keep your change, too.

L. B. Cebik W4RNL
5015 Holston Hills Road
Knoxville TN 37914

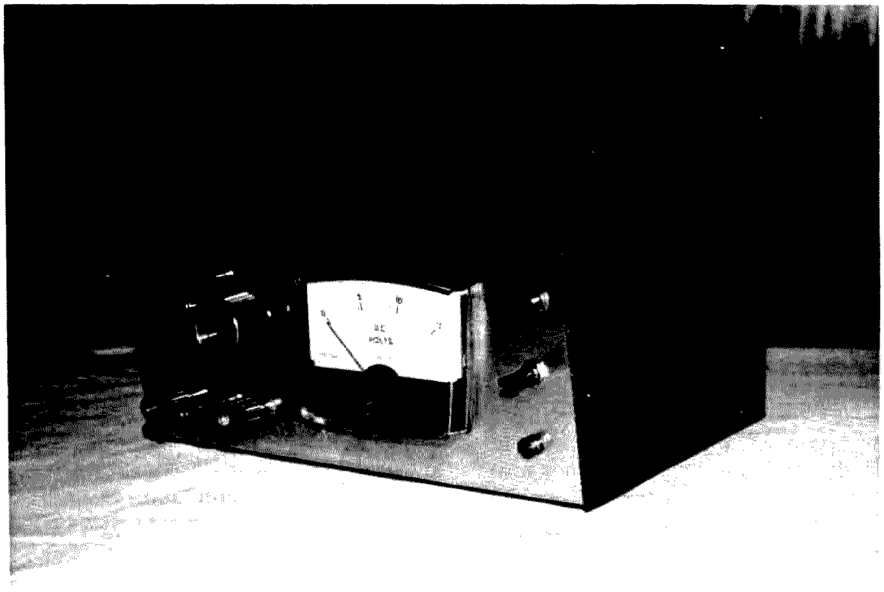
Metering is one of the best ways to monitor the operation of almost any piece of equipment in the shack. However, meters have two faults which have suppressed their use in home-brew ham gear: They are expensive and they are large. Even the least expensive panel meters cost eight to ten dollars each, and surplus meters in the correct range and size run as much or more. If that were not enough to cut down our use of them (and it is enough), meters also take up large areas of panel space. In this age of miniature electronics, we often do not want to waste space for just a few meters. There are a few lines of tiny meters, but they are hard to read.

There are compromises. We can, as do most equipment manufacturers, use one meter and manually switch functions. However, this option also has drawbacks. Ordinarily, we leave the meter set to register the most important value—relative output or plate current, for example—and we hardly ever look at the remaining values. Something can go very wrong inside a piece of equipment, and we might not know it until much too late.

If only we had a meter which could switch itself automatically from function to function, we could keep track of all parameters without raising a finger. We might also add a switch to lock the meter on a single reading in order to make adjustments. Ideally, when we returned the switch to Auto, the cycle would pick up where it left off. The circuit for accomplishing this trick should be fairly simple, or at least straightforward, so that we can adapt it to any number of devices we might build. But, alas, this is probably too much to ask of a circuit.

Automatic Meter Switching

In fact, the trick is easy to perform. With a combination of ICs—CMOS digital, linear, and op amp—and transistor switches, we can develop any number of switching schemes for meters. Fig. 1 shows in block form what we need. First, there is a clock to control the cycling period. Since we want to allow the meter needle to settle down so



An external view of the dual-voltage power supply shown in Fig. 2. The meter alternately reads the positive and negative voltages, while the LEDs to the right indicate which reading is on the meter scale. The switch between the LEDs permits the user to lock the meter onto the desired voltage.

that we can read the value clearly, something around 3 to 4 seconds per reading is desirable. We will need a pulse output to control the selector stage. On the whole, this looks like a job for the old reliable 555.

The second step is to select the metering circuit which will be read by the moving needle. Some form of a 1-of-N selection device or circuit will do the job. If we have only two values to monitor, a flip-flop would do. For more than two, there are selector chips such as the CMOS 4017 and 4022. I doubt that we would need more than 8 or 10 readings from one meter. In addition to selecting the circuit for the meter to read, this circuit should present the proper pulse to the next stage.

The next stage is a trigger for the transistor switches. At this point, we should be able to stop the cycle at any time for manually selected readings and then return to the automatic mode. These extra features may require one or two more chips, but the circuit design should not be difficult.

If we want to select voltages of opposite polarity, then the problems call for a slightly different technique. We will need to trigger switches that respond to different polarity voltages, and thus the standard high and low of digital ICs will not be the easiest route to follow. However, a digital output can drive an op amp to both positive and negative limits, and we can then use these pulses for our switches.

The final step is a series of transistor switches to connect the meter to the right metering circuit at the right time. The switches must be able to handle the voltages and currents involved, but there are techniques to keep these to a minimum so that a 1-milliamp meter can read almost anything we want to monitor. Also, we must ensure that one switch goes off before the next goes on, so that the meter sees one value at a time. Depending upon what we are monitoring, if the meter sees two values at once, we might end up with a bent needle, a fried meter, a blown fuse, or equipment destruction. Care in selecting our meter-switching circuits can overcome this potential problem. In some cases, we may also have to design some compensation into the circuit to cover slight losses in the transistors or in some other components. In most instances, these compensatory measures are simple.

In order to see these prin-

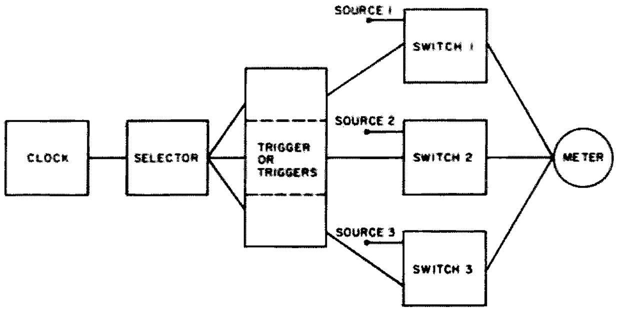


Fig. 1. Block diagram of an automatic metering system.

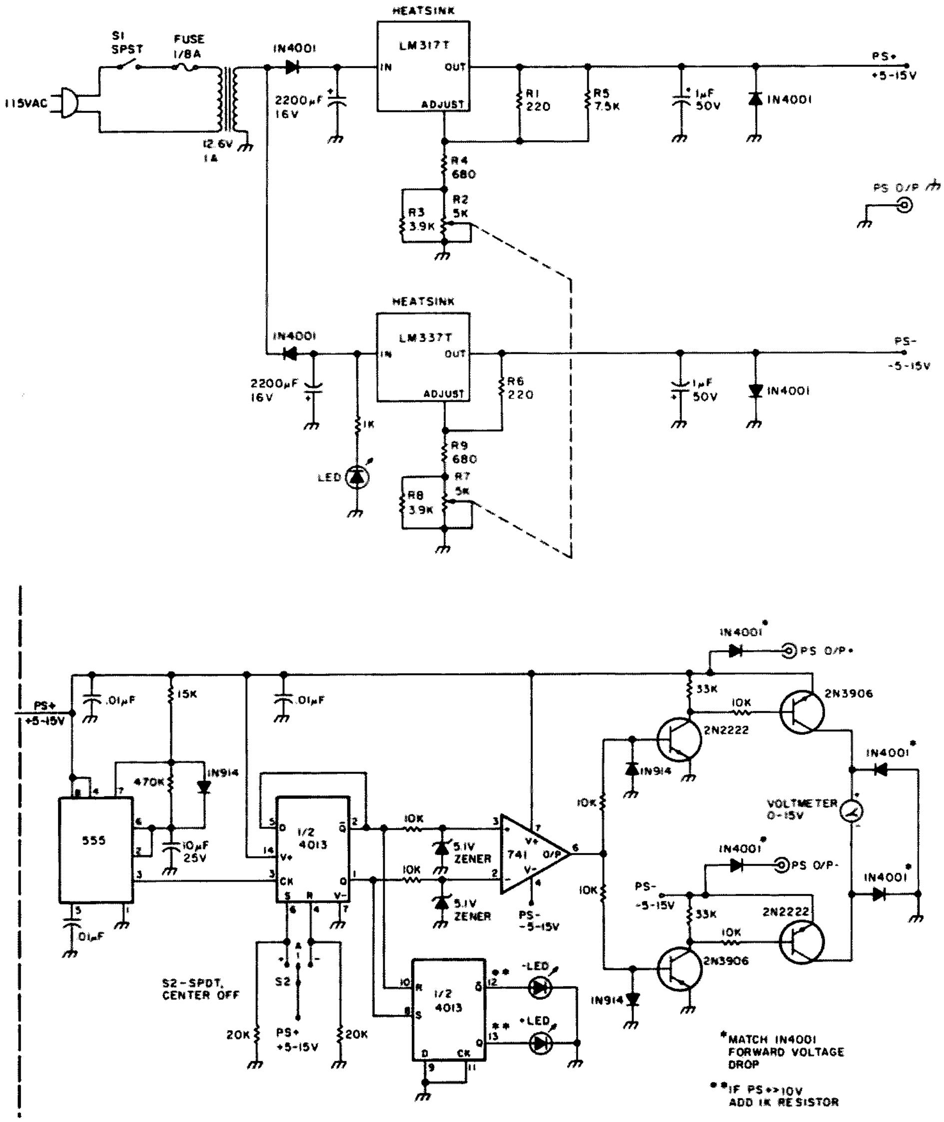
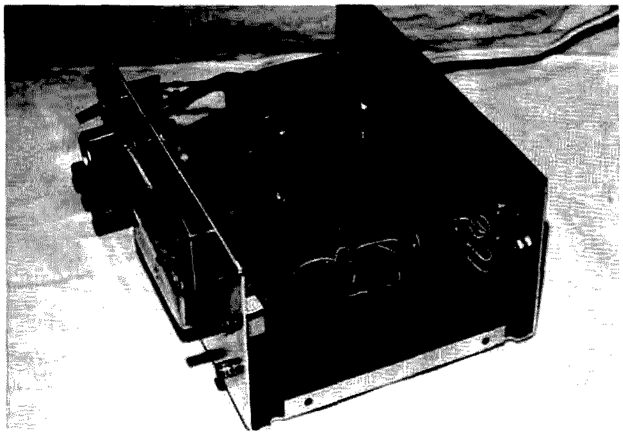


Fig. 2. Circuit of a dual power supply with automatic meter switching. All resistors ¼ Watt. 1N4001—50 piv, 1 A. 1N914—silicon signal diode. LED—color to taste. Basic power supply—modified Jameco JE-215. 2N2222—40-V, 100-mA NPN. 2N3906—40-V, 100-mA PNP. S1—SPST toggle. S2—SPDT center-off toggle. R2, R7—dual 5k pots.



An interior view of the dual-voltage power supply. The power components are in the background, while the double strip of perfboard in the foreground contains the metering circuit. The forward board holds the ICs, while the second board contains the transistor switches. Construction is noncritical, and any convenient layout will work.

ciples at work, let's look at some actual circuits. Each has been tried and found useful in the shack.

One Meter for a Positive and Negative Bench Supply

Every ham workbench needs a dual power supply for testing or experimenting with op amps. The marketplace offers any number of matching positive and negative voltage regulators. A number of inexpensive kits (without meters) and partial kits are available. Thus, it makes sense to build this essential shack item. The problem is to find a way to meter both voltages to permit continuous monitoring and easy adjustment. Fig. 2 shows a way.

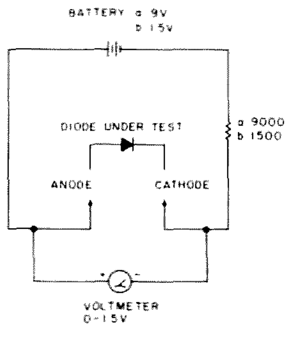


Fig. 3. A test circuit for matching diode forward-voltage drops.

The power-supply portion of the circuit, top, is a modified Jameco JE-215 semi-kit. It comes with a printed circuit board and most of the components we need for a bench supply. Switches, fuses, a case, and front-panel components are not included. The addition of the fuse and power switch are simple. Adding an off-board dual potentiometer was a bit more work.

The supply will provide 2 to 15 volts, positive and negative. The LM317T (positive) and LM337T (negative) adjustable regulators have a wider range, but the transformer (12.6 volts rms) limits the upper voltage to about 15, and then loading must be lighter than at lower voltages. For my purposes, the load capacities were correct, but I needed only a 5-to-15-volt range. The values for the labeled resistors, R1 through R9, were selected so that the dual pot tracks within a couple of tenths of a volt across the desired range. As a convenience for other builders, the method of combining calculations with test readings to obtain final values is described at the end of this article.

The metering circuit appears at the bottom of Fig. 2. It consists of a clock, a selector flip-flop, an op-amp switch trigger, a pair of two transistor switches, and the meter itself. As predicted, the clock is a 555, timed to give a brief positive pulse every 3.5 seconds. The diode across the 470k resistor allows the 15k resistor to control the positive pulse, while the off time is dependent upon discharging the 10-uF capacitor through the high-value resistor in this astable circuit.

The pulses clock the CD4013 D-type flip-flop, causing the Q and $\bar{Q}$ outputs to alternate, because the $\bar{Q}$ output is also connected back to the D input. Since there are two flip-flops per 4013 package, the unused section simply drives a pair of LEDs which flash according to whether the positive or negative voltage is being displayed on the meter. Normally, this circuit would ground the Set and Reset inputs of the selector flip-flop. However, we can use them to manually lock the meter on either the positive or negative voltage since they override clock pulses. Set drives the Q output high, while Reset drives $\bar{Q}$ high. Since CMOS can be grounded through fairly high value resistors, the 20k values shown keep the circuit in its automatic cycle until the SPDT center-off switch is flipped to one or the other of the lock positions. The LEDs will follow the manual readout as well as the automatic. When the switch is returned to center, the next pulse from the clock selects the other voltage and the cycle continues as if nothing had happened.

The op amp, a common 741, operates as a voltage comparator. Whichever input has the high drives the op-amp output to its full positive or negative value. The zeners in the input leads of the op amp limit the voltage, since only a distinct difference is needed to flip the op amp. The high-low contrast between the outputs of the 4013 more than suffices, and since they change together, proper comparator action would be guaranteed even if the difference were much less.

The op-amp output simultaneously feeds two switching circuits which are mirror images of each other. The 1N914 diodes at the first transistor bases eliminate opposite polarity excursions, hence the need for the 10k input resistors to the transistor switches. In fact, the switching circuits have been optimized on a breadboard to use the least current while still permitting clean switching with almost any replacement transistor. The transistors shown are available from numerous sources, but any 40-volt, 100-mA transistors will work. If there is a significant voltage drop across the output transistor for either circuit, decrease the base resistor of the output transistor (10k), then reduce the collector resistor of the input transistor (33k), or try another output transistor.

Using a two-transistor switch for each of the voltages is necessary. First, op-amp output voltages often do not rise to the level of the supply voltage. However, if the output transistors are to be cut off, the base voltage must be very close to the supply voltage. Using an input transistor switch solves this problem. Second, the meter must be isolated from the line by the switch, and one switch must be off before the other comes on. This circuit achieves both results with relative simplicity.

The meter itself appears to be connected across the collectors of the output transistors. However, the diodes to ground complete

the voltage-reading circuit for each of the supplies. Thus, you can think of the meter as being in two separate circuits which do not interact. The 1N4001 diodes do introduce between .5 and .6 volts error in the meter reading. To correct this, we might design a complex compensating circuit. In this case, simplicity is serendipity. The 1N4001 diodes in the power-supply output, forward-biased, lower the voltage by just the same amount so that the meter is accurate with respect to the voltage reaching the outside world. Since small power diodes (anything with a 50 piv rating will do) are available at many for a dollar, matching four within a tenth of a volt is easy. Fig. 3 shows a test circuit for doing this job, although many new DVMs have a special resistance position that will reveal the forward drop of diodes.

The circuit is adaptable to many other applications. The ICs will all operate with supply voltages from 5 to 15 volts (positive and negative for the op amp only). Fig. 4 shows three different ways to power the circuit. The scheme labeled (a) was used in this supply, its only negative aspect being that the brightness of the tracking LEDs changes with the supply voltage. For voltages higher than 15 or lower than 5, (b) and (c) show ways to tap unregulated voltage and use zeners to supply the ICs. For voltage limits between 15 and 18, (b) is convenient, requiring one less zener diode. All the ICs in this application draw negligible current, allowing fairly high values for the zener dropping resistors. Since only the switches need to see the actual supply voltage, you can run the ICs at any value recommended in the spec sheets. If the op-amp output voltage runs too far above the supply voltage to the input

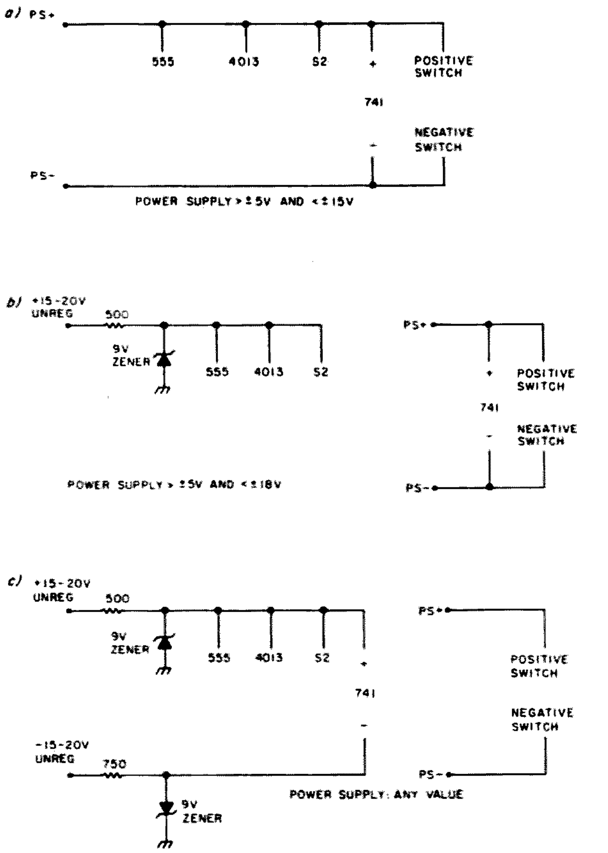


Fig. 4. Three methods of supplying power to the meter-switching circuit.

transistor in each switch, a zener at that point will limit the voltage and hence the base current.

Construction is noncritical. The photograph of the supply shows the use of two strips of perfboard—one for the ICs, the other for the transistors. T46 vector pins hold the boards together, with insulation material between. Besides its compactness and the fact that I was able to use up some scraps of perfboard, there is nothing in particular to recommend this form of construction. However, note that not only are the ICs in sockets, but so too are the transistors. Eight-pin IC sockets work very well for low-current pairs of switching transistors.

One Meter for Many Readings

In order to switch more than two voltages, we need to change techniques somewhat. Fig. 5 shows a circuit for handling up to eight voltage readings on one meter. Despite appearances to the contrary, the circuit is similar to the earlier one. We begin with a 555 clock to provide counting pulses at 3.5-second intervals. Instead of using a flip-flop as our selector, we insert a CD4022 one-of-eight selector. This counter is simply a string of flip-flops, the output of each coming on in turn and going off as the next one comes on. If we need fewer than eight readings, then we cut the count short. Suppose, as in the schematic, we need 4 readings. We use outputs 0 to 3 to turn on the switches. Output 4 is coupled to the Reset pin via a capacitor. The very brief pulse returns the counter to output 0 (our first reading) without any significant delay or meter needle lag. For some other interesting switching possibilities, see WA2FPT's "No More Rotary Switches" (*73*, September, 1979, p. 118).

Between the 4022 and the switches, we insert a hex buffer, the CD4503. We need this device in order to be able to lock the meter manually in case we wish to make adjustments. The 4503 is a tri-state device; that is, it acts as a normal buffer when the Enable pin is low. When the pin is high, the buffer outputs are effectively open circuits (more correctly, very high impedance circuits), unaffected by and not affecting anything else on the output lines. This is ideal for manual switching. We place a high on the Enable pin and simultaneously turn on the desired switch so that the meter reads the desired voltage. At the same time, we also place a high on the clock Enable pin of the 4022, which locks its output wherever it last was. Then, when we return the switch to the Auto position, the readout cycle picks up just where it left off.

Note that the clock pulse is guided to the 4503 Enable pin through a diode (and is isolated from the 4022 Enable pin by another diode). The function of this system is to ensure that one switch goes off before the next comes on. The delay is of the order of .1 second, so that the meter needle drops about a third of the scale before rising to the next measurement. By reducing the 15k resistor in the 555 clock circuit (about 2k minimum), we can reduce the pause almost to the point where the needle will not react to it. However, we do preserve meter isolation as we move from voltage to voltage.

Because there are no usable leftover IC sections, we have to add a hex buff-

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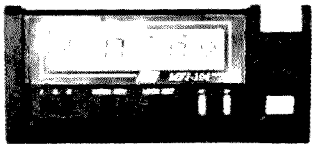

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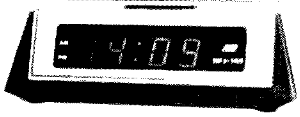

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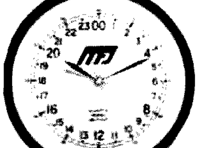

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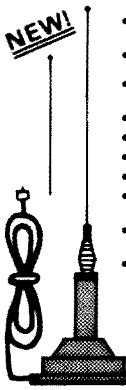

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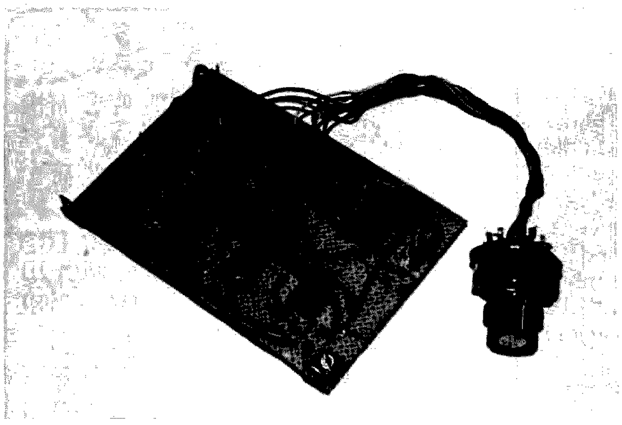

The four-meter switching circuit of Fig. 5 is shown in a test configuration prior to installation. For initial testing, the four transistor switches along the bottom of the board are all connected to the test supply line, and temporarily mounted LEDs in the upper right corner (later to go on the front panel) indicate which parameter is being measured. T46 pins provide convenient points for final assembly.

er, the CD4049, to drive indicator LEDs. The inputs can be connected to the 4503 output lines since the input requirements do not appreciably load the sources. However, if the supply voltage is at or above 10 volts, add a current-limiting resistor to the LED line, scaling it from 500 to 1k for voltages from 10 to 15. For voltages under 10, the IC provides sufficient current-limiting. In this circuit, all voltages between 5 and 15 will provide equal performance, so that any convenient tap with an isolating resistor and a zener diode (say about 9 volts) will power everything. The switches, of course, will be powered by the voltage being read.

The switching circuits for each line are the same. If the voltages vary widely, you may wish to optimize the resistor values on a breadboard before building a final unit. If the voltages vary by as much as 10 to 1 or more, then you may want to add multiplier resistors to the meter. Most voltmeters are simple microammeters or milliammeters with a series resistor to limit the current to the full-scale meter value at the highest value of voltage to be read. Since they are more common and cheaper, let's assume we start with a 1-mA meter. If our basic voltage range is 10 volts, then we would add a 10k resistor in series with the meter according to the formula R=Ef/Af, where Ef is the desired full-scale voltage and Af is the full-scale limit of the meter, all in basic units. Thus, our desired 10 volts divided by 1 mA (.001 A) yields 10,000 Ohms.

Suppose one of our readings requires a 100-volt scale. To calculate the required multiplier to insert at any of the "x" points in Fig. 5, we can use the formula Rm=(Ef/Af)−R, where Ef is our new full-scale voltage, Af is the current full-scale reading, R is the series resistor we just put in place, and Rm is the new multiplier. If we divide 100 volts by 1 mA, we get 100,000 Ohms. However, we already have 10k in the circuit, so the extra multiplier in the collector circuit will be 990,000 Ohms, or the closest catalog value we can find. The closer the tolerance resistor we can obtain, the better. One-percent resistors are used in VOMs; for our purposes, a close value culled with an accurate resistance meter from a batch of 5% resistors will usually be good enough. If the multiplier is a variable PC board trimmer, then the value can be set to compensate for any voltage drop across the transistor, and the basic resistor in the voltmeter circuit can also be made variable. Some quick tests with a well-calibrated VTVM will permit you to optimize the circuit readily.

In this all-positive circuit, there is no need for guiding diodes to complete the meter circuit. Since the switching output transistors isolate the meter from the voltages except when one is conducting, the meter will see no more than a single voltage at a time. The circuit can be modified further for current readings; however, this requires switching isolation at both terminals of the meter, which adds complexity to the circuit. Identical switches controlled by the single selector or trigger IC will function with appropriate shunts to bypass the operating current. In fact, we can make the circuit about as fancy as we wish. How cost-effective this technique is will be a function of how many panel meters we save in the process.

Multiple Positive and Negative Readings

The selection system used in Fig. 5 can be adapted to a mixture of positive

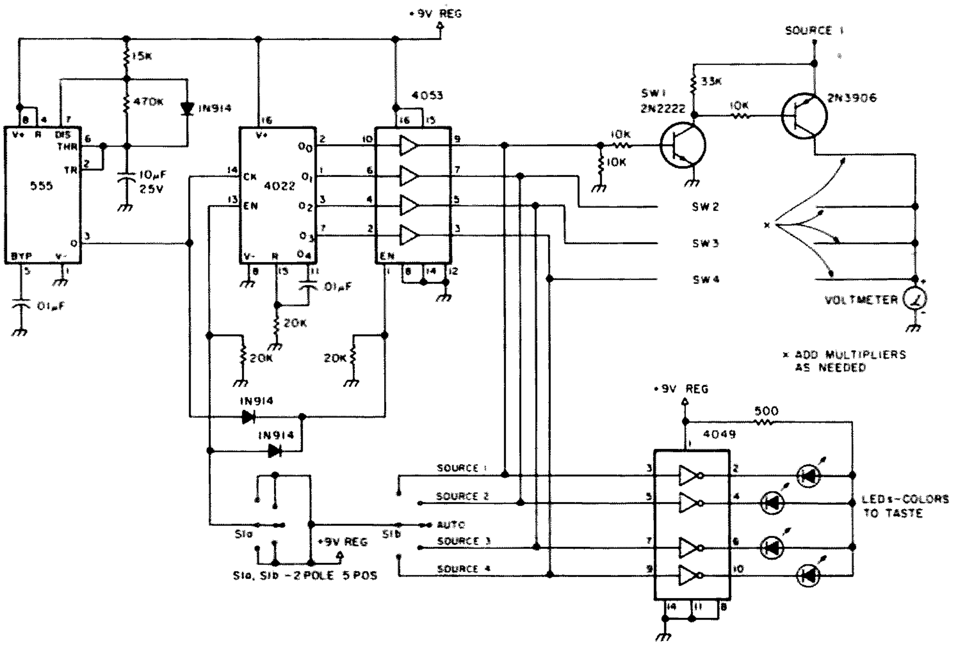

Fig. 5. Circuit for switching several meter readings automatically.

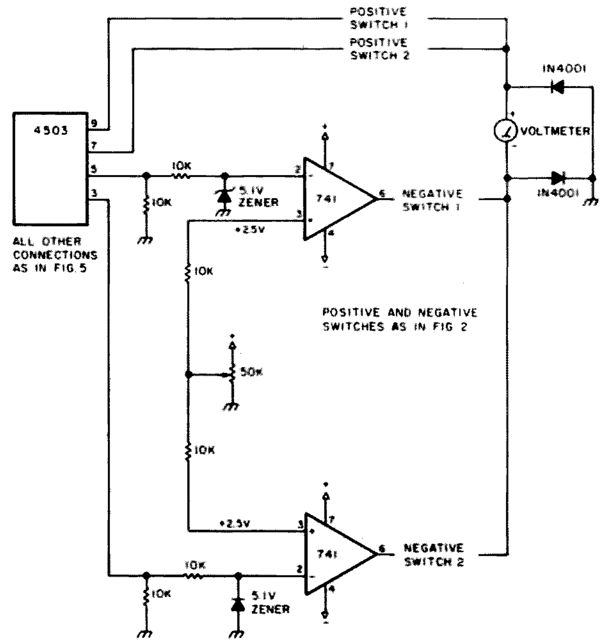

Fig. 6. Revisions to Fig. 5 for multiple positive and negative readings.

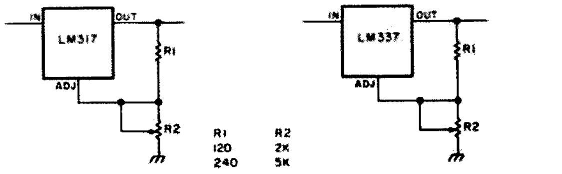

Fig. 7. Basic control circuit for the LM317/LM337 regulators.

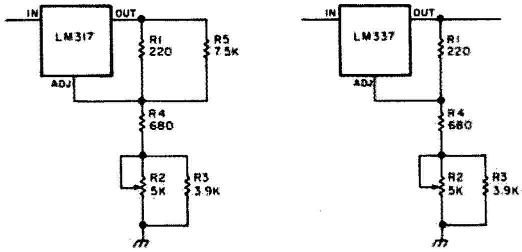

Fig. 8. LM317/LM337 control circuits with range limit and tracking adjustments.

and negative readings by the addition of op amps and guiding diodes. Fig. 6 provides the details of what we need to add. Assume that we have two negative readings to take in addition to a couple of positive ones. A pair of 741s solves the problem. Since we do not have a flip-flop to provide automatic output reversal, we provide the positive input of the op amp with a reference voltage. It should be about half the supply voltage, although 2.5 volts positive will handle almost any supply voltage. When the 4503 output goes positive, driving the inverting input, the op amp swings negative. It drives a negative switch identical to the one in the power-supply circuit, with a 1N914 at the transistor base to limit the positive swing at that point. Of course, we provide the op amp with positive and negative supplies, tapped and regulated from some convenient circuit point. The only other addition to the circuit is the diodes at the meter to provide isolated completion to the meter circuit.

Since, once again, there is a definite diode voltage drop to make readings inaccurate by that amount, we need compensation. If the trick in the power supply is not applicable (for example, if we are metering the voltage in circuits within a piece of equipment), then variable multipliers may be the best means to make readings accurate over the region of the scale of most concern to us.

A Note On Tracking Power-Supply Voltages

As promised earlier in the article, here are some notes on getting positive and negative supplies to track with common components available from sources such as Radio Shack. Fixed resistors are rarely a problem because we can find matched pairs with an ohmmeter. The problem lies with dual potentiometers that may be readily available. They may vary by up to 10 percent from section to section. But we can compensate. Fig. 7 shows the positive and negative control circuits recommended for the LM317 and LM337 regulators. The values shown for R1 and R2 in each case call for either a 1k or a 2k pot in the variable part of the circuit. Dual 1k pots do exist, and if you have one, then your problem is solved, assuming you wish the regulator voltage to go down below 5 volts.

Fig. 8 shows the requisite circuit in my case, which called for R3 to limit the low voltage and R4 to parallel the potentiometer. Here is how to proceed through the problem, calculating and measuring your way to final values. The manual covering the regulators provides this formula for determining output voltage: $V_o = 1.25\,(1 + R2/R1)$, where R1 and R2 are the components shown in Fig. 7. If we assume that R1 will be 240 Ohms (we will calculate an actual value shortly), then we can solve for R2 at the 5-volt lower limit of the supply. $R2 = R1(V_o - 1.25)/1.25$, or 720 Ohms. At 15 volts, the upper limit of my supply, R2 would be 2640 Ohms. A slight compromise of using a 680-Ohm resistor at R3 would permit use of a 2k pot to vary the voltage from just under 5 volts to just over 15 volts.

To find a 2k dual pot is nearly impossible when you are in a hurry. However, dual 5k audio pots are common, and a parallel resistor will bring them to 2k without spreading or contracting the ends of the scale too radically. Since manuals always print the parallel resistor formula in terms of Rt and never in terms of the resistor you need to put with what you have to achieve a desired value, here it is: $R_p = (R_t \times R_g)/(R_g - R_t)$, where Rg is the resistor you have, Rt is the total parallel resistance desired, and Rp is the value to be placed in parallel with Rg. The value we need to convert the 5k pot into a 2k pot is 3.3k.

Remember, however, that the pot sections will not be very accurate. Measurements forced me to use 3.9k resistors. The two sections of series-parallel combinations had ranges of 688 to 2756 Ohms and 699 to 2819 Ohms respectively. Using 688 Ohms as the lowest value with 5 volts output, the next calculation was R1.

$R1 = 1.25\ R2/(V_o - 1.25)$, or 229 Ohms, with the values given. 220-Ohm resistors for R1 were the obvious trial choices. In measuring values on hand, a slightly low value was used with the

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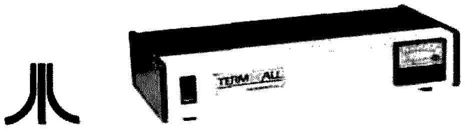

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688-Ohm circuit and a slightly high value was used with the 699-Ohm circuit. Since the output voltage is a function of the ratio of R1 and R2 in Fig. 8, this move tended to stabilize the ratio.

Upon wiring the circuit, one voltage was slightly above the other. Resistors with values in the 5k to 10k range were soldered in parallel with R1 in the lower voltage circuit, increasing its output. The 7.5k value provided tracking within a couple of tenths of a volt across the range.

Although the procedure sounds difficult, a hand calculator makes the calculations simple. Breadboard resistance measurements are quick with an accurate ohmmeter. Only the final parallel resistor was added after construction and testing. The entire procedure took about an hour, and some of that time was devoted to converting the formulas and to scrounging in the parts bins. A little extrapolation will permit you to design for any range you wish (within limits of the regulators, of course). Since most regulators have formulas similar in form, although different in detail, to the ones used here, these notes may help you custom design your own supply rather than accepting only what is offered on the market.

Combined with the meter-switching circuits, the article may help save you some money and space, since together these ideas provide a foundation for a compact bench supply that still offers complete control and monitoring. The circuits, of course, have a wide potential for application to other projects. They fit about anywhere you need to know several voltages, whether high or low, positive or negative, or all of the above. ■

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73 INTERNATIONAL

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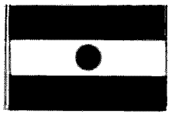


INDIA

DX George tunes in the 40-meter ham band—he hears a local SSB rag-chew in progress. The next moment he hears a QSL in AM followed by a CW ham happily thumping through the progressive conversations. The round-robin mixed-mode net goes on merrily for hours. This must be VU2-land. Nowhere else on Earth will you find such an accommodative ham spirit of coexistence with World War II surplus equipment alongside the latest ham gear of Kenwood, Yaesu, Icom, and home-brew QRP transistor transmitters with modified broadcast transistor receivers—ham spirit to the core! Hi!

The latest Indian callbook accounts for 1,300 callsigns including 45 club stations. Considering a population of 700 million, each callsign holder represents over half a million people. Seventy-five percent of the hams are in the cities like Bangalore, Bombay, Calcutta, Delhi, Hyderabad, and Madras. The remaining hams are spread over the country. Of these, only about 300 have multiband equipment, and it is mostly for CW operation. A few have been able to acquire modern transceiver rigs providing SSB operation—and those are the stations that are heard overseas on SSB.

The CW stations use the surplus and disposal equipment or use home-brew rigs made out of components of disposal equipment. The receivers will be of the type AR-88 (RCA), SX-28, BC-779, HRO, R-1155, etc. The aircraft receivers of the BC-348 series also are used, suitably modified for mains operation. The transmitter is invariably home brew, using an 807/1625 final. The power is limited to 100 Watts.

These surplus bargains are no longer available, so the younger generation of hams has to look for transistors and ICs for home brewing. While technical know-how is available for home brewing, poor availability of suitable components and cost are the limiting factors. Club stations and many of the old-timers help SWLs get started with licenses and rigs.

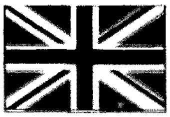
There are two types of licenses—Grade I and Grade II. The Grade I license requires a 12-wpm Morse speed as against 4 wpm for Grade II. Both grades must also pass a theory test. Initially, only CW operation is allowed. The license-issuing authority is "Wireless Adviser to Government of India, Ministry of Communication," located at New Delhi. The examination fee is Rs. 15/—($2.00) and license fee for two years is Rs. 40/—($5.00).

There are two major organizations which look after hams' interests: the Amateur Radio Society of India (ARSI) and the Federation of Amateur Radio Societies of India (FARSI). The only ham magazine, *Radio*, is published by FARSI and contains articles of interest reprinted from ham magazines elsewhere in the world, like *QST*, *73*, *CQ*, etc., in addition to covering local news.

Gaining experience and equipment, Indian hams are breaking new ground in national service. They handled emergency communications during the Morvi disaster in Gujarat State. They provide base station and mobile communications for the 4000-km Himalayan rally and the Mysore Safari every year during November/December. They take part in the International Scout Jamboree, which spreads ham activities to the younger generations. They carry their stations to schools and enable children to speak and listen on the ham net all over the world; they create awareness and interest that may germinate and grow in the future.

The Andhra Pradesh Amateur Radio Society (APARS) is the only organization which has received government support. The state of Andhra Pradesh has a large coastline in the east similar to the US Florida coast, subject to heavy cyclonic weather every year. To provide information and communications in emergencies, the AP government has joined hands with the hams and they are in the process of establishing a number of communications networks long the east coast of India. This is a pioneering venture of a state government which may prove fruitful and can pay itself off during a single bout of cyclonic weather.

In spite of many hurdles and limitations, the meager ham population proudly includes veterans who were licensed before 1920—and also stations communicating through OSCAR and tracking other satellites. It is a wide contrast and a difficult point for overseas hams to understand—that with few facilities and finances, these hams are propagating the ham spirit as well as sustaining ham activities.



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ADVENTURE AND QSOING FROM BY-LAND

It goes without saying that the BY call is in one of the rare DX areas! But to be able to make the trip into China and have the BY next to our own call as a portable or mobile seems almost too good to be true. It was not, however, for Robin Maule VS6HH (formerly G3OEF and 9V1RR), who last February realized this dream. He is probably the first and only foreign ham operator since 1949 to have an authorized portable/mobile BY attached to his call.

Maule works in Hong Kong as sales manager for East Asia, with Motorola, Inc., and worked with the Hong Kong Motor Association which sponsored and was chiefly responsible for the international car rally from Hong Kong, going all the way to Peking, China. This event took place early last month. There were a lot of taxing preparations for this "first" in China, and one was desperately-needed radio communications. Robin was able to lend a helping hand on more than one occasion.

One such time was 8:00 am (local time) Sunday, February 20, 1983, at the New World Hotel in Kowloon, Hong Kong. Here, the caravan of one mini-bus and two cars led by Phil Taylor of the H. K. Automobile Assocation, with Robin and a team of eleven others, began the dry-run trip to Peking.

The Radio Sports Federation of China and the China Ministry of Tele-Communications approved the granting of the BY portable/mobile call to Robin. Four frequencies were requested on SSB, two on 40 meters, two on 20 meters, and one VHF frequency. Although this was not a DXpedition but a final route trial for the rally, VS6HH was able to operate. As Robin said when I interviewed him, "It was not within our mandate to work DX." So only traffic related to the rally or greetings to families of the rally team and members in H.K. were allowed. The correspondents from Japan likewise sent some greetings home.

At 10:00 am, the group crossed into China. They missed their first radio schedule since they were going through customs and immigration. They were met by the Deputy of the Chinese Police, officials from Chinese Public Security, many interpreters, several press agencies, and a Chinese TV crew which made video recordings.

They had to take along their own fuel and other supplies. Robin said that the speed limit in China was 40 mph, but the police escort sailed down the highway with red lights flashing, flags waving, and sirens sounding at a jaunty 60 mph!

The next schedule was with Ed Nance VS6DX and Phil Weaver VS6CT at 3:00 pm local time. Robin had a Motorola (of course) Micom S, 100-Watt synthesized SSB, and used a mobile antenna. Contact was made on both 7075 and 14.160 MHz. You are right! There were two very jubilant DXers in Hong Kong as well as one very happy VS6HH/BY in China.

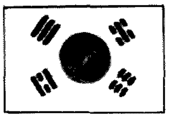
At times, the road was dark with mud up to the axles, but the scenery along the way was incredible. Robin said it was a unique experience to find oneself at night, in a strange place, in the rain, at an unknown QTH, hanging up a dipole antenna! L. S. Drakeford VS6EK, as well as JH1UGN and JH1IED, likewise made contact and had a good QSO with this rare call station!

Robin accompanied the trial-run group as far as the city of Wu Han. On February 25th, he flew back to Hong Kong. However, the remainder of the team continued to drive to Peking. This was probably only the second time a group of Westerners had been permitted to drive that route. (First time was last year.) At each village, the group passed by several hundred people lining the road who surrounded the vehicles when they stopped.

Robin declared, "The scenery was fantastic with gorges—cliffs below and high mountains above as we made the journey through Canton, Hunan, and Hubei provinces, with Hubei province being the most spectacular."

Another first in the episode, besides the rally, was Westerners traveling by car with the authorization to use SSB for the first time since the "liberation" in 1949.

Crossing into Hunan from Guangzhou Province, escorts hand over the caravan (VS6HH/BY in center).



KOREA

Michael Wengert KH2AC/HL
CPO Box 2961
Seoul, Korea

Thirty years after the cessation of hostilities on the Korean peninsula, the United States military still maintains upwards of 75,000 troops, civilians, and dependents in South Korea. Although the Republic of Korea has no reciprocal amateur radio licensing agreement with any country, certain foreign personnel are allowed to operate their ham stations here. The Korean government has allocated a fixed number of amateur radio sta-

tions to US military personnel stationed here, and, although it is not published, the number is believed to be 55. Licensing of the HL9-prefix stations is handled by the J-6 Office at the Frequency Coordination Office at the Eighth US Army garrison at Yongsan, in Seoul.

Unfortunately, as 1983 opened we found an actual decrease in ham activity in Korea amoung HL9 stations. The reason: Due to the increase in the number of military personnel stationed in Korea, roughly 90 percent of them must live off base, in housing in the Korean civilian community. So due to the recent enforcement of a long-ignored qualification by the J-6 Office that HL9 operation must take place from inside a US base, most of the hams, especially in the Seoul area, have found themselves involuntarily QRT. Since I neither live in a military compound nor am connected directly with the military, I am also off the air.

A recent check with the Korean Amateur Radio League indicated that they were not particularly interested in pursuing reciprocal licensing at this time. This would seem the best way to solve the licensing problems in Korea, but it seems to be impossible to hurry things in the East. Perhaps when a larger number of Koreans are permitted to visit foreign countries and the percentage of hams among them becomes greater, we might find some interest on the Korean side for reciprocal licensing.

The main theme of the column this month, then, might be a warning not to expect to hear too much from HL9 stations in the near future. But activities by HL1-5 stations is on the upswing. The Korean government seems positively behind the expansion of amateur radio in Korea as a sort of PR operation in light of the Asian Games to be held in Seoul in 1986 and the Olympics in 1988.

More on these and other topics next month. 73 from the Land of the Morning Calm.

TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan
Republic of China

Some hams who have frequently visited Taipei and BV2A/BV2B are W9ZNY, N5RM, G4KLP, KA8LGX, JA1AN, JA1EBM, W6PN, VS6DD, N9BBQ, and W2NSD. All of them have business and personal connections in Taiwan and have an eyeball QSO with Tim Chen upon almost every arrival. K7UGA also was greeted by BV2A four times in the past few years.

By statistics, I have so far met ham friends from the US mainland, Canada, Panama, Venezuela, Colombia, Peru, Brazil, New Zealand, Australia, Vanuato (Solomon Island), Guam, Hawaii, Saipan, the Philippines, Singapore, Indonesia, Malaysia, Hong Kong, Macao, Thailand, India, Israel, Nepal, Jordan, Korea, Japan, France, Italy, England, Switzerland, Germany, Belgium, and South Africa.

W6BIP, K6IR, K4XH, K2CM, W2AMS, WA3HUP, W2IYX, JA2MTO, JG1QGT, 9V1RH/VK3QV, and JM1UXU have had frequent exchanges of letters with me to discuss RFI, QSLing, OT stories, and regional matters.

W7PHO, W6RGQ, WA7ZTL, VS6CT, and AH2G are met on the air from time to time, but the currently poor propagation is causing me to miss all the fellows who used to check in with the Family Hours Net maintained by Bill W7PHO and his associates. I occasionally check in on the SEANET hour at 1200Z Wednesdays on 14320.

Bob Mitchell N5RM and his XYL visited Taipei before the Chinese Lunar New Year holiday and dined with the Chens at the Grand Hotel, one of the ten best in the world. We exchanged personal gifts to mark the special occasion. Besides them, the president of Air Asia was also present; he was very delighted to know about the unique friendship and activities of the world's radio amateurs.

Since my retirement, I have been able to make more schedules on the air. Those who want my QSL for DXCC will have more chances. But owing to construction of iron work on my roof, I am suffering from surrounding obstacles, especially toward the direction of the States.

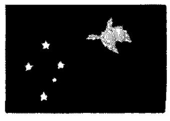
Frank W9ZNY is now in Taipei and is going to lend a hand in this matter, hopefully, to raise my present antennas higher for better radiation. Long-path QSOs with the US east coast are frequently open at around 1130-1330Z. I have just received an award from the South Florida DX Association. Also, try for possible US QSOs 0000-0200Z, Sundays, on 21030 or 28530.

Many enquiries are being received questioning the possibility of obtaining a temporary license and TTY operation, etc., on Taiwan. There is nothing happening with these concerns until local hams have been granted more station and operator licenses.

Regretfully, someone claimed a lost QSL via a post office box, and the International Lions Club lost a trophy which had been sent by air parcel. I have contacted the Postmaster and learned that some mail has been misrouted but sent back later.

Only Japanese IRCs are exchangable at the Chinese post office. Occasionally other IRCs are exchanged with some philatelics—who do not accept old ones exceeding two years. CRA BV QSL Bureau is to answer QSLs; it used to return 2 IRCs as reciprocal upon receiving a green stamp. If obtainable, Chinese mint stamps seem more convenient.

Noticing that the 1983 *Callbook* has deleted the BV Bureau from the QSL Bureau page, may I ask that all direct QSLs (except via QSL managers) be forwarded to my address (above) for handling, please.



PAPUA NEW GUINEA

Siegi Freymadl P29NSF
PO Box 165
Rabaul
Papua New Guinea

Hello there and greetings to everyone from Papua New Guinea, and especially from the Island of New Britain. The 10m band appears to have recovered and I have had a great time working into the United States. It is amazing how many hams tell me that they know my QTH as they were here during the campaign in the Pacific in World War II. In those days, communications played a very important role, as the coastwatchers maintained observation over occupied areas and passed the information to Allied Headquarters for action. Rabaul was the Headquarters of the Japanese Navy then.

I have just received updated information on the number of licensed amateurs in PNG. There are 93 full calls, 22 limited calls, and 36 Novice calls, giving a total of 151. About 10 of these would be YL operators. The ranks of hams may be swelled when new callsigns are allocated as a result of the AOCP exams held in February—we can expect to hear several new operators from the North Solomons Province.

As of January, 1983, all full-call amateurs in P29 can operate the new 10-MHz band in line with VK. The Papua New Guinea Amateur Radio Society (PNGARS) has written to Radio Branch concerning allocation of the 10- and 24-MHz bands for full-call operators; these also are available to VK amateurs.

VHF activity: P29ZUK, P29QA, P29ZSS, P29ZTD, and P29ZFD are active on 6m. P29SS hopes to be active soon on 6m, SSB, and CW, upon completion of a beam. P29ZUK, P29ZTD, P29ZSS, and P29LW operate on 2m and 70cm, and P29ZSS is also on 1296 MHz.

There are two beacons in Port Moresby, a 6m beacon (P29SIX on 52.013 MHz) and a 2m beacon (P29TWO on 144.030 MHz).

On the repeater scene, the Port Moresby repeater is operational. The planned repeater on the border of the Northern and the Central Province will be ready for testing in Port Moresby before you read this. When finally installed on site, on the eastern dome of Mt. Albert Edward at an altitude of 13,000 feet, it will be the highest repeater in the southern hemisphere and possibly the highest in the world. Equipment is Philips FM-828; the transmit frequency is 146.650 MHz and the receive frequency is 146.050 MHz. Power source: three Solarex 2-Amp, 12-V solar panels, two 105-Amp/hour batteries. Antenna: AEA Isopole, 5-dB gain.

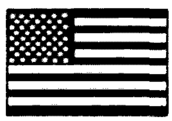
The planned North Solomons repeater (P29RBI) is being tested at Arawa. Transmit frequency, 147.0 MHz; receive, 146.400 MHz. The equipment is a modified Philips FM-828. There are three possible sites under review, two of the sites being on the coast and one high up in the mountains. The latter would bring the repeater in line-of-sight with Mt. Albert Edward (about 900 km away), but there are fears that the repeater could be vandalized at this location.

Information has come to hand about the North Solomons Amateur Radio Society. North Solomons Province, on the island of Bougainville, is one of the most active provinces in P29, amateur-wise. Most of the operators there are employed at the giant copper mine, Bougainville Copper Limited. Gatherings of the North Solomons Amateur Radio Society are held every 4 to 5 weeks at the Panguna Mine site. Bougainville Copper Limited obliges with luncheon provided in the mess, and OMs P29BG, P29QA, P29TE, P29NJW (P29ZSO), P29NML, P29NES, and YL P29NJF get together with other interested people.

Also at Panguna is Jenny VK4NIY who hopes to upgrade and receive a P29 full call, and VK4VAU, a 12-year-old student who is too young to receive a P29 license. It appears that one has to be at least 15 years old to receive an amateur license in P29!

The Radio Society also holds social outings every two months or so. The North Solomons Amateur Radio Society is in the process of affiliating with the PNGARS. A very active group, that! John P29JM from Panguna is also one of the net controllers of the Inter Island Net which operates every day on 14.315 MHz at 0800Z. Other net controllers are Tom KX6QU on Kwajalein, Bud KN6GJN and Gus AH6DR on Hawaii, and Mel KG6JHH on Guam. The net handles 2nd- and 3rd-party traffic, emergency traffic, and marine traffic, and thereby fills an important need.

Another province with a fairly large amateur population is the Eastern Highlands Province. As previously mentioned, the Highlands provinces even have their own net on 80m. At Ukarumpa in the Eastern Highlands, we have the Summer Institute of Linguistics with about 500 members, and in their ranks are a number of active hams: P29AX, P29CB, P29NPM, and XYLs P29SM, P29DI, and P29RM. It is the aim of the Institute to translate the Bible into native languages; translations into 24 languages have been completed so far. There are 150 language groups in the field—that is, family groups living with the people in villages and studying their languages. A gigantic undertaking in a country of 700 different languages amongst a population of 3 million!



GUAM

James T. Pogue KH2AR
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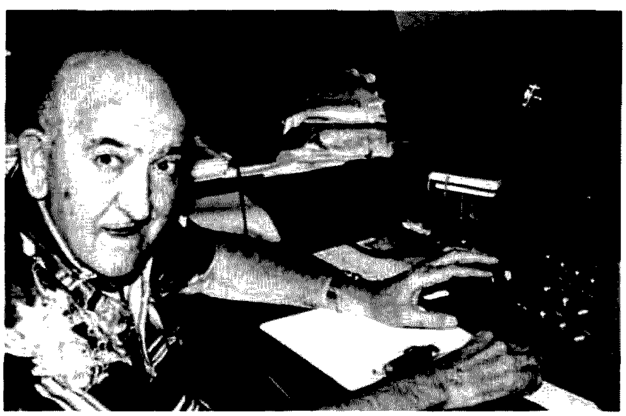
FPO San Francisco 96630

THE VIEW FROM GUAM

If you have sent or received a QSL card through the Guam Bureau during the last 10 years, then you can thank Joe Frekot



Guam's Joe Frekot AH2G.

AH2G. Fondly known on our island as "Oscar the Grouch," Joe traces his ham-radio roots back many years.

Using a UX201A as the heart for his first receiver as well as his first transmitter, Joe was first licensed and went on the air in 1931. Signing W3CHH from Philadelphia, Joe managed on more than one occasion to work California with just over 3 Watts.

Prior to WWII, he worked for the Ballistics Lab at the Frankford Arsenal in Philadelphia. In 1944, he went to work for Western Electric as a field engineer. When WWII ended, Joe signed on with Philco as a tech rep and started traveling. His new duties made the entire Pacific his backyard and took him to Guam, Iwo Jima, Eniwetok, the Philippines, Okinawa, Japan, Hawaii, Vietnam, and Thailand, to mention just a few destinations. During this time he held the calls KX6BT, KR6FT, and KG6JAR in addition to the two callsigns already mentioned.

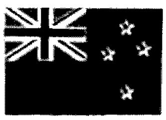
Today, Joe is in many ways like the avid angler who has plenty of fish stories to tell. "I've worked over 300 countries and never used a beam," he says. The only difference between Joe and the fisherman whose catch got away is that Joe has a huge pile of QSL cards to prove his stories.

When asked about what constitutes a rare DX station, Joe says, "A DX station is any station that I haven't worked yet." Judging from the towering stack of filled log books next to his operating table, there can't be too many stations left in that category.

Retired since 1977, Joe is the exclusive dealer for Kenwood gear on Guam, along with several other lines of antennas and accessories. This, along with the QSL Bureau, contesting, and just plain rag chewing keep him occupied most of the time.

Along with his many accomplishments over the years, Joe is listed as an "A-1 Op," a member of the "First Class CW Operator's Club," and is a life member of the IEEE.

When asked about the future of ham radio and whether he thought it was a dying hobby, Joe just smiled and pointed at the brand new "930" on his desk. It looks as though Joe and ham radio will both be around for a long time.



NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

The New Zealand Association of Radio Transmitters (NZART) is the New Zealand equivalent of the ARRL and represents ZL amateurs within New Zealand and internationally.

NZART is controlled by a president and 17 councillors, all elected by the members every two years. The councillors represent the four Districts on a proportionate basis as follows: 1st District, 6; 2nd District, 6; 3rd District, 3; 4th District, 2. The vice-president is appointed from amongst the elected councillors. There is one salaried officer of the NZART, the general secretary, and our headquarters are in Astral House, Upper Hutt, near Wellington. All other NZART departmental managers and officers are honorary positions carried out in conjunction with the members' normal vocational or professional duties.

The business of NZART is conducted during the year between Annual Conferences by the Executive Council, a Secretarial Committee, and the various departmental managers. The NZART Council has at least two meetings during our Annual Conference, which is held the first weekend in June every year. At these meetings, members consider policy and domestic matters before and after the conference and receive reports from the various departmental managers and officers. The Council also meets every month on the air on 80 meters, where members discuss and decide on matters relevant to the day-to-day running of the organization.

The Annual Conference, our association's annual general meeting, is held in different towns and cities, and each of the 80 branches may send a delegate. Individual members may attend the conference and speak and vote on any motion discussed on the business agenda of the conference if they so desire.

The business conducted consists of the Annual Report and Accounts, reports from departmental managers, and remits. Remits (submissions for conference consideration) may come from the Executive Council, any branch, or any five members; subjects covered are association policies, domestic matters, and regulatory matters, and if carried by the vote of conference are (with the exception of regulatory matters) actioned by the Executive Council. Remits on regulatory matters carried by conference vote can only be sent forward to the regulatory body, the New Zealand Post Office, with a suitable recommendation. The New Zealand association is probable unique in that its members control its policies through the annual general meeting.

NZART publishes a monthly magazine, *Break-In*, operates the ZL QSL Bureau, ZL Contests and Awards, a Radio Training Scheme, the Amateur Radio Emergency Corps (AREC), and an Intruder Watch, has a liaison officer to deal directly with our regulatory body, and has three overseas liaison officers who represent New Zealand at IARU and other overseas conferences such as WARC.

BITS 'N' PIECES

IARU Region 3 Monitoring Service Coordinator, Alf Chandler VK3LC, has been forced to retire for personal reasons, after many years of Monitoring Service and Intruder Watches. He has been replaced by Bob Knowles ZL1BAD/ZL6IW, who has been New Zealand Intruder Watch Coordinator for the last four years. He has applied to the IFRB for "direct access" on behalf of the Region 3 Monitoring Service which, if granted, will enable that service to submit reports of "harmful interference" to the Amateur Service without going through the National Administration concerned. In the past, National Administrations, with a few exceptons, have been noticeably reluctant to act as provided for in ITU Radio Regulations. An approach along similar lines has been made also to the New Zealand Administration, and these moves to obtain direct access to the administrations concerned should make it possible to achieve better results in the future.

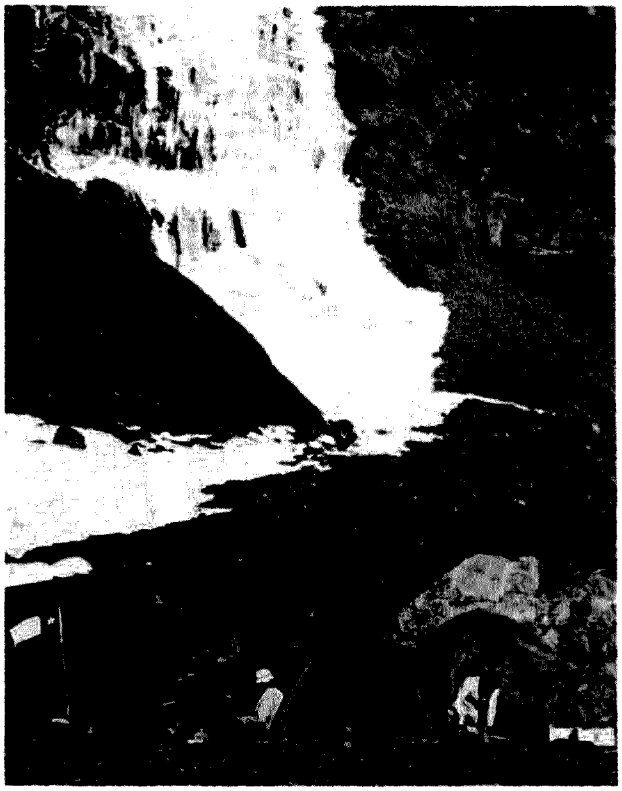
A point of interest regarding Bob's ZL6IW callsign: The New Zealand Post Office recognizes the value of NZART's Intruder Watch, and in what could be a world first, issued the special callsign for Intruder Watch business. It is not permitted for amateur QSOs, but is to be used expressly for transmissions, mainly on CW, to non-amateur stations intruding into the exclusively amateur portions of our various bands.

ZL HAPPENINGS

WCY Activity Day in ZL, 0000 GMT to 2400 GMT, May 21, 1983: special callsigns on all bands, all modes, during the 24-hour period. Remember, commemorative QSL cards for contacts with these special callsigned stations will be sent via the Bureau, but if you want a direct QSL, send an SAE plus 3 IRCs, with details of the QSO, to the ZL WCY station worked, c/o NZART QSL Bureau, PO Box 40-212, Upper Hutt, New Zealand. No QSL cards necessary—only the details of the QSO.

NZART Annual Conference and Convention, Dunedin, June 3-6 in the heart of ZL4-land. Overseas visitors welcome; enquiries to PO Box 6050, Dunedin, New Zealand.

Remember, if you have any queries, don't hesitate to write me at my ZL address; include 2 IRCs for airmail postage for my reply.



Base camp at 9,100 feet with a frozen waterfall in the background.

CHILE

Patricio Fernandez H. CE3GN
PO Box 14781
Santiago de Chile

Chile is an extremely long, narrow, and mountainous country, all of which means, of course, difficult communications.

With the advent of the mass-produced Japanese 2-meter transceivers in the early 70s, Chilean hams began to discover the wonderful possibilities of this band, and it was not too long until the first repeater was installed at the Radio Club de Chile headquarters, on an 80-foot tower, in downtown Santiago.

Experimenters soon discovered that although this repeater had a very nice coverage for normal purposes around the city, the mountains that surround Santiago presented a barrier which made any contact over 20 or 30 miles completely impossible.

In addition to the Andean range, which is a natural borderline between Chile and Argentina, the country has another coastal range which runs parallel to the Andes and is situated very near the coast. These mountains were the cause of the problem in trying to establish 2-meter contacts from the capital to various cities situated along the coastline, such as Valparaiso, Vina del Mar, and San Antonio.

After much investigation and tests from various spots, other repeaters were installed by the Radio Club de Chile during the late 70s. Of these, the most successful have been La Cantillana at 7,500 feet, La Dormida at 4,700 feet, and San Ramon at 3,900 feet. Some firsts have been established via La Cantillana. The most important was the commencement of mobile communications between the continent and Robinson Crusoe Island (Juan Fernandez Arch. CE0Z) some 480 miles from the coast; contacts between Chile and Argentina across the Andes, which are, of course, a formidable natural barrier, were also made.

Back in July, 1982, Radio Club de Chile, which is the largest amateur radio organization in the country, decided to study the possibility of placing a repeater on a very high spot in the Andes. This repeater would have to be high enough to permit reliable communications between Santiago and all the coastline and south of Santiago. This repeater would be the first of a series of linked repeater systems north and south of the capital.

The project was assigned to Ricardo CE3XJ and Saul CE3ZI, who, in addition to being hams, are also experienced elec-

tronics technicians actually working for the Chilean TV net, which covers over 1,500 miles using over 100 repeaters.

As the project involved mountain-climbing knowledge, they contacted Flavio CE3CHH, an experienced climber, and did some research work studying most of the high peaks of the Andes near Santiago.

They finally came to the conclusion that it would be possible to install a solar-powered repeater on top of Cerro El Plomo, which has an altitude of 18,000 feet.

During the next months, both Saul and Ricardo, assisted by other hams, designed, built, and tested a double repeater (15 W on 146.7 less 600, and as a backup repeater, 1.5 W on 146.73) using factory and custom-made parts. An automatic system was included in order to disconnect the batteries if their charge level falls beyond tolerable limits. The same circuit connects them again after 70-percent charge has been regained.

The system was installed on top of Cerro San Cristobal, a hill situated practically at the side of Santiago, and was given a test run of over two months.

In the meantime, CE3CHH had organized the mountain climb to El Plomo with five friends, all members of the Rama de Andinismo of the University of Chile. They had studied the route and had come to the conclusion that the project was feasible, although the biggest problem would be to carry almost 900 pounds of electronic equipment, food, and other gear up to 18,000 feet and then spend at least one day at that altitude in order to assemble everything and make it work.

At that height, even in summer, temperatures can easily reach 20 degrees C below zero, and the oxygen available is about 50 percent less than normal at sea level.

A helicopter would have to transport most of the gear up to at least 13,000 feet, and then mules would have to be used as much as possible above that altitude.

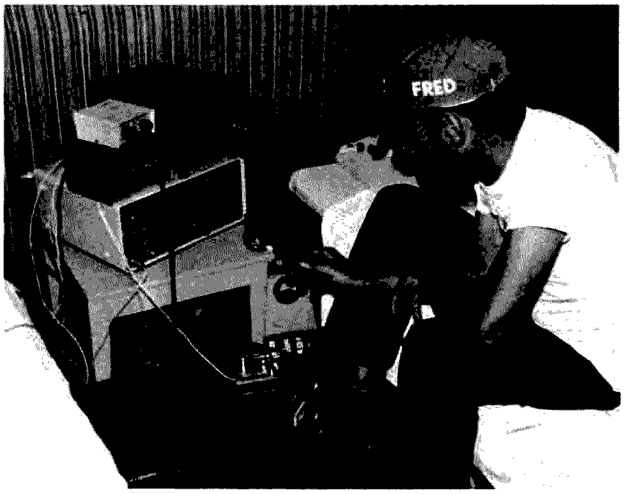
The operation started on January 25. On that date, Flavio and the rest of the team and gear were transported to Farellones by car. Farellones is a skiing resort village about 30 miles from Santiago and has an altitude of about 6,200 feet.

The next morning at 6:30 am, the helicopter from Santiago arrived, piloted by Maj. Pulgar, a most experienced flyer from the Chilean Highway Patrol Police. Two climbers boarded the BO-105 with the mission of getting as far up as possible on the slopes of El Plomo.

Unfortunately, flying at those altitudes is extremely difficult and dangerous, as downdrafts are common—and that day was no exception. Several attempts were made to reach a flat spot at about 13,000 feet, and on the last attempt, the craft was caught by a vicious downdraft which carried them down for about 2,000 feet, almost scraping the rocks on the mountain slope.

After that experience, it was decided to carry the gear to another spot located at about 9,100 feet at the base of El Plomo. Seven flights were made from Farellones to that spot, carrying all the gear and men. On a final successful attempt, the helicopter loaded the batteries, each of which weighed 80 pounds, and landed safely at 10,500 feet. From then on, the climbers had to hand-carry most of the gear up to 15,700 feet in successive trips; this took 3 days.

On the fourth day, they had to bear a heavy storm with hail and snow which kept them under their tents for over a day. On January 29, the mules that had been requested some days before finally arrived, so the batteries and other heavy gear were loaded on the animals. After two days of very difficult climbing, they reached 17,000 feet with all of their gear.



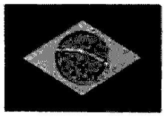
Fred PYØZZ operates from Fernando de Noronha.

At this height, the mules were so exhausted and the terrain so rugged that it became impossible to use them any more, and they had to be left aside. The route from this point to the top of the mountain goes through a very steep glacier over one mile in width, very difficult and dangerous to cross.

It took the climbers another three days to reach the top with all of the gear on their backs. At this altitude, and without the mules, the task was almost unbearable. Finally, on February 2, after ten days of climbing, they reached the top and the repeater and two antennas were assembled, placed into position, and the first contacts were made that afternoon with Santiago.

The group then returned to the night camp at 17,000 feet and Flavio waited until the next day to climb to the top again and further check all the system. At 10:30 they started their way down, arriving at Farellones that night, where they were greeted by various hams from Radio Club de Chile.

The system has been working very nicely since, and there is reason to believe that it will survive many winters. The coverage is enormous, and the sensitivity is such that hams situated on the coast can work through the repeater using only hand-held gear. After all, it's the world's highest repeater.



BRAZIL

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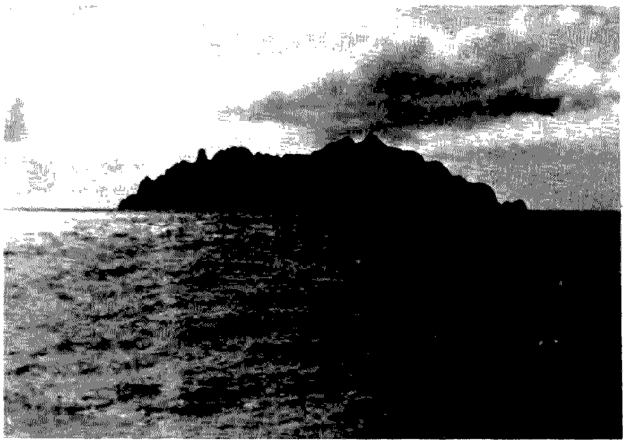
Brazil

FERNANDO DE NORONHA ISLAND EXPEDITION

Last October, PYØZZ and PYØCW were again on the air from Fernando de Noronha Island. Fred PYØZZ operated from October 9 to 10 and Andre PYØCW operated from October 9 to 26. They operated on all bands in spite of the heavy noise, especially on 80 meters, produced by the generator located in front of the hotel. Fred made about 8,000 QSOs and Andre 3,000. Andre took advantage of the trip to work on the island, so he did not have too much time to operate.

They used a Yaesu FT-201, which burned out the fourth day of operation, and a Delta 500, a Brazilian transceiver. After this accident, they could not be on the air at the same time. The antennas were a dipole for 40 and 15 meters and a Hy-Gain 18 AVT.



Trindade Island.

Fernando de Noronha Archipelago lies in the South Atlantic, 300 miles northeast of Natal. Its geographic coordinates are 30°50'27"S, and 32°24'52"W. It is composed of twenty islands among which Fernando de Noronha, Rata, and Rasa are the main ones. Its area is only 10,422 square miles. Its average temperature is 77° F.

Fernando de Noronha is called The Emerald of the Atlantic by Brazilian and foreign tourists. It has a population of about 1,500 and is the smallest unit and the only military territory in the Federation of Brazil. It is under the direct control of the Ministry of Army. There are Army troops as well as Air Force people working there. Civilians living on these islands have several activities—fishing being the main one.

AWARDS

ABCW Award: Sponsored by the ABC Group of CW, the ABCW Award is available to all licensed amateurs for confirmed contacts with 5 (five) different ABCW members. Contacts must have been made after March 29, 1980, on any amateur band. Only two-way CW mode. No QSLs. Send GCR log of stations worked (call, date, time, band, mode, and report), your personal QSL, and 10 IRCs for mailing expenses to: ABCW, PO Box 285, 09700 Sao Bernardo do Campo, SP, Brazil.

Endorsements: For confirmed contacts with 10, 20, 30, and 40 PY2 stations.

SWL: Same rules.

ABCW Members: PY2AAW, PY2AFG, PY2AMU, PY2ASI, PY2CQM, PY2DEH, PY2DMY, PY2EJX, PY2FKD, PY2FWZ, PY2FXK, PY2FXR, PY2HAB, PY2IAP, PY2IAT, PY2IBE, PY2ITA, PY2JM, PY2RAN, PY2SHC, PY2SHI, PY2THM, PY2TNG, PY2USC, PY2VHW, PY2VIW, PY2VTJ, PY2XA, PY2XR, PY2YDD, PY1AEE, PY1AJK, PY4AUB, PY4BNL, and PY4SS.

TRINDADE ISLAND

One of the Brazilian ocean islands with DXCC status, and 620 miles from Victoria City on the coast of Brazil's Espirito Santo state, Trindade is a savage volcanic island rising from 5,500 meters depth to form a surface of 8.2 square kilometers.

Abruptly steep and covered by low grass and herbs, with trees five and six meters high and giant samambaias, Trindade Island seems to be a lost paleozoic forest in the middle of the Atlantic Ocean.

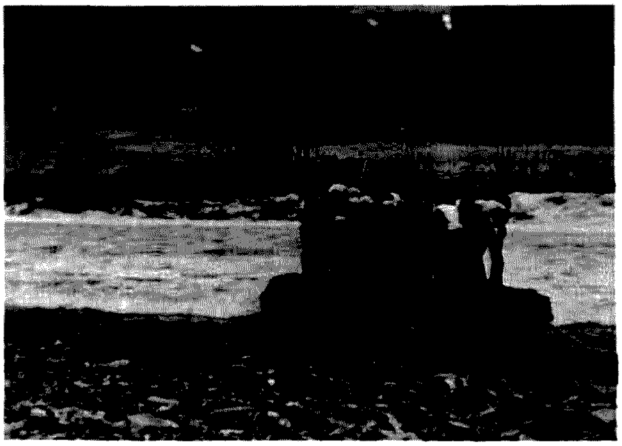
Giant sea tortoises look for Trindade as an ideal place to lay their eggs, and year after year they come by the hundreds. Wild goats and pigs brought to the island many years ago are inhabitants. Crabs by the thousands live there, and so do sea birds—the newborn tortoise's worst enemy in nature's struggle for life.

A five-minute daily rain was named Pirajá (Peer-ar-jar) by Marines who have a 4-month stay at Trindade, joining a Navy detachment for weather-prediction programs.

Fishing is the main hobby, and it sure is fun there—a paradise of the finest fishes you can imagine, lobsters and barracudas, and also little black fish who are such fools that you can catch them barehanded. "Fish me, please," is what the men call them.

Fresh drinking water comes from the tops of the sloped volcanic hills of this impressive 600-meter-high mountain, with its lava flows and volcanic sand all around. The mountain was discovered in 1501 by a Spanish captain who was serving the Portugese king at the time.

Every two months, a Navy supply boat lands for a few days, bringing 50 percent of the island's crew and returning home with another 50 percent who have fulfilled their 4-month tour of duty. This is the chance for radio amateurs to get ashore



After a four-month stay on Trindade, it's back to the continent.

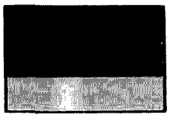
and put Trindade on the air: a sure pileup as long as the stay lasts! Landing at Trindade is not easy; stone walls surround the island and there are very few places where a small boat can get in.

If radio amateurs are lucky enough to have a helicopter aboard, that is wonderful, and this is how they will be taken ashore. But if not, a boat is sent close to the island and a rope is shot out so that they can pull the cable through a pulley and back to the ship. Then a raft about three by three meters, made from boards tied to empty oil drums, is shuttled between the island and the ship until everything is landed—men, goods, and equipment.

It's all very easy until you get near strong breakers close to shore, with waves sometimes covering men and supplies alike, including all amateur gear, thus causing much distress. Although gear may be perfectly wrapped in plastic, there will always be water dripping from transceivers.

Even so, Trindade Island is a marvelous challenge to Brazilian amateurs, and the tremendous fun of an operation from the much-awaited PY0T is a permanent push to an adventure never to be forgotten. This means that if you ever hear someone calling "CQ...CQ...de PY0T...Trindade Island," you can bet he's in paradise.

Radio amateurs can count on Navy sympathy when possible. Of course, there is no Waldorf Astoria Hotel at the island, but the people there are extremely friendly and do their best to help amateurs. And this is why friends who have been operating from there are always dreaming about "the next time I go to Trindade Island." I have never been there, but I dream of it myself...



WEST GERMANY

Ralf Beyer DJ3NW
Opferkamp 14
3300 Braunschweig
Federal Republic of Germany

Hans J. Schalk DJ8BT
Hammerskjold-Ring 174
D 6000 Frankfurt 50
Federal Republic of Germany

The Deutschland-Diplom (DLD Award) sponsored by the German Amateur Radio Association (DARC) is not too difficult to get and it is issued in the form of a beautifully-designed certificate in full color. But effective January 1, 1983, new regulations apply. Here are the essentials.

Two classes of DLDs are available—DLD 100 and DLD 200. For European applicants, 80m contacts only are valid while all other amateurs may use 80, 20, 15, and 10 meters. Two-way communications are required in any legal mode of operation. Each confirmed DOK number (see below for explanation) is counted as 1 point except for non-Europeans who may count 2 points for each DOK number confirmed on 80m. 100 or 200 points respectively are needed to get the DLD 100 or 200. Contacts on or after January 1, 1956, are valid.

For 40m contacts, the DLD 100/40m and DLD 200/40m are available. Uniform regulations exist for European and all other applicants, i.e., 1 confirmed DOK number is counted as 1 point. Contacts on or after May 7, 1959, are valid.

Lapel pins are offered in the following categories: Bronze for DLD 300, i.e., DLD 100 + DLD 200/40m, or DLD 200 + DLD 100/40m, or DLD 200 + 100 additional DOKs on 80m, or DLD 200/40m + 100 additional DOKs on 40m. Silver for DLD 400, i.e., DLD 200 + DLD 200/40m, or DLD 200 + DLD 100/40m + 100 additional DOKs on 80m, or DLD 200/40m + DLD 100 + 100 additional DOKs on 40m. Gold for DLD 500, i.e., DLD 200 + DLD 200/40m + 100 additional DOKs on 80m, or DLD 200 + DLD 200/40m + 100 additional DOKs on 40m. Non-Europeans may use 80, 20, 15, and 10 meters to fulfill the 80m requirements. And in addition to the lapel pin in gold, stickers are available in green, red, silver, and gold for 600, 700, 800, and 900 confirmed DOKs. Top of the line is the DLD 1000 award which requires a total sum of 1000 confirmed DOKs. The DOKs confirmed on 40m are counted separately if one applies for stickers or for the DLD 1000 award.

1982 GARTG* SSTV CONTEST SUMMARY RESULTS

	Call	1st part	2nd part	Total points
Group A (Shortwave transmitting stations):				
1.	JA1XGI	12750	37600	50350
2.	LZ1MH	8008	24552	32560
3.	EA3PE	7547	15336	22883
4.	LZ2OV	1155	12320	13475
5.	I3BQC	3145	6804	9949
6.	I4LRH	900	2428	3326
7.	DF7XA	-	1672	1872
8.	HA1ZH	800	-	600
9.	F5WF	-	312	312
10.	YU2CDS	-	168	168
11.	DK7UG	84	60	144
12.	DJ8WL	-	60	60
13.	YU2CB	-	8	8
Group B (Shortwave Listeners):				
1.	DL7FAB	1950	-	1950
2.	DG6DAF	-	418	418
3.	NL 4483	-	192	192

*German Amateur Radio Teleprinter Group.

DOK Designations

The Distrikts- und Ortsverbands-Kenner (DOK) is composed of a letter and a numeral representing a particular district and the local group of DARC in that area. For example, the DOK H03 represents the district of Niedersachsen and one of the local groups in Braunschweig/Germany. Several groups may exist in larger cities. (See the table.)

The letter Z is employed by radio amateurs who are affiliated with the German Department of Telecommunications. Their organization, Verband der Funkamateure der Deutschen Bundespost e.V. (VFDB), is a corporative member of DARC. And there are special DOK numbers from time to time as, for example, WCY for 1983, IBO33 from 1st April to 31st July, 1983, and IR33 from 1st August to 30th November, this year.

Confusing? If so, get your feet wet by starting with the DLD level having the simplest rules: the DLD 10m. Only 50 DOK numbers confirmed on 10m are required—that's all. Contacts on or after January 1, 1976, are valid.

The fees are moderate, on the order of 10-15 DM($4.00-$6.00 approx.). Complete information and application forms may be obtained from the DLD manager, Mr. H. P. Guenther DL9XW, Am Strampel 22, 4460 Nordhorn 1, Federal Republic of Germany.

AMATEUR RADIO SATELLITE

AMSAT/DL has been notified by ESA (European Space Agency) that the launching date for the AMSAT Phase IIIB Amateur Radio Satellite, DL0WCY, is expected for May 27, 1983. This means the satellite will be shipped to Kourou (French Guiana) in mid-April, followed closely by the launch control crew. If no unexpected delays in the pre-launch procedures happen, the satellite should be in orbit about 3 years after the disastrous false start from the ARIANE L 03 flight in 1980.

Negotiations concerning the launching of a Phase IIIC satellite from Vandenberg, California, are presently unsuccessful.

QSL MANAGERS

A listing which contains over 2000 QSL manager addresses can be obtained for 15 DM or equivalent from Arthur Maurer DL8BL, Beim Weisenstein 9, D-6602 Dudweiler, West Germany.

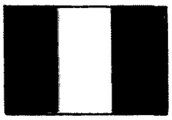
CONTEST CALENDAR 1983

Date	UTC	Name	Bands	Mode
May 8	1100-1700	*DARC "CORONA" Contest	10m	RTTY
June 11	1200-1600	*GARTG Short Contest	80/40m	RTTY
July 17	1200-1500	2nd DARC 10m Contest	10m	CW + mixed
Aug. 13-14	0000-2400	WAEDC—CW	80/10m	CW
Aug. 28	0700-1100	GARTG Short Contest	80/40m	RTTY
Sept. 3	1100-1700	DARC "CORONA" Contest	10m	RTTY
Sept. 10-11	0000-2400	WAEDC—Phone	80/10m	SSB
Oct. 8	1200-1600	Z Contest	80/40m	CW
Oct. 8-9	0600-0600	GARTG SSTV Contest	80/40m	SSTV
Oct. 15	1300-1700	GARTG Short Contest	80/40m	RTTY
Oct. 29-30	1400-1400	2nd DARC FAX Contest	80/10m	FAX
Nov. 6	1100-1700	DARC "CORONA" Contest	10m	RTTY
Nov. 12-13	0000-2400	WAEDC—RTTY	80/10m	RTTY
Nov. 13	1200-1500	3rd DARC 10m Contest	10m	CW + mixed

*DARC—Deutscher Amateur Radio Club (National Amateur Radio Society).
GARTG—German Amateur Radio Teleprinter Group.
WAEDC—Worked All Europe DX Contest.

A	Baden
B	Franken
C	Bayern/South
D	Berlin
E	Hamburg
F	Hessen
G	Koeln/Aachen
H	Niedersachsen
I	Nordsee
K	Rheinland-Pfalz
L	Ruhrgebiet
M	Schleswig-Holstein
N	Westfalen/North
O	Westfalen/South
P	Wuerttemberg
R	Nordrhein
T	Schwaben
U	Bayern/East
Z	VFDB

Table of DOK designations.



ITALY

Mario Ambrosi I2MQP
Via Stradella, 13
20219 Milano
Italy

The scene has been dominated by the VK0 expeditions. Even if difficult to understand, the reason for two expeditions to this same spot in the same period of time has been the thrill to be on frequency there. Signals from VK0HI were very strong the first days of operations, but then the propagation dropped. When VK0JS appeared, the demand for Heard was still tremendous. The pileups on 14195 were incredible, and sometimes VK0HI was on 15 in the same period, working his own frequency with no customers.

Italian operators have been very lucky because, with such propagation, many North Europeans were not able to copy Heard. Most of the contacts have been made on 20, a few on 15, and very few on 10. 40 and 80 have been dominated by CW with few contacts on SSB.

RADIO IN ITALY

The national body for amateur radio in Italy is the Associazione Radioamatori Italiani, or ARI. It has an elected council of 8 members in charge for a term of 3 years.

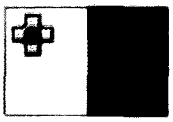
The first honorary president was Guglielmo Marconi. Today, the council consists of a president, a vice-president, a secretary, and five other members. Others who play important roles are the various managers, one for each kind of activity: DX, VHF, Awards, RTTY, QRP, ATV, SSTV, SWL, Repeaters, Reciprocity, etc. I will report on the above topics in the future.

The official monthly magazine, *Radio-Rivista* (it means Radiomagazine), also known as *RR*, is somewhat in between *CQ*, *73*, and *QST*. Like *QST*, *RR* gives ample reporting on League activities like meetings, division activities, hamlests, and others. As *73* and *CQ*, it widely covers DX, awards, new rigs, and antennas.

The magazine has changed substantially during the last months with the new management of two professional journalists: Nax Di Marco I2DMK and Angelo Pinasi I2PKF, who is also the DX editor. The new format of *RadioRivista* resembles *Time* and consists of about 120 pages, of which 40 are devoted to advertising. Advertising is more or less the same in Italy as in the States, but there are no toll-free lines and prices are never mentioned in the newspaper. Dealers do not like to compete too much against each other (the market is relatively small); they do prefer to squeeze the customers.

The total number of hams in Italy is around 24,000, and 50% of them are members of ARI. The cost of membership is 38,000 lire (about $27.00), which includes the handling of incoming and outgoing QSLs without other costs and without any limit in quantity (I personally send 6,000-7,000 cards per year). To top it off, an antenna insurance policy and some other small additional benefits are included in the fee.

In our country, we are very proud of the fact that the first radio amateur (as he liked to call himself), G. Marconi, was Italian. If it happens that you work IY4FGM, you will be interested to know that this club station is transmitting from the same room Marconi used to make his experiments! And to your surprise, if you visit the Manhattan World Trade Center, on one of the observation decks of "The World at Your Feet," you will find: "The radio—an American invention"!



MALTA

C. A. Fanech 9H1AQ
35 Main Street
Attard
Malte

THE MALTESE ISLANDS

The Maltese Islands, consisting of Malta, Gozo, Comino, and two other small, uninhabited islands, are situated in the middle of the Mediterranean Sea about 93 km south of Sicily and 288 km from North Africa. The total area is 315.6 square kilometers, with Malta having approximately 248 of them. The longest distance in Malta southeast to northwest is about 272 kms, and the widest east/west distance is about 14.4 km. The population of Malta is 320,000. Valletta is the capital city of Malta. The main seaport is the Grand Harbour at Valletta, which is surrounded with magnificent bastions recalling great historical moments in the history of the Maltese Islands. The only airport is situated at Luqa, about 6.25 km from the capital city.

Malta boasts of a very temperate climate. There is no snow, fog, or frost. Rain falls only during short periods, usually between October and April, averaging about 55.9 cm in a whole year.

On such a small island as Malta, there are about 150 licensed amateurs, of which only about 90 are active. The two types of licenses issued consist of License A and *License B. Holders of the A license must* pass an examination in radio theory and operating procedure and a Morse test of 12 words per minute. Holders of such a license are allowed to operate on all bands with 150 W dc input (10 W on 1.8 MHz). License B holders also have to pass the theoretical examination but do not need to sit for a Morse test. Holders of such a license are allowed to operate only on VHF, i.e., from 144 MHz upwards. The following are the callsigns issued in the Maltese Islands: 9H1 followed by one or more letters denotes a category A license holder. 9H5 followed by one or more letters denotes a category B license holder. 9H4 followed by one or more letters denotes a category A license holder living in Gozo. 9H3 followed by one or more letters denotes a category A license issued to a visitor who comes to Malta for a short period. (There are no licensed radio amateurs on the Island of Comino.)

A license to set up an amateur radio station in Malta costs three Malta pounds (about $1.20), renewable every year. Such a license is not transferable.

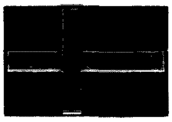
The Malta Amateur Radio League (MARL) is the society that represents the majority of radio amateurs in Malta. It has IARU recognition and is affiliated with the ARRL and the RSGB. The club is situated at The Parochial Centre, Attard, and the official address is Malta Amateur Radio League, PO Box 575, Valletta, Malta. Meetings for members are held every Tuesday and Thursday evenings and every Sunday morning. Courses, free of charge, are also given for those members who would like to obtain a license. The society also runs a very efficient QSL Bureau.

How To Apply

Following are the requirements to apply for permission to establish and use an amateur (sound) station; applications should be made to: The Chief Inspector of Wireless Telegraphy, Castille, Valletta, Malta, Europe, and should include:

A.1. Name of applicant (with full Christian names)
A.2. Date and place of birth
A.3. Home address
A.4. Details of occupation
A.5. Telephone number
A.6. Citizenship and passport number
A.7. Father's name
A.8. Mother's name and maiden surname
A.9. Address of where the amateur station is to be set up
A.10. Duration of stay in Malta (from . . . to . . .)
A.11. Qualifications (amateur license); copy of current license is to accompany the application
B.1. Transmitter(s). Type, class(es) of emission, power, frequency coverage, etc. Circuit diagram to be enclosed with the application. (Maximum dc power energizing the final stages or any device energizing the aerial shall not exceed 150 Watts. Hand portable equipment is not allowed. Mobile operation is likewise not permitted.)
C.1. Receivers. Types, modes of operation, frequency coverage, etc.
D.1. Details of any other equipment
E.1. A declaration by applicant that (s)he will adhere to all the conditions of the radio amateurs in Malta

Applications for such a license should be made at least 3 months in advance of arrival on the island.



SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

Rainer Martinsson SM2DMU
Sikea 3178
915 00 Robertsfors
Sweden

SCANDINAVIAN HORIZON

The amateur radio world is divided into three regions. Europe, Africa, and parts of Asia belong to Region 1, North and South America belong to Region 2, and Southeast Asia, Australia, and the South Pacific belong to Region 3. Region 2 has the most favorable frequency allocations compared to the two others. In Region 1, the amateur bands 50 MHz and 220 MHz are assigned to other services. The 160-meter band was, with a few exceptions, not assigned to hams until 1982, and we are still restricted to just a few kHz and limited power up to maximum 10 W input. Both the 80- and 40-meter ham bands are 200 kHz wider in Region 2 (America) than in Region 1 (Europe/Africa).

LICENSING IN SWEDEN

The Swedish Amateur Regulations were revised during 1982. Generally speaking, these put tighter restrictions on the hams, which is unfortunate. For example, Swedish hams initially were forbidden to participate in satellite communications on the 432-MHz band. We still are strictly forbidden to operate on the 21-MHz band if we may interfere with radio and TV broadcasts when the affected receiver has an i-f with this frequency or a harmonic thereof. Furthermore, we were told that having a transmitter capable of transmitting outside the ham bands was illegal after October 1, 1982. This made all commercially-marketed ham rigs illegal at once! Practically all equipment has some overlapping, and a rule like this will only degrade the respect for regulations.

SSA, the Swedish amateur radio league, is trying to negotiate with the authorities, and the restriction on 432 MHz for satellite communications has been lifted.

Since the early 70s, Sweden has had four classes of ham licenses. The fourth class we got ten years ago was a Technical class for VHF with no Morse code requirement.

Looking at the license class structure in Sweden (see the table) makes one wonder why there are four classes when the difference is so small. In fact, most countries have only two classes, a Novice class and a General class. Basically, the requirements for achieving a license in various countries is much the same. The most common code speed for the highest license class is 12 wpm (60 characters a minute). Sweden with 16 wpm and the US with 20 wpm are two exceptions. The written exam covers about the same but is of course structured according to the different classes in each case.

LOW INCENTIVES

There used to be a gain in privileges by upgrading in Sweden. During the last decades, the difference has become less obvious and there is not much of an incentive any more, especially since the recent change increasing the power levels for class B licensees from 75 W to 250 W and class C from 10 W to 100 W without giving the class A anything new. The concern for TVI/RFI has been the major reason for keeping the old 500 Watts input as maximum.

In the late 50s, when I got started, I had to wait till I turned 16 before I could try for my Novice ticket. This gave me 15 kHz on the 40m band CW (7035-7050 kHz) with 5 W input crystal-controlled. Much the same as your Novice ticket, but we sure envied your 75 Watts. Ours was not renewable either, and we had to upgrade before turning 19 or find something else to do. (This limit has also been changed.) The code speed was and is still 8 wpm for class C.

NOVICES IN FINLAND

I never forget those days when the Novices in Finland always did beat me with their marvelous 15 Watts. When an OH ham popped up on my crystal frequency, he usually stayed there for about two weeks. That was the time it took him to work the 250 QSOs required before he could upgrade. It did not take many days until there was a new one with the same crystal on "my" frequency for another two weeks. I had to work one year before I could upgrade and "go vfo."

OTHER NORDIC COUNTRIES

Finland and Norway have two classes of license, a Novice and a General, while Denmark has four classes structured the same way as the Swedish system. Their age limits differ, though, starting with 13-year-old Novices. Finland does not have age limits as the other countries. Hams in OH-land can use up to 600 W output which can be compared with 600 W input for the Norwegians. The Norwegians are even prohibited from owning a transmitter capable of more than that limited dc power. Denmark and Sweden have an upper limit of 500 W dc input. Another peculiarity I have found is that in Norway you have to identify with your callsign every 5 minutes. Most countries have followed the 10-minute recommendation made by the ITU.

WARC BANDS

Denmark has opened all the three new bands for their hams. This, of course, also includes OY, the Faroe Islands. Norway was also *heard on 10 MHz* right away on

Class of License	Minimum Age	Modes of Operation	Max. Power Input	Amateur Bands
A	17	All	500 W	All
B	16	CW, RTTY On 28 MHz and above, also phone	250 W	All
C	14	CW, RTTY On 28 MHz and above, also phone	100 W	All but 20 meters
T	17	All	75 W	144 MHz and above

License class structure in Sweden.

January 1, 1982, when that band could be opened for the first time. Finland has had operating privileges on 160 meters for years. It is still unknown when we in Sweden may get any of the new WARC bands, and the 15 kHz we got on April 1, 1982, on 160m are only opened on a trial basis and "can be revoked immediately if other services are interfered with or if there are put forward any objections internationally of fundamental nature against these transmissions." Our power limit for this band is 10 W input, only CW (class A1A).

CODE-FREE LICENSE

A possible code-free license in the US has been discussed a lot lately. We got such a license ten years ago—the so-called T license (T for Technical). The idea was to give CBers a chance to get into ham radio without having to put in that extra effort required to learn the code to start with. It was obvious that lots of people got into CB because of some interest in radio communication as a hobby and not to use CB as it originally was intended to be used.The hope was that these people would get a deeper interest in amateur radio and upgrade, and the national amateur league accepted this new license.

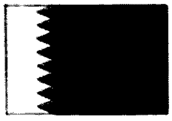
Many became genuinely interested and eventually upgraded, but a majority of these people stay on 2-meter FM and this is and continues to be their only experience in the wide field of ham radio. The most unfortunate thing, in my personal opinion , is that many of these T licensees degrade themselves by indicating a feeling of inferiority because of not mastering the code. This, however, is apparently not enough to make them go through the effort required by everyone for learning this skill. In some cases, this fact has produced an unnecessary strain between groups of hams which is difficult to avoid.

A summary of our ten years' experience with a code-free VHF license is that the Swedish ham population has grown considerably. There are now almost half as many T licensees as class-A licensees. About 90 percent of all new licenses issued are class T. Some of them are indeed technical people, but most of them stay strictly on 2-meter FM.

You have probably heard 3 or 4 different Swedish prefixes on the air. Most common is SM, which is granted to all persons passing the exams. SK is a club station either in a ham club or from a school. These stations are run on a voluntary basis, and two amateurs having the highest level of certificate are responsible for all traffic from such a station. You will find a lot of SK stations on the air when the major contests are on. SL is the prefix of stations belonging to the Swedish defense forces. These are manned by trainees or amateurs doing their national service.

The fourth and most rare prefix is SJ, which is held by one station, SJ9WL, situated in Morokulien—an imaginary country on the border of Sweden and Norway. This "country" was founded during a radio show in the middle of the 1950s. There is a nice hut at the disposal of any visitor, and a licensed amateur can have a choice between using SJ9WL or LG5LG. The station is equipped with gear covering all HF bands as well as 144 and 432 MHz.

Sweden is divided into 8 districts and a ham must change the number in his prefix if he moves from one district to another. The suffix is the same and nowadays lost calls are not given to a new amateur for a long time.



BAHRAIN

Ian Cable A92BW
PO Box 22381
Muharraq
Bahrain

The third biannual Middle East Communications Exhibition (MECOM) took place in Bahrain, February 7-10, and as usual, ARAB (Amateur Radio Association Bahrain) was there. We operated special-event station A99A on the HF bands during the hours that the exhibition was open, with somewhat disappointing results in terms of QSOs made. Unfortunately, the move from the original temporary exhibition site to the new permanent one at the Central Market was not without its problems. In the radio receiving sense, the new location is extremely noisy, with an S7 noise level commonplace on the HF bands; we assume the power line radiated. It didn't help that the tower exhibitor, whose products we had hoped to use to hold up the A99A antenna, was located so far away from our stand that we would have needed a second mortgage to fund the purchase of feeder cable! The best that we were able to manage under the circumstances was a trapped multiband vertical on the roof of the building with an swr on the feedline low enough not to cause any problems. Our apologies to those who called loud and long and didn't make it through the noise.

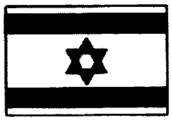
Amateur radio visitors to the ARAB stand at MECOM included stations licensed by the administrations of A71, DL, EA, G, HZ, K/W, OD5, OZ, SV, VE, 5B4, and 9K2. We even had to drag some of the exhibitors, who were also amateurs, away from their own stands in order to sign in at ours.

Also present whilst MECOM was in progress were Lloyd and Iris Colvin W6KG/W6OL, fresh from their exploits in A71. We were more than somewhat startled when they emerged from the Airport Customs Hall complete with transceiver and amplifier on their own suitcase wheels! Regrettably, that was when good luck deserted them; no license was forthcoming. Our Association president, the Minister of Information, was willing to license, but the Security and Intelligence Service of the Ministry of the Interior said no.

Our 2-meter repeater, A92RP, 145.150 MHz in, 145.750 MHz out, 1750-Hz tone-burst access, has recently undergone a retrofit involving the installation of a higher gain antenna. All of the previously marginal scratchy signals are now fully quieting. Maritime mobiles in the Gulf are welcome to make use of the repeater; there normally is activity at around 1830 local time. Future plans are to move the repeater from its present site atop the National Bank of Bahrain to the Gulf Hotel, which will effectively remove it from the downtown repeater rat race. There is absolutely no truth in the rumor that we leaned on Ted A92CE in order to persuade him to move from the Ramada Inn to the Gulf Hotel—but every little bit of influence helps!

Our 28.245 IBP beacon, A92C, has been running recently on the tribander at the clubhouse except, of course, when the club station is in action. The replacement meter switch for the club's FT-101E has recently become available, so we will be able to tune up on the meter rather than by maximum smoke. Next project looks like a 2-meter beacon—we have available a Communicator IV which should be capable of generating the requisite amount of rf and the old repeater antenna to radiate it.

As the springtime propagation picks up, perhaps both A92BE and A92BW can be persuaded to devote time to 20 meters rather than to their respective computers. Let's wait and see what happens!



ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev Mobile Post Office
85530
Israel

Greetings from Israel to all readers of *73*. This is to keep you informed on what's happening in amateur radio in Israel. I'll be delighted to answer any questions you have pertaining to the ham scene here, so don't hesitate to drop me a line.

If you're active on the HF bands, then it's likely that you've already heard and possibly worked some of us. We number just a touch over a thousand licensed stations at this time, with the prefixes 4X4, 4Z4, and 4X6, this being the order in which these callsigns were issued. The suffixes are two letters with the exception of Novices who have a three-letter suffix beginning with N, the N being dropped upon receiving a higher grade of license.

The Novice, or Grade C license, is the easiest to get. You need six words a minute in Morse, an elementary knowledge of electrical laws similar to that needed for the US exam, and a basic grasp of Q signals, operating procedure, and radio regulations. With this license, which, by the way, is renewable, you're permitted the use of crystal-controlled CW transmitters of ten Watts input from 7.065 to 7.085 MHz and 21.100 to 21.150 MHz.

The Grade B license is comparable in scope to the General class in the States as far as theory is concerned. Here the Morse code requirement is 12 words per minute, and the licensee can then use up to 200 Watts input on all modes and bands with the exception of 160 meters and the three new WARC bands, where power input and frequency range are somewhat limited.

After holding the Grade B license for at least a year, one may then go on to take the Grade A test. You have to copy code at sixteen words a minute, and the theory exam is oral. Although this test is supposedly on a higher level than that of the B exam, many report it to be easier since it isn't written and there is a rapport with the examiner. Besides being able to run a kilowatt input on all but the 160-meter and WARC bands, the holder of this license may receive authorization to connect a phone patch to his station or let others use his equipment under his own direct control.

Examinations take place twice yearly—in the spring and in the fall. There is a higher failure rate here than in the US, but this is probably due to the form in which these examinations are given. The code must be written down solidly in Latin letters—a difficult task for native Hebrew speakers used to a different script. The exam questions are different each time and require a written answer—no multiple choice, and Dick Bash or his Israeli equivalent has yet to appear here.

However, if you already hold a foreign license similar in requirements to either the Grade A or B tickets, you will be exempted from the above ordeal. And the reciprocal licensing here is quite liberal.

How does a visitor to Israel go about getting on the air? He simply appears at the office of the Ministry of Communications on the tenth floor of The Shalom Tower on Ahad Ha'am Street, downtown Tel Aviv's highest building. (It really isn't all that high, but it's all we've got!) He presents his valid license, not a photocopy, and will be granted on the spot, free of charge, a reciprocal license. I've heard American, Canadian, South American, European, and South African callsigns on our repeaters, so it's a fairly easy procedure. Office hours of the Ministry are 9:00 am to 1:00 pm, Sundays through Thursdays, and the phone number is (03)-610278.

Interested in working Israel? Your best bet is on 10, 15, or 20 meters, depending on propagation. These bands are where the local hams are most active, especially on SSB, but there are fellows on the other bands and modes as well. Ricki 4X4NJ is a 160-meter enthusiast, and this winter has improved his antenna farm and has made quite a few QSOs with stateside stations both on SSB and CW. David 4X4VL has been cracking out a lot of DX QSOs on 40 meters with his delta loop, and Dov 4X4DX has been cooking up a storm on 80. I get on 10 MHz from time to time myself, and there are many others. Bear in mind that Israel is two hours ahead of Greenwich Mean Time, and that we are on the Eastern Mediterranean, so if you're hearing Greek or Italian stations, there's a good chance a 4X or 4Z station is sandwiched somewhere in between the QRM.

Our national organization is the Israel Amateur Radio Club, presently consisting of some 700 members including SWLs. The club takes care of in- and outgoing QSL bureaus, publications, VHF and UHF repeaters, liaison with the Ministry of Communications, special events and field days, and the transmission of weekly bulletins. In the near future, the IARC hopes to set up beacons both on ten meters and VHF. All the officials and helpers in the club are voluntary, so we do have our ups and downs. After a low period, in the last few years our QSL bureaus have really picked up and we've received many compliments from abroad.

There is certainly a lot more to tell you, such as the awards offered, special events, the VHF and repeater scene, DXing in this part of the world, amateurs of note here, etc., but I'll leave that for another time.

Build the Weather-Grabber

Don't know why there's no sun up in the sky? With this simple converter, you can listen to National Weather Service forecasts on your 2-meter rig and find out.

N1II received an extra $50 for this Home-Brew I Contest Honorable-Mention entry.—Eds.

Paul M. Danzer N1II
2 Dawn Road
Norwalk CT 06851

Does it look like rain? As you drive along, you can find out by switching in a converter and tuning your two-meter FM rig to receive the continuous broadcasts of the National Weather Service. In 1981 there were almost 100 stations scattered throughout the US and additional stations in Canada providing weather information 24 hours a day. The usual transmitter frequencies of these stations are 165.40 and 165.55 MHz. Two FETs serve to convert these frequencies to two frequencies of your choice in the 144-to-148-MHz band.

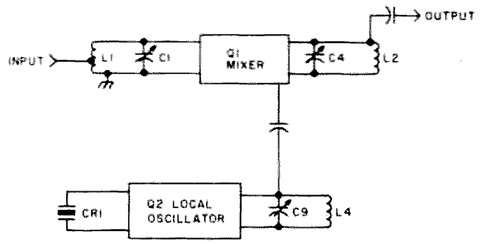


Fig. 1. Block diagram of converter.

How It Works

Referring to the block diagram in Fig. 1, Q1 is a dual-gate FET working as a mixer, with L1 and C1 tuned to the weather frequency. The output of the mixer is selected by L2/C4 and is within the 144-to-148-MHz range of your 2-meter rig. Q2 is also a dual-gate FET, but in a circuit which acts as both an oscillator and a multiplier. Its frequency is set by crystal CR1. If you compare the two weather frequencies with the limits of the two-meter band (162.55 − 148 = 14.55; 162.40 − 144 = 18.40), you can see that for a synthesized rig, any oscillator frequency in the range of 14.55 to 18.40 MHz will allow you to receive both weather frequencies.

The oscillator is both an oscillator and a multiplier. C9 and L4 are tuned to the 14-to-18-MHz range. You can use either a fundamental crystal in this range, a crystal at half this frequency, or a crystal at one-third this frequency.

If you happen to have a crystal in this frequency range, the oscillator operates as a straight-through circuit. Alternately, if you are the owner of an old two-meter or six-meter rig, perhaps you might have some 8-MHz crystals. They will operate fine with the oscillator acting as a doubler. Your third choice is an overtone crystal which is actually one-third this frequency. In any case, try what you have. Just make the subtraction and hopefully the two-meter output will not fall on the same frequency as the local 500-Watt repeater, in which case you might have some feedthrough of hams on top of the weather.

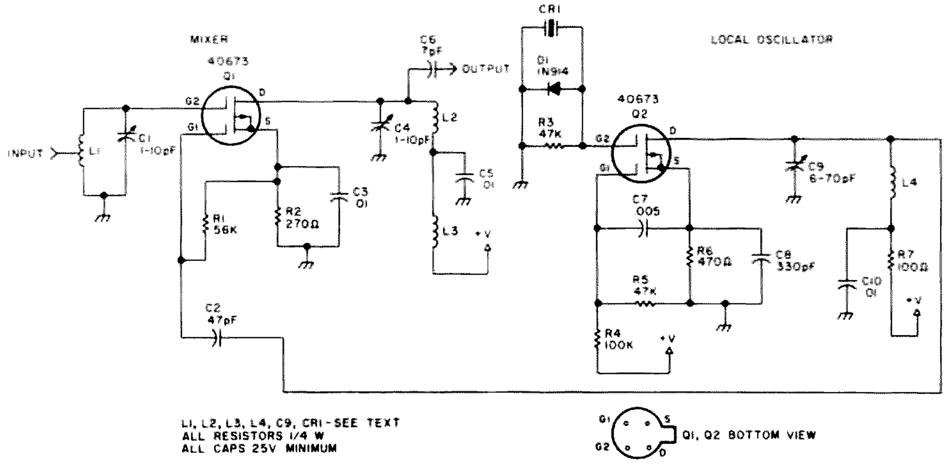


Fig. 2. Converter schematic.

Circuit Design Details

Many hams, including

myself, firmly believe in starting with an existing circuit rather than starting from scratch. If you would like to get into the details of the self-biased mixer used here, you can start with the ARRL *Electronic Data Book*. You might also want to glance at the popular two-meter preamp in the UHF/VHF receiving section of the ARRL *Radio Amateur's Handbook*.

The schematic of the converter is shown in Fig. 2. Both Q1 and Q2 are dual-gate FETs of the 3N211 or 40673 variety. Radio Shack sells them under part number 276-2045. Ideally, miniature trimmer caps C1 and C4 should be variable from 1 to 10 pF, but either the Jameco Electronics TC 2-8 (2 to 8 pF) or the Calectro A1-245 (1 to 7 pF) will do.

L1 is three turns of a tinned number 20 wire wound on a ½-inch rod. After winding, remove the rod. Space the turns so that L1 is about 1 inch long. L2 is also wound on a ½-inch rod and consists of 3 turns without any tap. It is spaced to be about 1¼ inches long. L3 is a commercially wound coil. Any value of 10 uH or more will do (Radio Shack 273-101). If you want to wind your own, take a 100k, 1-Watt resistor and wind 3 or 4 layers of number 30 wire over it. Neatness does not count in this case!

The oscillator is characterized as a "parallel mode Miller oscillator" in an excellent survey of oscillators by VK2ZTB, published in the March, 1976, issue of *Ham Radio Magazine*. C9 and L4 resonate in the range of 14 to 18 MHz. I used a T50-2 core with 12 turns of number 24 wire in parallel with a 6- to 70-pF variable (Jameco TC 6-70). You can use whatever you have as long as it resonates at the proper frequency range. Just be careful that it is not tuned to 7 to 9 MHz or some other related set of frequencies.

Construction

A tracing of the layout used is shown in Fig. 3. Before you make the board, note that the entire board remains covered with copperclad. The lines shown are the *only* areas of bare board. Each of the copper lands is surrounded by a thin line of bare board. Outside of these areas, the remaining board is covered with copper and acts as the ground plane.

The prototype board for this circuit was made by first taking a section of bare printed circuit board and carefully shining it and cleaning it using soap and steel wool. After drying, the entire board was covered with a single layer of masking tape. The edges of the masking tape strips were slightly overlapped and pressed down firmly.

A piece of carbon paper was cut to slightly over the size of the board and placed, carbon side down, on the masking tape. The excess carbon paper is bent over the back of the board and held in place with additional tape. A copy of the layout is now placed on top of the masking tape. With a hard pencil or ball-point pen the layout is copied onto the masking tape by tracing over it on the top sheet.

When you remove the layout paper and the carbon paper, you should end up with a "carbon copy" of the layout on the masking tape. With an X-acto® knife, cut away a thin strip (perhaps 1/16 to 1/32 inch thick) over each of the lines. When finished, you end with the layout in bare copper and the entire rest of the board covered with masking tape.

Now you have two options. Either immerse the board in etching solution and etch until all of the exposed copper disappears, or use a miniature hand grinder and grind away this exposed copper.

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VISA

The layout and component placement in Fig. 3 is shown from the copper side, but note that all components except the variable caps are placed on the other (bare board) side. Before drilling the holes which connect the bulk of the components from one of the isolated copper pads to the ground plane, check the size. You may want to move the hole in the ground plane in or out to fit the exact component length you are using.

Tuning and Testing

After checking your construction job for solder bridges, missing or incorrect component placement, and cold solder joints, recheck that the FETs are correctly oriented. Remove crystal CR1 and install the converter between your rig and antenna. Apply power and tune your rig to a local repeater. When the repeater is transmitting, you should get some gain through the converter. Tune C4 for maximum signal. You may have to place a 5- or 10-pF cap across C1 to resonate the input to the 144-MHz band from its normal 162-MHz resonance.

Caution: Do not go key down and transmit. There might be a tendency to press the PTT button on your rig to bring up the repeater. If you do, Q1 will probably go up in a tiny puff of smoke and you might damage the finals in your rig.

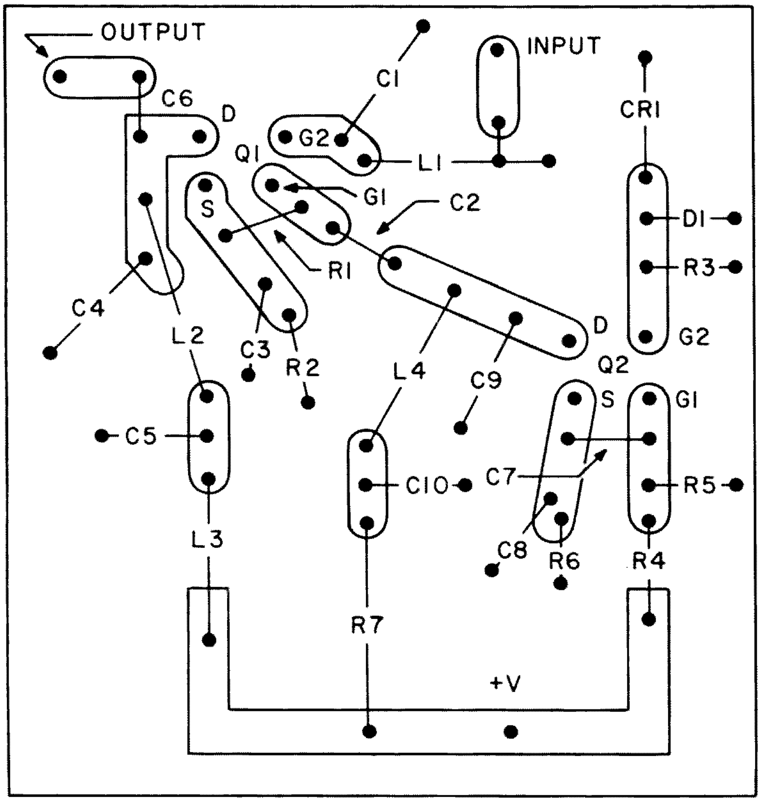
Assuming you get some gain out of the circuit, remove the padder cap across C1 (if you used it) and restore CR1 into the circuit. Check the output of the local oscillator to make sure it is in the 14-to-18-MHz range. You might do this with a high-impedance scope, a counter, or a general-coverage receiver.

If you use a general-coverage receiver, tune it from 6 MHz to 30 MHz and make sure that the strongest output detected is in the 14-18-MHz range. A grid-dip meter can also be used by wrapping one turn of wire around the core and around the coil of the GDO. Again check that the strongest output is in the proper frequency range.

The last step in checkout is to once more make the subtraction: weather frequency − your oscillator frequency = rig frequency. Tune your rig to the proper frequency and there should be the weather station. Gently peak all variable caps and you are in business.

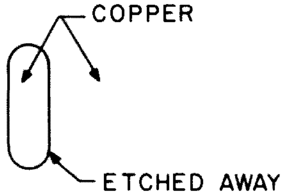
Installation

The weather converter is simply placed between the rig and the antenna. Power of 9 to 12 volts will do; however, if you decide to use the car battery as the power supply, a noise filter



COPPER CLAD SIDE SHOWN. COPPER LANDS SHOWN ARE ETCHED FROM REST OF BOARD, BUT REMAINING SURFACE AREA IS COPPER.

EXAMPLE



ALL COMPONENTS MOUNTED ON OTHER SIDE OF BOARD EXCEPT: C1, C4, C9.

Fig. 3. Layout and parts placement.

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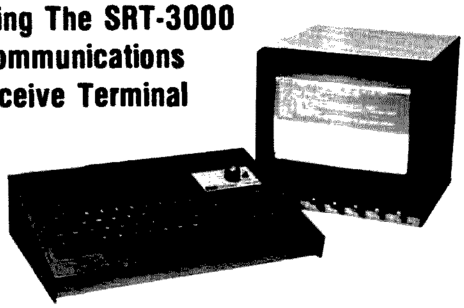

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such as in Fig. 4 should be added.

You might also consider installing the converter as shown in Fig. 5. The selector switch (Radio Shack 275-1384) places the converter between the rig and the antenna. In addition, the microphone cable is brought to the enclosure and the PTT line is interrupted, thus preventing you from transmitting with the converter in the line. If your rig is conventionally wired (Fig. 6) with the PTT line going directly to a relay and the 12-volt line, you can even pick up the power for the converter from the PTT line since the converter draws less current than needed to energize most relays.

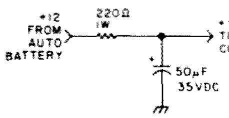

Fig. 4. Noise filter.

Possible Problems and Cures

If you have never built anything at VHF, this could be a good first project. Remember that Murphy's Law applies to all things, and especially at VHF the law states, "Resonant Circuits Usually Don't." Therefore, you might have to add a turn, cut a turn, squeeze the coil, or spread it out to resonate the input and output of the mixer.

Dual-gate FETs, especially those capable of VHF operation, also like to oscillate at weird and wonderful frequencies. If this happens, you will notice a large increase in noise when you connect the converter to your rig. You also might notice fragments of conversations, music, and general instability. The usual cure is to add a ferrite bead by unsoldering the gate leads of Q1 and Q2 and slipping the gate lead through the hole in the bead. Usually one bead per FET is enough, although you will have to try yourself to see which of the two gate leads cures the problem. Alternately, a 100-Ohm, ¼-Watt resistor could be added in series with the gate lead.

A problem of a different variety is faced by most hams—obtaining parts (see Parts List). Most of the parts used in the converter are not critical and are available at your local Radio Shack store.

Miniature variable caps can be a problem. The Calectro line is available at many independent electronics supply houses. Jameco Electronics is another source, at 1355 Shoreway Rd., Belmont CA 94002.

In mixed average terrain, the weather stations are usually good for over 25 miles, although 40- to 60-mile coverage is not unusual. If you are in a very hilly area or well out of the coverage, you could add a preamp such as the standard one in the ARRL handbook. One or two turns will have to be taken off the input and output coils of the preamp.

Want to hear the weather? At home or in your car? Two FETs plus a few hours work and you can make your two-meter rig do double duty. ■

Converter Parts List

R1 56k, ¼ W
R2 270 Ohms, ¼ W
R3 47k, ¼ W
R4 100k, ¼ W
R5 47k, ¼ W
R6 470 Ohms, ¼ W
R7 100 Ohms, ¼ W
L1, L2, L3, L4—See text
Q1, Q2—Dual-gate FETs, 40673
CR1—See text
C1 1-10 pF trimmer
C2 47 pF, 25 V dc
C3 .01 µF, 25 V dc
C4 1-10 pF trimmer
C5 .01 µF, 25 V dc
C6 7 pF, 25 V dc
C7 .005 µF, 25 V dc
C8 330 pF, 25 V dc
C9 6-70 pF trimmer
C10 .01 µF, 25 V dc
D1 1N914
Noise filter (Fig. 4) 220-Ohm, 1-Watt resistor, 50 µF, 35 V dc capacitor
Switch (Fig. 5) 3PDT

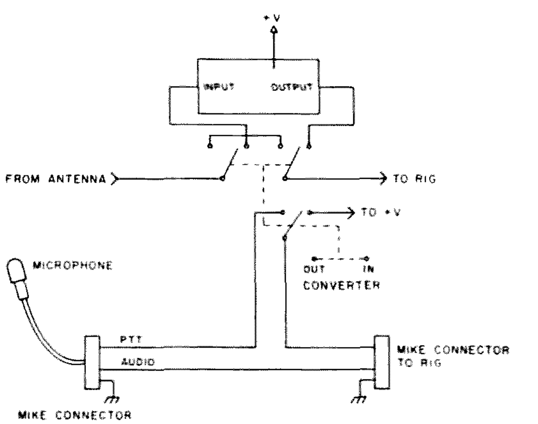

Fig. 5. Converter installation.

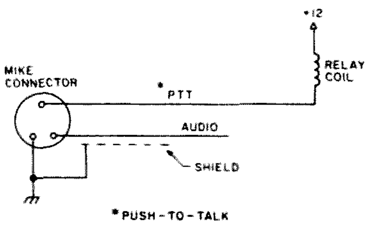

Fig. 6. Conventional rig wiring for PTT.

William Ringleben K3UK
Box 23, RD 1
Drums PA 18222

Kill Power-Line Interference

You don't have to be a big-game hunter to find the source of that annoying noise. All you need is your rig and your good hamming habits.

Since 1973, I have been employed by an electric utility company. One of my principal responsibilities has been to investigate power-line interference problems affecting customers. This has involved over 1800 complaints concerning reception of TV, AM radio, FM radio, Citizens Band, and amateur radio. Having had this experience, I would like to suggest a few things to my fellow amateurs to aid in the correction of many of their interference problems without having to request outside help.

The amateur affected by interference has some major things going for him:

1) He is available when the interference is occurring.

2) His station probably has far superior sensitivity and selectivity than the broadband receiver and omnidirectional antenna which some investigators use.

3) He has a working knowledge of radio principles and can make up an accurate and meaningful log of interference characteristics to see if a pattern develops.

Elaborating on the third point, experience indicates that at least 60% of all interference complaints are not due to power lines but are caused by consumer devices. By far the greatest offenders in producing interference are arcing contacts such as those found in all types of thermostatic devices. If interference is of an intermittent nature without a relationship to weather conditions, one can say with some certainty that it is being caused by a device indoors and, most likely, that that device will contain a thermostat of some kind or another.

Two of the most difficult problems in locating these culprits can be handled by having someone there while the interference is occurring, and also by determining the existence of a pattern. This is where an accurate log will help with your efforts in locating interference either on your own or with the help of an investigator.

Some of the devices that we find responsible most often include:

- *Oil burner aquastats*, usually on for 10–15 minutes every hour or so depending on the demand for heat and hot water. Quite often, one will assume that this is not the cause because the trouble clears once the oil burner is ignited. Since this interference is caused by the aquastat, the noise can and probably will occur just prior to ignition or, more rarely, just as the burner goes off.
- *Aquarium heaters* have the characteristic of being on and off somewhat more frequently, usually every 20–40 seconds throughout the whole day and night.
- *A heating pad* is another device found to be troublesome quite often. Fortunately, they seem to interfere every few seconds with a somewhat rhythmic pattern. One problem with some heating pads lies with the controller switch positions: high, medium, off, and low. Most people will, without thinking, turn the controller to the last position instead of to the off position. This practice causes the pad to cycle on and off almost continuously, resulting in arcing and eventual failure of the thermostat contacts. For the same reason, do not be fooled into assuming that heating pads cause interference only at night!
- *Door-bell transformers* are another common cause of trouble, with a sound very similar to the heating pad: on and off over a short time period (but not quite so rhythmic). These transformers are usually located in a basement or crawl space where the temperature near the device is higher than normal. With the power applied continuously to the transformer, the temperature rises and the internal thermal cutout operates long enough for the transformer to cool down. Once it reaches a safe operating temperature, power is restored and the process starts all over.
- A few others are *older refrigerators* with heated butter conditioners, *heat tapes* used to prevent pipes from freezing, and *dimmer switches*, where the interference varies with the applied voltage to the lamps.

One more worth mentioning that will vary with the weather conditions is the *electric fence* with its rhythmic on and off cycle. Even if you live in a metropolitan area, do not rule this culprit out, as I have located them in the strangest places when people want to confine their household pets.

Locating these sources can be fairly simple, but a good piece of advice is to check at home first, just to save some red-faced embarrassment with your neighbors. Look the list over and see if any of my descriptions fit the bill. If so, next time the interference starts, unplug or shut off the power to the suspected device. If it stops, that is it, and you can take whatever corrective measures are necessary. One note of caution: Interference may not start right after power to the suspected device is restored; the device may have cooled down and will take a short rest before it starts driving you nuts again.

If you do not recognize any of these as your problem, while the main interference is on, go to your service panel and shut off the main while listening to the interference on a portable radio tuned between stations. Even an AM radio will usually suffice here, since spark noise is broadband. If the noise stops when you shut off the power, the cause is something fed from your panel box. Next

time it is on, proceed to the branch circuits and interrupt them one at a time until it stops. Then investigate what is fed from that circuit and you can track it down to the defective device.

If the interference should remain while your power is interrupted, the problem is external to your home. A short walk around the neighborhood is in order. Listen to your portable radio for the peak, or point of loudest interference. Avoid holding your radio near guy wires, down grounds, etc., as this may result in a false reading due to the increased coupling to your antenna. Once you have determined the home with the highest noise level, you will have to get permission from the owner to interrupt his power at his panel box.

A little tact goes a long way here, and you might ask him if he is having an interference problem with *his* radio or TV. Remember that the intensity of the interference will decrease as we go up in frequency, and if your neighbor has UHF TV, for him the problem may be non-existent or very mild. Also, the picture will be affected due to its being amplitude modulated and the sound being FM. Try not to accept his word that he is not having any trouble since he may be listening to a very strong local AM radio station which could mask the interference. In other words, try to look and listen for yourself. Most of the offending devices I have found have been within about two blocks of the complainant's location.

Should you feel that the problem is not a consumer device, you may want to take note of the weather conditions when the interference occurs. The chances are that if the problem is caused by a power line, interference that occurs on dry, sunny days will not be present when the weather is rainy or humid, and vice versa.

Since your receiver has tremendous sensitivity, a small micro spark along the power line can result in a great deal of interference. One of the problems we find often is a hardware condition where lag screws, bolts, washers, and other pole hardware loosen slightly, resulting in microsparking. This type of spark is seldom visible to infrared gear since there is very little heat produced, but oh what a racket in the radio spectrum!

Quite often, hardware problems will show up only on dry, cold days, since in wet weather wooden poles absorb some water, swell out, and, in effect, tighten the hardware. This particular problem can be very difficult to correct 100 percent due to the number of poles that may be affected. Also found troublesome are lightning arrestors, disconnect switches, pole grounds, neutral connections, and, of course, tree contact, kite strings with metallic cores, and other such foreign objects.

If you suspect the power line after you have made a careful, accurate log, including frequencies affected, weather conditions, temperatures, and dates and times of occurrences, for safety's sake do not try to locate the trouble by making any direct or indirect contact with the power line. Do furnish your power company with as much information as possible. Doing so demonstrates two major things to the investigator: your concern for the situation and your knowledge of power-line interference. Patience and perseverance are the two main prerequisites for the solution to these interference problems.■

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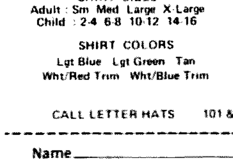

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SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

ST. PAUL MN
JUN 4

The North Area Repeater Association will sponsor the Amateur Fair, a swapfest and exposition, on June 4, 1983, from 6:00 am to 6:00 pm, at the Minnesota State Fairgrounds in St. Paul MN. Admission is $4.00 and children under 12, accompanied by an adult, will be admitted free. Features will include an inside flea market but space is limited and available on a first-come, first-serve basis and tables will not be provided. There will be demonstrations, exhibits, booths, an outdoor flea market, and on Friday, June 3rd, free overnight parking for self-contained campers. There will be food concessions inside and outside, and free parking will be available. Talk-in on .25/.85 or .16/.76. For more information or dealer inquiries, write Amateur Fair, PO Box 857, Hopkins MN 55343, or call (612)-420-6000.

GUELPH ONT CAN
JUN 4

The Guelph Amateur Radio Club (VE3ZM) will hold the 9th annual Central Ontario Amateur Radio Flea Market and Computerfest on Saturday, June 4, 1983, from 8:00 am to 4:00 pm, at Regal Hall, 340 Woodlawn Road West, Guelph ONT. Admission is $2.00 and children 12 years and under will be admitted free. Vendors must pay an additional $3.00. Doors will be open to vendors only from 6:00 am and a quantity of 3' × 8' tables will be available for rental for $5.00 each. Features will include commercial displays, surplus dealers, computer software and hardware, indoor and outdoor displays, and a refreshment concession. Talk-in on 146.370/146.970 (VE3KSR), 147.960/147.360 (VE3ZMG), and .52/.52. For further information contact Al Krist VE3KVI at (519)-821-4337, Henry Christiansen VE3BYU at (519)-743-9022, or write VE3ZM, PO Box 1305, Guelph ONT N1H 4M9, Canada.

GRAND RAPIDS MI
JUN 4

The Independent Repeater Association will hold its annual Hamfestival on Saturday, June 4, 1983, from 8:00 am to 4:00 pm, at the Wyoming National Guard Armory, 44th Street, just east of the US-131 expressway. Admission is $3.50. Free table space will be provided to all sellers and dealer setups will be at 6:00 am. Programs will include ATV, satellites, QRP, DX, a CW rx contest, computers, technical upgrade course, MARS, and a shack-photo contest. Talk-in on 147.165/147.765. For advance table reservations or for more information, call John Knoper KC8KK at (616)-534-5501, or write IRA, 562 92nd Street SE, Byron Center MI 49315.

SALINA KS
JUN 4-5

The Central Kansas Amateur Radio Club (CKAR) will hold the 3rd annual Kansas State ARRL Convention on June 4-5, 1983, at the Red Coach Inn Convention Center, West Crawford and I-135, Salina KS. A free flea market will be held, rain or shine, in the parking lot adjacent to the Center. Other features will include programs on both days for hams, non-hams, and ladies, including a technical program involving amateur radio presented by Jerry Hall from ARRL headquarters. On Saturday evening there will be a banquet and entertainment. For further information, send an SASE to Bill Ringquist KAØCUF, RR #1, Box 155, Gypsum KS 67448.

QUEENS NY
JUN 5

The Ebonaire Amateur Radio Society will hold its 2nd annual hamfest/flea market on Sunday, June 5, 1983, from 9:00 am to 3:00 pm, at Southern Queens Park, 119-09 Merrick Boulevard (near the St. Albans Veterans Hospital), St. Albans, Queens NY. Buyers' donations are $2.00 and each exhibitor's space is $4.00. There will be cover if it rains, and free parking. Talk-in on 145.35/144.75 and 146.52 simplex. For more information, call Vince KA2CPA at (212)-528-0416 or Art WA2VYG at (212)-523-2319, nights.

LOVELAND CO
JUN 5

The Northern Colorado Amateur Radio Club will hold Superfest V on June 5, 1983, from 8:30 am to 3:30 pm, at the Larimer County Fairgrounds, Loveland CO. There will be family activities, technical talks, and a swapfest. Food will be served in the building. For further information, contact Rick Hubbard WAØDDC, 140 23rd Avenue 29, Greeley CO 80631.

ROME NY
JUN 5

The Rome Radio Club, Inc., will sponsor the 31st edition of its Rome Ham Family Day on Sunday, June 5, 1983, at Beck's Grove, Rome NY. Activities will include games, contests, technical presentations, and a giant flea market. Food and beverages will be available throughout the day, which will be climaxed by a buffet-style dinner and the Ham-of-the-Year award. Talk-in on 146.28/.88 and 146.52.

DALTON MA
JUN 5

The Northern Berkshire Amateur Radio Club will hold a flea market on June 5, 1983, at the American Legion Pavilion, North Street, Route 9, Dalton MA. Admission is $1.00 and XYLs and children will be admitted free. Tailgating is free and tables are free on a first-come basis. Refreshments will be sold by the Dalton American Legion.

MANASSAS VA
JUN 5

The Ole Virginia Hams ARC, Inc., will hold the ninth annual Manassas Hamfest on Sunday, June 5, 1983, beginning at 8:00 am, at the Prince William County Fairgrounds, VA Route 234, ½ mile south of Manassas VA. General admission is $4.00 per person (children under 12 will be admitted free) and there will be no advance sales. Activities will include 25 acres of tailgating (setups at 7:00 am), indoor commercial exhibits, breakfast and lunch menus, a YL program, and CW proficiency awards. Talk-in on 146.37/.97 (Manassas repeater) and 146.52. For more information, contact Bob Kelly KA4NES, General Chairman, Manassas Hamfest, c/o Ole Virginia Hams ARC, Inc., PO Box 1255, Manassas VA 22110, or phone (703)-361-9468.

HUMBOLDT TN
JUN 5

The Humboldt Amateur Radio Club will hold its annual hamfest on Sunday, June 5, 1983, from 8:00 am to 4:00 pm, at Bailey Park in Humboldt TN. Admission is $2.00. There will be a flea market, ladies' activities, lunches, refreshments, and RV parking. Talk-in on 146.37/.97. For more information, contact Ed Holmes W4IGW, 501 N. 18th Avenue, Humboldt TN 38343.

CHELSEA MI
JUN 5

The Chelsea Swap and Shop will be held on Sunday, June 5, 1983, at the Chelsea Fairgrounds, Chelsea MI. Gates will open for sellers at 5:00 am and for the public from 8:00 am until 2:00 pm. Donation is $2.50 in advance or $3.00 at the gate. Children under 12 and non-ham spouses will be admitted free. Table space is $6.00 per 8 feet and trunk sales are $2.00 per space. There will be plenty of parking (including for the handicapped) and there are campgrounds available in the area. Talk-in on 146.520 and 147.855. For more information, write William Altenberndt, 3132 Timberline, Jackson MI 49201.

TERRE HAUTE IN
JUN 5

The 37th annual Wabash Valley Amateur Radio Hamfest will be held on June 5, 1983, at the Vigo County Fairgrounds on US-41, ½ mile south of I-70. Advance registration is $2.00 or 3 for $5.00, or $3.00 at the gate (children under 12 will be admitted free). A covered, 12 × 12, flea-market space is $3.00; outdoor flea-market space is free. Some ac and tables will be available on a first-come basis. There will be overnight camping, food and refreshments, and a giant shopping mall nearby. Forums will include computer and ARES. For tickets and detailed information, send an SASE to WVARA Hamfest, PO Box 81, Terre Haute IN 47808.

COEUR D'ALENE ID
JUN 11

The Kootenai Amateur Radio Society will hold their Hamfest '83 on Saturday, June 11, 1983, from 8:00 am to 4:00 pm, at the North Idaho Fairgrounds, Coeur d'Alene ID. There will be free swap tables, a large RV parking area, and food available. Talk-in on 146.38/.98 or 146.52. For further information, contact Vladimir J. Kalina, South 1555 Signal Point Road, Post Falls ID 83854.

BOWLING GREEN KY
JUN 11

The Kentucky Colonels Amateur Radio Club, Inc., will hold the 1st annual Bowling Green Swapfest on June 11, 1983, from 8:00 am to 4:00 pm, at the Jaycee Pavilion, Morgantown Road (off US 231), Bowling Green KY. Donations are $2.50 in advance and $3.00 at the door. Indoor, air-conditioned vendor space is $1.00; outside vendor space will be available and all setups begin at 7:30 am. Proceeds will go for emergency communications equipment. There will be plenty of free parking and concessions will be available. Talk-in on .25/.85 (KA4CLL) or 146.52. For more information or advance tickets, please send an SASE to Jack Wilson WA4SAC, 451 Skyline Tr. Park, Bowling Green KY 42101, or Ed Schwab KA4REF, 1546½ Chestnut Street, Bowling Green KY 42101.

DEAL NJ
JUN 12

The Jersey Shore Chaverim Amateur Radio Club will hold the Jersey Shore Hamfest and Electronic Flea Market on June 12, 1983, from 9:00 am to 3:30 pm, at the Jewish Community Center, 100 Grand Avenue, Deal NJ. Admission is $3.00 per person (children under 12 and XYLs will be admitted free). Indoor space is $5.00 for an 8-foot table and outdoor tailgating is $2.50 per space. Refreshments will be available. Talk-in on 147.045 + .6 and 146.52 simplex. For space reservations, send an SASE and check (payable) to Jersey Shore Hamfest, PO Box 192, West Long Branch NJ 07764 by May 15, 1983.

QUEENS NY
JUN 12

The Hall of Science Amateur Radio Club will hold its annual indoor/outdoor, rain-or-shine hamfest on Sunday, June 12, 1983, from 9:00 am to 4:00 pm, at the municipal parking lot, 80-25 126th Street (1 block from Queens Boulevard), Kew Gardens, Queens NY. Sellers' donations are $3.00, buyers' donations are $2.00, and XYLs and children will be admitted free. Talk-in on 146.520. For additional information, contact Tony Russo WB2OLB at (212)-441-6545 or John Powers KA2AHJ at (212)-847-8007.

BELLEFONTAINE OH
JUN 12

The Champaign Logan Amateur Radio Club, Inc., will hold its annual hamfest and flea market on Sunday, June 12, 1983, beginning at 7:00 am EDST, at the Logan County Fairgrounds, Bellefontaine OH. Tickets are $1.50 in advance and $2.00 at the door. Tables are $3.00 in advance. Talk-in on 147.60/.00 (CLARC/Hi Point Repeater, W8EBG). For more information, tickets, or tables, contact Michael DeVault KU8I, 7157 Road 158, East Liberty OH 43319.

WILLOW SPRINGS IL
JUN 12

The Six Meter Club of Chicago, Inc., will hold its 26th annual hamfest on Sunday, June 12, 1983, beginning at 6:00 am, southwest of Chicago at Santa Fe Park, 91st and Wolf Road, Willow Springs IL. Registration is $2.00 in advance and $3.00 at the gate. There will be a large swapper's row, picnic grounds, plenty of parking space, displays in the pavilion, refreshments, and an AFMARS meeting. Talk-in on 146.52 (K9ONA) or .37/.97 (K9ONA/R). For advance tickets, contact Val Hellwig K9ZWV, 3420 South 60th Court, Cicero IL 60650, or any club member.

GRANITE CITY IL
JUN 12

The Egyptian Radio Club, Inc. (W9AIU), will hold its 54th anniversary celebration and annual hamfest on Sunday, June 12, 1983, at the club grounds near Granite City IL.

AKRON OH
JUN 12

The 16th annual Goodyear ARC Akron Hamfest will be held on Sunday, June 12, 1983, from 10:00 am to 5:00 pm, at Wingfoot Lake Park, near US 224 and SR 43, east of Akron OH. Family admission is $2.50 in advance or $3.00 at the gate. The pavilion is $5.00 per table and the flea market is $2.00 per space. A picnic area and refreshments will be available, as well as free parking. The gate will open at 7:00 am for flea-

market and exhibitor setups. Talk-in on 146.04/.64. For advance tickets and/or reservations, send an SASE to Don Rodgers WA8SXJ, 161 S. Hawkins Avenue, Akron OH 44313, or phone (216)-864-3665.

LEWISBURG PA
JUN 12

The Milton Amateur Radio Club, Inc., will hold its 12th annual hamfest on Sunday, June 12, 1983, from 6:00 am to 5:00 pm, rain or shine, at the Winfield Fire Company grounds on Route 15, south of Lewisburg PA and 8 miles south of exit 31 on I-80. This is a location change from last year and more covered spaces are available. Registration is $3.00 and wives and children will be admitted free. There will be a flea market, an auction, and contests. Talk-in on 146.37/.97 and 146.025/.625. For further details, write Ken Hering WA3IJU, RFD #1, Box 381, Allenwood PA 17810, or phone (717)-538-9168.

DALLAS TX
JUN 16-19

The YL International Single Sidebander's 1983 Convention will be held on June 16-19, 1983, in Dallas TX. Activities will include the DX Roundup, slide shows from Japan and Egypt, and the System Awards Banquet (barbeque style) on Saturday night (with speeches, awards, and a country-western band and dance). Pre-convention activities will begin June 13. Golfing, fishing, and side trips are planned to fill in the hours between ham-radio activities. For more information, please send a business-size SASE (40 cents postage) to Joe Parsons W5UJO or Mary Parsons KC5UO, 1639 Evergreen Drive, Mesquite TX 75149.

COLUMBUS OH
JUN 18

The Battelle Amateur Radio Club will hold its 3rd annual Columbus OH Hamfest on Saturday, June 18, 1983, at the Battelle Memorial Institute Auditorium parking lot, Rte. 315 and King Avenue. Admission is $1.00 and trunk sales are $2.00 per space. There will be free parking. Talk-in on .75/.15 and .52. For more information, call Bill W8LLU at (614)-261-7053 or Kevin WA8OHI at (614)-891-2205.

CORTLAND NY
JUN 18

The Skyline Amateur Radio Club (SARC) will hold its hamfest on June 18, 1983, from 9:00 am to 5:00 pm, rain or shine, at the Cortland County Fairgrounds, I-81, Exit 12, Cortland NY. There will be indoor and outside flea markets. Talk-in on .52. For additional information, write Robert H. Partigianoni, Advertising Chairman, Skyline Amateur Radio Club, PO Box 537, Tully NY 13159, or phone (315)-696-8476.

DUNELLEN NJ
JUNE 18

The Raritan Valley Radio Club will hold its 12th annual hamfest on Saturday, June 18, 1983, beginning at 8:30 am, at Columbia Park, Dunellen NJ. Donations are $2.00 for lookers; sellers' spots are $3.00 each and no tables will be supplied. Food and drink will be available at the refreshment stand and advance tickets may be purchased from any club member. Talk-in on 146.025/.625 (W2QW/R) and 146.52. For further information, call Bob KB2EF or Mary WA2JWS at (201)-369-7038 from 10:00 am to 10:00 pm.

PAYETTE ID
JUN 18

The Treasure Valley Amateur Radio Association will hold its hamfest on June 18, 1983, in Payette ID. Pre-registration is $5.00. There will be games, swap tables, ladies' activities, family fun, and a banquet. For more information, send an SASE to PO Box 790, Payette ID 83661.

LANCASTER OH
JUN 19

The Lancaster and Fairfield County Amateur Radio Club will hold its annual Father's Day Hamfest on Sunday, June 19, 1983, from 8:00 am to 4:00 pm, at the Fairfied County Fairgrounds, Lancaster OH. Admission is $2.00 in advance and $3.00 at the gate. Tables under cover, food, and plenty of free parking will be available. Talk-in on 147.03/.63 or 146.52. For additional information, write Box #3, Lancaster OH 43130.

SANTA MARIA CA
JUN 19

The Satellite ARC will hold its 1983 Santa Maria Amateur Radio Swap FEST and BBQ on June 19, 1983, from 10:00 am to 4:00 pm, at the Union Oil Company New Love Picnic Grounds, south of Santa Maria, off US 101. Admission is free for the swapfest; BBQ tickets are $7.50 for adults and $3.50 for children 6-12 years of age (children under 6 will be admitted free). Swap tables (2' × 6') are available for $2.50. Talk-in on 146.34/.94. For tickets and more information, write Santa Maria Swap FEST, PO Box 2616, Orcutt CA 93455.

CROWN POINT IN
JUN 19

The Lake County (Indiana) Amateur Radio Club will hold its 11th annual Dad's Day Hamfest on June 19, 1983, beginning at 8:00 am, at the Industrial Arts Building at the Lake County Fairgrounds, Crown Point IN. Tickets are $2.50. All events will be held indoors and there will be plenty of food and parking. Talk-in on 147.84/.24 or .52. For further information, contact Denny Tokarz KA9FCG, 6930 Lindbergh, Hammond IN 46323.

FREDERICK MD
JUN 19

The Frederick Amateur Radio Club will hold its 6th annual hamfest on June 19, 1983, from 8:00 am to 4:00 pm, at the Frederick Fairgrounds. Admission is $3.00 and YLs and children will be admitted free. Tailgaters will be charged an additional $2.00; exhibitors' tables are $10.00 for the first and $5.00 for each additional one. Gates will open for exhibitors at 8:00 pm on June 18, 1983, and overnight security will be provided. Overnight parking will be welcomed. For further information, write V. A. Simmons KA3CVD, 7301 Pin Oak Drive, Middletown MD 21769, or phone (301)-371-5735.

WILKES-BARRE PA
JUN 19

The Murgas Amateur Radio Club K3YTL will sponsor the annual Wilkes-Barre PA Hamfest on Sunday, June 19, 1983, beginning at 8:00 am, rain or shine, at the Kingston Armory, Market Street, Kingston PA. Donations are $3.00 (children under 12 and XYLs will be admitted free) with tailgating $1.00 extra per space. Doors will open at 6:00 am for setups only. There will be plenty of food and free parking. Talk-in on 146.61, 146.88, 224.66, and 142.52 simplex. For more information, contact Hamfest Committee, PO Box 1094, Wilkes-Barre PA 18703, or phone (717)-779-3882.

SHELLSVILLE PA
JUL 4

The Harrisburg Radio Amateur Club will sponsor the annual Firecracker Hamfest on Monday, July 4, 1983, at the Shellsville VFW picnic grounds, Exit #27 (follow signs 2 miles to Shellsville), I-81, north of Harrisburg. Admission is $3.00, XYLs and children will be admitted free, and there will be no charge for tailgating. There will be plenty of parking, shade trees, tables, and a pavilion. Talk-in on .16/.76 or .52/.52 simplex. For additional details and table reservations, contact KA3HZW, 131 Livingston Street, Swatara PA 17113, or phone (717)-939-4957.

SPOKANE WA
JUL 8-10

The 5-state ARRL Northwestern Division Convention will be held on July 8-10, 1983, at the Spokane Convention Center, Spokane WA. The Spokane Swapfest (normally in April) will be combined this year with the convention as will be the flea market. Registration is $5.00 and swap tables are $10.00. Events will include displays by manufacturers and dealers, seminars on antennas, computers, VHF/EME, weather, traffic handling, and repeater operation. There will be ARRL and advisory committee forums. Ladies' programs will include a luncheon and style show. The Saturday-night banquet will feature Roy Neal, NBC news correspondent, and the Royal Order of the Wouff Hong ceremony will follow at midnight ($1 admission). The DX breakfast and church services will be on Sunday morning. Close-in RV parking is available. For additional information, write Northwest '83, PO Box 3933, Spokane WA 99220.

MILTON ONT CAN
JUL 9

The Burlington Amateur Radio Club, Inc., will host the ninth annual Ontario Hamfest on Saturday, July 9, 1983, at the Milton Fairgrounds. For more information, write Burlington Amateur Radio Club, Inc., PO Box 836, Burlington ONT L7R 3Y7, Canada.

FARIBAULT MN
JUL 9

The Faribault Amateur Radio Club will hold its 2nd annual swapfest on Saturday, July 9, 1983, from 9:00 am to 3:00 pm, at the Rice County Fairgrounds on the north edge of Faribault MN. General admission is $1.50, admission and selling space is $3.00 (indoor or outdoor), and tables (7-foot and by pre-registration only) are $3.00 each. Lunch and free parking will be available. There will be amateur radio and computer gear as well as electronic equipment displayed. Talk-in on 146.19/.79. For more information, contact Donald Klier, 1118 NW 8th Street, Faribault MN 55021.

OAK CREEK WI
JUL 9

The South Milwaukee Amateur Radio Club will hold its annual swapfest on Saturday, July 9, 1983, from 7:00 am to approximately 5:00 pm, at the American Legion Post #434, 932? South Shepard Avenue, Oak Creek WI. Admission is $3.00 per person and includes a "Happy Hour" with free beverages. Parking, a public picnic area, hot and cold sandwiches, and liquid refreshments will be available on the grounds. There will be free overnight camping. Talk-in on 146.94. For more details, including a local map, write South Milwaukee Amateur Radio Club, Inc., PO Box 102, South Milwaukee WI 53172-0102.

STATE COLLEGE PA
JUL 9

The Nittany Amateur Radio Club will hold a hamfest and computer fair on Saturday, July 9, 1983, beginning at 8:00 am, at the Pleasant Gap Firemen's Park, Route 144, Pleasant Gap PA (just off Route 26, east of State College). Tickets are $3.00; tailgating spaces are $5.00. Talk-in on 146.16/.76 and 146.25/.85. For further information, write Dave Buckwalter KC3CL, 1635 Circleville Road, State College PA 16801, or phone (814)-234-0759.

CROSSVILLE TN
JUL 9-10

The Plateau Amateur Radio Club will hold the Crossvile Hamfest on July 9-10, 1983, at the Cumberland County Community Complex, Highway 70 North, Crossville TN. Admission is $1.00 for adults. Exhibit and flea-market space will be available on a first-come basis. There will be a Dutch-treat dinner on Saturday night. Talk-in on 147.93/.33. For further information, contact the Plateau Amateur Radio Club, PO Box 2621, Crossville TN 38555.

ALEXANDER NY
JUL 10

The Genesee Radio Amateurs, Inc., will hold the ARRL-approved third annual Batavia Hamfest on Sunday, July 10, 1983, from 6:00 am to 5:00 pm, at the Alexander Firemen's Grounds, Rte. 98, Alexander NY (9 miles south of Batavia). Registration is $2.00 in advance and $3.00 at the gate. Features will include a large exhibit area, OM and YL programs, contests, a boat-anchor auction, and overnight camping. Food will be available. Talk-in on 6.52 or 4.71/5.31 (W2RCX). For more information or advance tickets (make checks payable to Batavia Hamfest), write c/o GRAM, PO Box 572, Batavia NY 14020.

INDIANAPOLIS IN
JUL 10

The Indiana State Amateur Radio Convention, in conjunction with the Indianapolis Hamfest and Computer Show, will be held on Sunday, July 10, 1983, at the Marion County Fairgrounds at the southeastern intersection of I-74 and I-465. Gate tickets are $4.00 and entitle you to all activities. There will be inside and outside flea markets, a separate computer show and flea market, a commercial vendor's display

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area, technical forums, club activities, ladies' activities, and professional food services. There will be setups after 12:00 noon on Saturday, July 9th. Security will be provided Saturday night and Sunday, and camper hookup facilities will be available on the grounds. For further information, contact Indianapolis Hamfest, Box 11086, Indianapolis IN 46201.

MONTANA-ALBERTA CAN
JUL 15-17

The 49th Glacier-Waterton International Hamfest will be held on July 15-17, 1983, at Waterton Homestead Campground, just north of Waterton National Park entrance on Highway 6 (Alberta, Can.). There will be a bunny hunt, technical sessions, entertainment, and swap tables. For more information and pre-registration, write PO Box 148, Milk River, Alberta T0K 1M0, Can.

CARY NY
JUL 16

The Cary Amateur Radio Club will hold its eleventh annual Mid-Summer Swapfest on Saturday, July 16, 1983, from 9:00 am to 3:00 pm, at the Lion's Club Shelter (next to Cary Senior High School), Cary NC. There is no admission or commission charge. Featured will be an open auction at 1:00 pm. Talk-in on 146.28/.88, 147.75/.15, and 146.52 simplex.

CANTON OH
JUL 17

The Tusco ARC (W8ZX) and the Canton ARC (W8AL) will present the 9th annual Hall of Fame Hamfest on Sunday, July 17, 1983, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Tickets are $2.50 in advance, $3.00 at the gate, and children under 16 will be admitted free. Flea-market parking is $2.00 and tables are available on a reserved basis at $3.50 each. A check must accompany reservations. There will be forums, dealers, a flea market, food, and XYL activities. Talk-in on 146.52 and 147.72/.12. For reservations or more information, contact Butch Lebold WA8SHP, 10677 Hazelview Avenue, Alliance OH, or phone (216)-821-8794.

BOWLING GREEN OH
JUL 17

The 19th annual Wood County Ham-A-Rama will be held on Sunday, July 17, 1983, beginning at 8:00 am, at the Wood County Fairgrounds, Bowling Green OH. Admission and parking are free. Trunk sales and food will be available. Advance table rentals are $5.00 and are for dealers only. Saturday will be available for setups until 8:00 pm. Talk-in on .52. For more information or dealer rentals, send an SASE to Wood County ARC, c/o Craig Henderson, Box 366, Luckey OH 43443.

POUGHKEEPSIE NY
JUL 23

The Mt. Beacon Amateur Radio Club will hold its annual ARRL hamfest on July 23, 1983, from 8:00 am to 3:00 pm, at the Arlington Senior High School, Poughkeepsie/Lagrange, Dutchess County NY. Admission is $2.00 (XYL and your children will be admitted free), tailgating space is $3.00 (includes one free admission), and a table space is $4.00 (includes one free table and admission). Hot food, beverages, and free parking will be available. There will be an auction beginning at 2:00 pm. Talk-in on 146.37/.97 and 146.52. For additional information, write Art Holmes WA2TIF, 2 Straub Drive, Pleasant Valley NY 12569, (914)-635-2614, or Walt Sutkowski K2DPL, W. Redoubt Road, Fishkill NY 12524, (914)-897-5158.

HAM HELP

I have to say thanks to *73* for the services provided to your readers by the "Ham Help" column. This is the second time I have used it and gotten what I needed. This time I got all the parts I was looking for and even more offers. This is really amateur radio spirit.

Robert Sondack VE2ASL
260 Rue Bellerive
St. Luc, Quebec
Canada J0J 2A0

Our radio club needs the service manuals and schematics for a military-surplus diesel generator, engine PU586/G, contract number NOM72836, manufactured by Electromagnetic Industries, Inc. (Sayville NY), in 1964. I will copy the manual and pay all postage.

Robert Francis KB9RT
809 LeRoy Avenue
Rock Falls IL 61071

I am looking for the schematic and manual for the Clegg Interceptor B.

J. H. Christilaw
38700 Ann Arbor Tr.
Livonia MI 48150

I need the schematics and manual for the Hammarlund HQ-180 receiver.

Bob Johnson K7EYT
E. 16109 Longfellow
Spokane WA 99216

I need to find the schematic and parts list for the Amcomm HB-120 F-series linear amplifier with built-in receive preamp.

David A. Berger WD8EUC
26871 Alessandro Blvd. #53
Sunnymead CA 92388

I need the manual and schematics for a Rhode and Schwarz model ZWA. I will pay for the original or a copy.

John Thomas VE3BVX
58 Albert N.
Lindsay, Ontario
Canada K9V 4J8

I am looking for the schematics for a Gonset G50 6-meter transceiver. I will pay a reasonable price for the original or photocopy of the schematic.

Kenneth H. Johnson WA4TOP
#8 Fairview Drive North
Sun Air Resort
Haines City FL 33844

Wanted: manual for the Hunter Bandit linear amplifier, model 2000C. I will purchase the original or a copy.

Al Wilde W8JZZ
5580 E. Galbraith Rd.
Cincinnati OH 45236

I would like to contact any active ham or marine-service radio operator who would like to show a maritime radio buff what it is like to go "down to the sea in ships" on HF CW and telex.

Norman H. Drechsel WA3KEY
PO Box 498
Quakertown PA 18951

I would like to hear from owners of the Timex Sinclair 1000 who are using it for RTTY, CW, and SSTV.

William Alzaga XE1WAC
PO Box 26 Suc. A
53100 CO Satelite
Mexico

(So would we!—Eds.)

I need the schematic, parts list, and alignment information for two Heath frequency converters, the SBA300-3 (6-meter) and the SBA300-4 (2-meter). I will pay all costs or copy the manuals and return them.

Robert Schlegel N7BH
2302 286th St. East
Roy WA 98580

I would like to obtain an original or a copy of the manual for a 1946 National receiver, number NC-2-40D. I also need *Single Sideband for the Radio Amateur*, published by the ARRL. I will pay all costs.

Robert L. Schreiber
341 Anlen Ave. #2
Glendale CA 91203

I am looking for the manual and schematic for a Demco Demon Fifty CB amplifier; I also need 10-meter conversion information for it. I will pay all costs.

Bill Edwards N8ARW
1930 Youll St. #30
Niles OH 44446

I need manuals, schematics, or other information on the following equipment: TMC low-frequency multi-coupler, model LMC-10/70U; CEI receiver, type 591; CEI signal monitor, type SM-9303A; Northern Radio Company volume- and current-level indicator, type 254, model 1; Northern Radio Company line amplifier, type 103, model 1; Hammarlund SP-600 VLF; and Collins antenna tuner, type 180L-3. I will pay for expenses.

Richard M. McClung WA6KNW/AAT6XB
6106 SW Summit
Lawton OK 73505

I have a Ballantine model 1066S oscilloscope (also known as an AN/USM 398). I would like to borrow a service manual for copying. I will pay all shipping costs.

Kan Cubilo WB8DOI
215 Huron Apt. A
Oscoda MI 48750

Wanted: maintenance manual for the AN/ART-13. I would also like to hear from anyone who has converted this unit to single sideband.

E. Patrick Herrigan N9AVO
5165 S. Magellan Dr.
New Berlin WI 53151

I need manuals and schematics for a Lafayette HA-800 receiver. I will gladly pay shipping and copying costs.

Philip Birdsong
1613 Whippoorwill Dr.
Lawrenceburg TN 38464

SATELLITES

Amateur Satellite Reference Orbits

	OSCAR 8		RS-5		RS-6		RS-7		RS-8		
Date	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
Jun 1	0016	87	0110	276	0056	277	0040	270	0131	280	1
2	0020	89	0105	276	0041	275	0030	269	0128	281	2
3	0024	90	0100	276	0025	272	0020	268	0125	282	3
4	0029	91	0054	276	0010	270	0011	268	0123	283	4
5	0033	92	0049	277	0153	298	0001	267	0120	283	5
6	0037	93	0044	277	0138	295	0151	296	0117	284	6
7	0042	94	0038	277	0122	293	0141	295	0114	285	7
8	0046	95	0033	277	0107	291	0131	294	0111	286	8
9	0051	96	0028	277	0052	288	0122	293	0108	287	9
10	0055	98	0022	278	0036	286	0112	292	0106	287	10
11	0059	99	0017	278	0021	284	0102	291	0103	288	11
12	0104	100	0012	278	0005	281	0053	290	0100	289	12
13	0108	101	0006	278	0149	309	0043	289	0057	290	13
14	0112	102	0001	278	0133	306	0033	289	0054	291	14
15	0117	103	0155	309	0118	304	0024	288	0051	291	15
16	0121	104	0150	309	0103	302	0014	287	0048	292	16
17	0125	105	0145	309	0047	299	0004	286	0046	293	17
18	0130	106	0139	309	0032	297	0154	315	0043	294	18
19	0134	108	0134	309	0016	295	0144	314	0040	295	19
20	0139	109	0129	310	0001	292	0135	313	0037	296	20
21	0000	84	0123	310	0144	320	0125	312	0034	296	21
22	0004	85	0118	310	0129	318	0115	311	0031	297	22
23	0009	86	0113	310	0113	315	0106	310	0029	298	23
24	0013	87	0107	310	0058	313	0056	310	0026	299	24
25	0017	89	0102	310	0043	311	0046	309	0023	300	25
26	0022	90	0057	311	0027	308	0037	308	0020	300	26
27	0026	91	0051	311	0012	306	0027	307	0017	301	27
28	0030	92	0046	311	0155	333	0017	306	0014	302	28
29	0035	93	0041	311	0140	331	0008	305	0012	303	29
30	0039	94	0035	311	0124	329	0157	334	0009	304	30
Jul 1	0043	95	0030	312	0109	326	0148	333	0006	305	1
2	0048	96	0025	312	0053	324	0138	332	0003	305	2
3	0052	98	0019	312	0038	322	0128	331	0000	306	3
4	0057	99	0014	312	0023	319	0119	331	0157	337	4
5	0101	100	0009	312	0007	317	0109	330	0154	338	5
6	0105	101	0003	313	0151	345	0059	329	0151	339	6
7	0110	102	0157	343	0135	342	0050	328	0149	339	7
8	0114	103	0152	343	0120	340	0040	327	0146	340	8
9	0118	104	0147	343	0104	338	0030	326	0143	341	9
10	0123	105	0141	343	0049	335	0021	325	0140	342	10
11	0127	107	0136	344	0034	333	0011	324	0137	343	11
12	0131	108	0131	344	0018	331	0001	323	0134	344	12
13	0136	109	0125	344	0003	328	0151	352	0132	344	13
14	0140	110	0120	344	0146	356	0141	352	0129	345	14
15	0001	85	0115	344	0131	353	0131	351	0126	346	15

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

THE YEAR THAT WAS—1976

Last night, I once again played the videotape of my favorite movie, "So Goes My Love," the story of Hiram Percy Maxim W1AW and his family. You know, no matter how many times I screen this fine film, I never get tired of it. It's just a shame that the copyright laws prevent me from making copies of the film for you readers. It's an amateur-radio classic.

Every ham who has seen this motion picture seems to have his favorite scene. I don't know about you, but my favorite part is where Don Ameche (HPM's pop) gives his pal some phosphorescent hair cream so that he can woo his girl friend in the dark. Wow! Old Hiram must have had quite a family. The only time my dad ever glowed was when he had a few too many Rheingolds at the company picnic. I wonder if they still have any of that ointment in Newington? The stuff would be great to smear over a tower when you have to make emergency repairs during a dark contest night.

This month's topic is the year 1976. You remember 1976, don't you? Lots of big happenings that year, both within ham radio and the world at large. If 1976 was a good year for you, here's hoping this month's FUN! brings back some fond memories. If not, enjoy the puzzles anyway.

ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

Across

1) The year's big celebration
7) QTH ________ Flushing NY
8) Unit of resistance
10) Thailand prefix
11) Programmable memory chip (abbr.)
13) Ham satellite
15) 5-land state or 6-land city (abbr.)
16) Certain type of transistors (abbr.)
17) Electrons in a circuit; river
19) Phone turnover
20) Peru prefix
21) 1976 presidential contestant
22) What many spouses regard ham rig as
23) Former DM-land (abbr.)
24) 2-land state (abbr.)
25) Bunny hunt (abbr.)
27) To accomplish
28) Glass ________
31) Ireland prefix
32) Hams affected by '76 rule changes

Down

1) Messy solder ________
2) Shack tools made first appearance in 1976
3) *73* state
4) Cut antenna wavelength
5) See 24 across
6) Operates 13 across
9) 1976 centennial state; host to that year's national convention
10) Ecuador prefix
12) Ham greeting (abbr.)
14) After contest: ________ wood
16) The Feds (abbr.)
17) See 21 across
18) Old-timer: prospective hams should ________ dues
19) Made Prog Line rigs (abbr.)
20) ARRL snitch (abbr.)
22) Teach hams
24) Organized on-air group
26) What you're reading
27) Canadian ham bosses (abbr.)
29) Tube amplification factor
30) Household power (abbr.)
31) Spain prefix

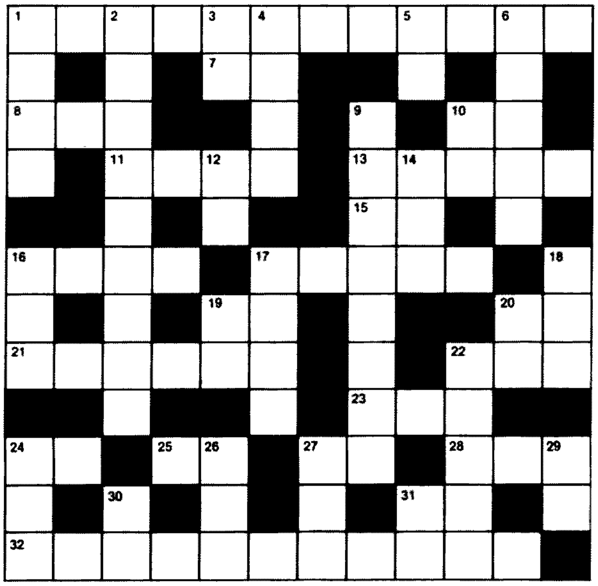

Illustration 1.

ELEMENT 2—MULTIPLE CHOICE

1) What notable contribution to amateur radio did Al Katz K2UYH make on July 29, 1976?
   1) He took part in the first intercontinental OSCAR QSO.
   2) He established the first DX net on 20 meters.
   3) He became the first amateur to qualify for the Worked All Continents award via EME (Earth-moon-Earth) communications.
   4) He became the first ham to work Africa on 2 meters.
2) When the Viking spacecraft landed on Mars, the Jet Propulsion Laboratory Amateur Radio Club relayed its photographic transmissions to amateurs via slow-scan television. What was the special event callsign used, and why was it unique?
   1) The call N6V was the first 1X1 amateur callsign ever issued by the FCC.
   2) The call WMARS was the only amateur callsign ever issued without a numeral.
   3) The call W6 was the shortest ham callsign ever issued.
   4) None of the above.
3) During 1976, the FCC:
   1) Eliminated the requirement to ID as "mobile" or "portable."
   2) Raised the Novice power ceiling from 75 to 250 Watts.
   3) Eliminated the Conditional-class license.
   4) All of the above.
4) In 1976, the first ham station was installed at UN headquarters in New York. Its callsign was:
   1) 4U1UN 2) K2UN 3) WA2MJK/4U1 4) 4U1ITU
5) During the 1976 Montreal Olympics, the official amateur station was:
   1) VE2OLY 2) VE2MTL 3) CZ2O 4) MØNTL

ELEMENT 3—SCRAMBLED WORDS

HCTAPOATU	LECHQUS	FFRATIC	UBLAN
IDESENOT	TEN	RATEX	

ELEMENT 4—TRUE-FALSE

	True	False
1) A new amateur radio magazine (now defunct) introduced in 1976, was titled *Ham Radio Perspectives*.	____	____
2) In 1976, all currently-licensed Novices received Technician-class operating privileges.	____	____
3) The famous "WARC 76" conference gave US hams three new bands.	____	____
4) WL2USA was a special-event station based at the Statue of Liberty.	____	____
5) Among the prominent amateurs to die during 1976 was Dr. Webley Webster W1QSR, inventor of the repeater courtesy tone.	____	____
6) During 1976, the Japan Amateur Radio League celebrated its 50th anniversary.	____	____
7) It was during 1976 that the FCC took the "N" out of Novice callsigns.	____	____
8) Special "bicentennial callsigns" allowed US hams to identify with such exotic calls as AD2IBE and AA2MFR.	____	____
9) Two OSCAR satellites were launched during 1976.	____	____
10) The first ham to work all states on 2 meters completed his effort in 1976.	____	____

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1—3 WAC the hard way.
2—1 Along with sister station N4V.
3—4 Busy year in Washington.
4—2 That was before the UN was a "country."
5—3 And you thought "strange calls" were a very recent development!

Element 3:
(Reading left to right): AUTOPATCH, SQUELCH, TRAFFIC, BALUN, and SIDETONE, NET, EXTRA.

Element 4:
1—False *Ham Radio Horizons*.
2—False It was the other way around.
3—False It was "WARC 79."
4—True During the 1976 Thanksgiving weekend.
5—False W1QSR is just a figment of your columnist's sick imagination.
6—True And it was attended to by much celebration.
7—True Marking the end of distinctive Novice calls.
8—True A taste of calls to come.
9—False No OSCARs were launched in 1976.
10—True Dick Hart KØQMS was the ham.

SCORING

Element 1:
Twenty-five points for the complete puzzle, or one-half point for each question correctly answered.

Element 2:
Five points for each correct answer.

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Element 3:
Four points for each correct answer.

Element 4:
Two and one-half points for each correct answer.

How well have you kept the spirit of '76?

1-20 points—Licensed in 1977.
21-40 points—The body is willing but the spirit is weak.
41-60 points—The mists of time obscure much.
61-80 points—You still drink Billy Beer.
81-100+ points—"Keeper of the Flame!"

B	I	C	E	N	T	E	N	N	I	A	L
L	■	O	■	H	R	■	■	Y	■	M	■
O	H	M	■	■	I	■	C	■	H	S	■
B	■	P	R	O	M	■	O	S	C	A	R
■	■	U	■	M	■	■	L	A	■	T	■
F	E	T	S	■	F	L	O	W	S	■	P
C	■	E	■	G	O	■	R	■	■	O	A
C	A	R	T	E	R	■	A	■	T	O	Y
■	■	S	■	■	D	■	D	D	R	■	■
N	J	■	D	F	■	D	O	■	A	R	M
E	■	A	■	U	■	O	■	E	I	■	U
T	E	C	H	N	I	C	I	A	N	S	■

Illustration 1A

2 GHz Microwave Receiving Systems

The new **Micro-System** features a machined 18" parabolic reflector for maximum efficiency, a linear feed-point downconverter with ceramic high performance RF preamplifier transistor, a variable 12 to 18 volt regulated power supply and 50' of 75Ω coaxial downlead, including a 3' jumper and matching transformer. The **Micro-System** includes a full 6 month warranty.

Micro-System (MS-021) $159.95
Micro-System (MS-578) $169.95
Micro-System (MS-645) $179.95
Shipping & Handling: USA ... $4.00 AK, HI & PR ... $10.00

Data Service Company 612-636-9469
✓346 3110 Evelyn Street
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HB33SP	3 El 13'2" Boom 27 Lb 3KW Max Pwr - Compact	$189.95 +ship.
HB43SP	4 El 19'8" Boom 38 Lb 3KW Big Signal Performance	$249.95 +ship
HB34D	4 El 16'5" Boom 34 Lb 3KW Slightly Larger Than 33SP	$219.95 +ship
HB35T	5 El 24'7" Boom 50 Lb 3KW "THE ULTIMATE"	$349.95 +ship

ALSO AVAILABLE

HB40NL3	3 El 40M Monoband	$379.95
HB40NL2	2 El 40M Monoband	$254.95
AX210NW	2 X 20 El 2M Array Twin "Cross Yagi" Cir. Polar	$209.95 +ship
KR-400	Med Duty Rotor	$119.95
KR-500	Elevation Rotor	$189.95
GDX-2	4 Band Discone Ant 6M Thru 70CM	$ 69.95 +ship

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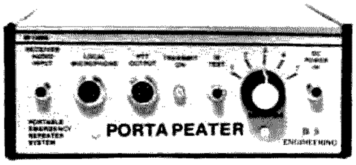

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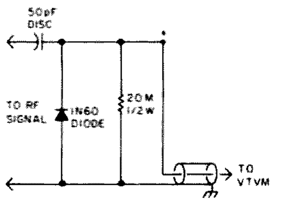
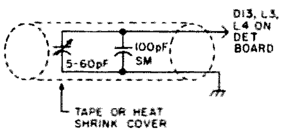
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*

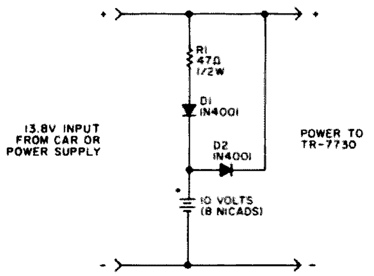


A SIMPLE RF PROBE FOR A VTVM: Your VTVM can measure peak voltage up to 200 MHz by using this probe. The maximum rf that can be measured is determined by the diode; with a 1N60, the probe is limited to 30 V. To increase the capacity, substitute a higher-voltage small-signal-detector diode. Be sure to house the circuit in a metal enclosure and use shielded wire. —Ed Schilling K5RSO, Fairfax VA.

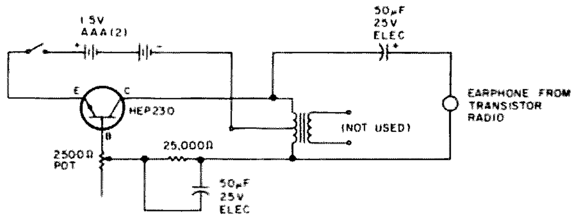


IMPROVING IC-730 SELECTIVITY FOR RTTY: This temporary modification enables the IC-730's CWN filter on LSB. On the second i-f board, connect the purple jumper from P2 to J7 and the white jumper from P3 to J6. This disables the FL-30 PBT filter and connects the FL-45 CWN filter in USB, LSB, and CW, but not CWN. However, the i-f shift still works. The figure shows a parallel capacitor network which should be connected underneath the detector board to the junction of D13, L3, and L4. The other lead goes to ground through one of the detector board's mounting screws. Keep the leads as short as possible and when you cover the network, leave room to adjust the trimmer. To tune up, put the rig in LSB, tune an incoming signal to 2200-Hz audio, and peak the trimmer capacitor for maximum audio output. You will have to retune as you trim to keep the audio at 2200 Hz. The transmitted and received AFSK tone centers will be about 1500 Hz below the LSB dial reading. Do not use modes other than LSB RTTY while this modification is in place.—Lance Holt N9CDD, Biloxi MS.

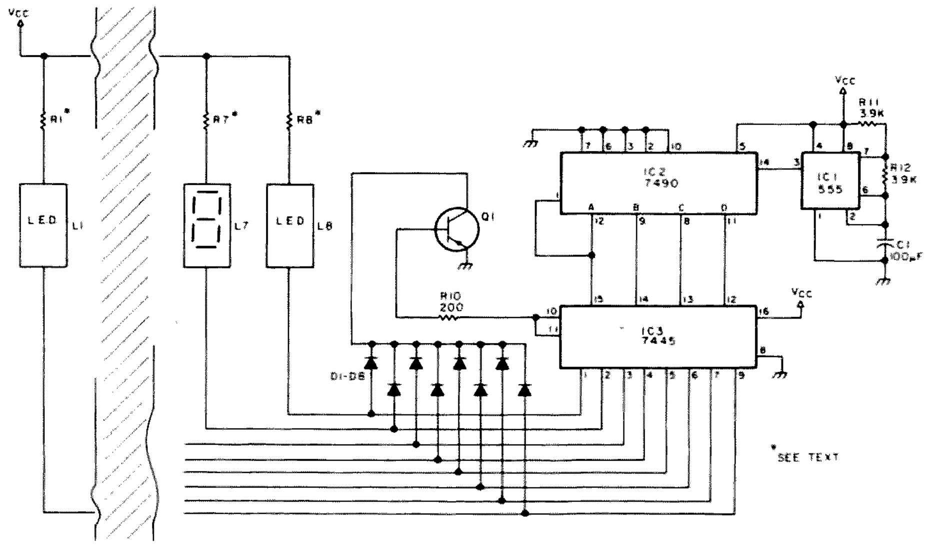
CRYSTAL FREQUENCY SHIFT: Another way of moving a crystal's frequency, besides padding with capacity, is to insert series inductance. Depending on the crystal's characteristics, frequency changes of about 1000 ppm may be obtained with 20 to 30 uH.—Bob Raker WB8ZFF, Cincinnati OH.



MEMORY BACKUP FOR THE KENWOOD TR-7730: This circuit will retain the frequencies in memory while moving the rig from car to house and vice versa. When connected to an external power source, battery B1 is charged through R1 and D1. D1 prevents B1 from discharging when connected to an external supply that is turned off. When external power is removed, D2 provides a current path to the TR-7730 to retain the memory's contents. However, the TR-7730 power switch should be turned off before external power is removed, since B1 will not provide power for normal operation.—William Gouge WB9ALH, Plainfield IN.



THE FISHERMAN'S FRIEND: The click-click sound lures fish to the vicinity, where your bait or lure can do the rest. The transformer is a subminiature type with a 500-Ohm, center-tapped primary and a 3.2-Ohm secondary. Put the circuit in a watertight container and lower it into the water.—Ed Schilling K5RSO, Fairfax VA.



PUT A NAME IN LIGHTS: This circuit will enable you to put a name or callsign in lights using seven-segment LEDs. The display will spell the desired name out sequentially. Select the correct type of LED from a Poly Paks grab bag. Solder the correct leads together to form the letters you want. After mounting the displays on perfboard, calculate the current necessary for the display. Allow 15 mA per segment. Select the appropriate current-limiting resistor. The 7445 can only sink 80 mA, so a PNP transistor is needed to handle the current required to light up the letters. The heart of the circuit is a 555 oscillator into a 7490 decade counter, which is decoded by a 7445 open-collector driver chip. Make your case with two pieces of Plexiglas™ just slightly larger then the perfboard. Space the Plexiglas with four 10-32 bolts, using chrome-plated bolts to make it extra fancy. To cut costs, use a 7-volt supply, series-up a few diodes (1N4001s), and use the .6-volt drop to kill a few volts. An on-off switch is not needed; current consumption is about ½ cent per 24 hours. In one afternoon, you can produce a unique gift! I gave one to a girl in school and now she's my wife!— Alex J. Piechocki, Edison NJ.

NEW PRODUCTS

Trio-Kenwood's TR-7950 2m FM transceiver.

ITC-32 INTELLIGENT TOUCHTONE™ CONTROL BOARD

Advanced Computer Controls has introduced its new ITC-32 intelligent touchtone control board. The ITC-32 addresses the universal need for touchtone control in amateur radio, commercial, and industrial applications with microcomputer-based flexibility and state-of-the-art Mitel tone decoding (no PLLs).

The ITC-32 provides 28 remotely controllable logic outputs and 4 remotely sensed inputs. Morse code or tone-encoded response messages verify command entry and enable remote interrogation of output and input logic states. Eight of the 28 outputs are buffered for high-current/high-voltage drive capability, such as for direct relay drive. The other 20 outputs are TTL compatible levels. The outputs may be commanded singly or in groups, allowing a variety of control possibilities, such as antenna direction, PL frequency, and gain controls. An additional command allows BCD programming for control of remote-base frequency synthesizers.

The logic inputs may be interrogated or may function as alarm inputs, such as for intrusion detect, over-temperature, or flood indication with external sensors. Optional connection to our telephone interface board allows land line control and auto-dial-out on alarm conditions.

The ITC-32 provides several additional capabilities. A basic repeater COR/ID/Timer function is included, so that the board may serve as a low-cost controller for simple repeaters, or for controlling remote receiver links. This capability makes the ITC-32 a perfect low-cost "starter" controller for a new repeater. Later, when you're ready to upgrade to more sophisticated control, you won't have any trouble finding other uses for the ITC-32.

Another feature is selective call decoding for use in the shack. The ITC-32 can keep your receiver silent until someone dials your touchtone access code to contact you, in addition to providing remote "home control" over a repeater or simplex frequency.

The ITC-32 will find amateur-radio applications in repeaters, remote receiver sites, remote bases, and home control. It's based on the popular Vector 4.5" x 6.5" 44-pin-edge-connector format, for easy integration into any system. It operates from a single 8- to 14-volt power supply.

For more information, contact *Advanced Computer Controls, 10816 Northridge Square, Cupertino CA 95014; (408)-749-8330.* Reader Service number 481.

2-METER MOBILE TRANSCEIVERS

The latest additions to the Trio-Kenwood line of 2-meter mobile transceivers are the TR-7950 and the TR-7930, identical in features except for rf output: a husky 45 Watts for the TR-7950, and a more modest 25 Watts for the TR-7930. The most notable features include a large, easy-to-read LCD display, 21 multi-function memories, automatic offset, programmable priority channel, memory and band scan, long-life lithium battery memory backup (est. 5-year life), built-in 15-key autopatch, and a host of accessories, including an optional 3-frequency sub-tone unit, with keyboard-selectable sub-tones.

Additional information on these models may be obtained by contacting the local Kenwood dealer, or by writing to *Trio-Kenwood Communications, 1111 W. Walnut St., Compton CA 90220.*

SUPPLEMENT TO *SW HOBBY EQUIPMENT REVIEW*

The International DXer's Club of San Diego has announced the new 1983 supplement to its popular *SW Hobby Equipment Review*. This supplement is 194 5½" x 8½" pages in loose-leaf form. A quarterly update also is available on a subscription basis, as well as a leatherette ring binder with the club's logo. The first update in March will contain full coverage of the new Icom and Kenwood.

For additional information, contact the *International DXer's Club of San Diego, 1826 Cypress St., San Diego CA 92154; (619)-429-9728.* Reader Service number 487.

NXL-1000 INDOOR SHORTWAVE ANTENNA

Contemporary Electronic Products has announced their innovative new NXL-1000 indoor shortwave antenna. Unlike other active indoor antennas, the NXL-1000 employs a Faraday shield for maximum rejection of man-made noise, which is so often a problem for the amateur or SWL. In addition, the NXL-1000 has a built-in crystal calibrator with selectable 1-MHz and 100-kHz markers. This is a great help with uncalibrated or poorly calibrated receivers.

The NXL-1000 covers the 1.5-30-MHz range in three ranges. A high-Q selective circuit provides excellent rejection of unwanted frequencies. This can be a valuable asset with receivers having poor front-end selectivity or marginal image rejection. Internally generated noise, a problem with some active antennas, has been substantially reduced in the NXL-1000.

The NXL-1000 can provide performance comparable to a long-wire antenna and allows even better reception than an outdoor antenna in high-noise environments. By adjusting the orientation of the loop via the AZ-EL mount, local signals and noise can be almost totally nulled out.

The NXL-1000 can be conveniently placed on a desktop. The cabinet measures just 3 by 5-1/4 by 5-7/8 inches (HWD). The loop is only 12 inches in diameter. For additional information contact *Contemporary Electronic Products, PO Box 570549, Miami FL 33157.* Reader Service number 480.

NEW RTTY PUBLICATIONS

Universal Electronics, publisher of RTTY station lists, has added two new titles to its publications: *Radioteletype Press Broadcasts* and *World Utility Frequency and Call Sign Guide*. These books contain the latest information on RTTY stations around the world.

Radioteletype Press Broadcasts is divided into two lists for easy access. The first list is in chronological order for each half-hour segment of the 24-hour day. Each segment lists the agency that will be on the air at that time. The second list gives detailed time and frequency schedules by press agency. Also included is an alphabetical listing of agencies around the world, with an accurate cross-reference listing by country.

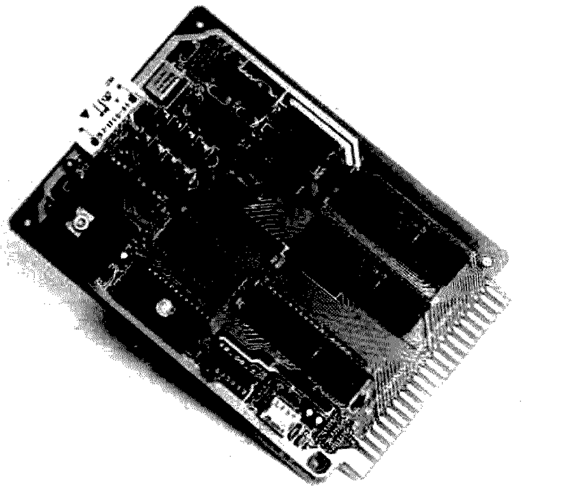
World Utility Frequency and Call Sign Guide gives detailed information on many utility stations around the world. Both books are printed in an 8½- x 11-inch format for quick reference and are guaranteed to contain the latest data available anywhere in the world.

For more information, contact *Universal Electronics, Inc., 1280 Aida Dr., Reynoldsburg OH 43068; (614)-866-4605.*

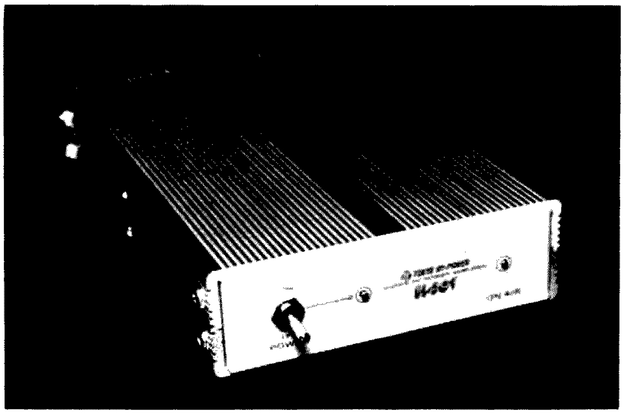
VHF LINEAR AMPLIFIER FROM ENCOMM

Tokyo Hy-Power Labs, Inc., has announced its new VHF linear amplifier, the 30-Watt HL-30V, for use with portable 2-meter radios.

The HL-30V is a high-quality, easy-to-use, 30-Watt VHF amplifier. It is designed to be driven to maximum output power with only 3 Watts drive from hand-held radios. It will take 1-5 Watts drive, with 1 Watt delivering about 10 Watts output. This neat little amplifier is perfect for turning your hand-held



ITC-32 intelligent touchtone control board from Advanced Computer Controls



Encomm's HL-30V VHF linear amplifier.

The Apollo Q-1 satellite receiver/downconverter from National Microtech, Inc.

2-meter transceiver into a powerful mobile rig (or base station with appropriate power supply).

This versatile linear amplifier operates on 13.8 volts dc and draws approximately 4 Amps maximum during transmit. It utilizes carrier-operated switching-(COX) with no delay and has SO-239 connectors. The HL-30V measures approximately 4" W × 6" D × 1" H (100 × 158 × 30 mm) and weighs 520 grams.

Also available from Encomm is the HL-32V. This amplifier is similar to the HL-30V except it has an FM/SSB switch to allow SSB/CW operation and a high/low power switch which cuts output power by one half.

For more information, write *THL Sales Department, Encomm, Inc., 2000 Ave. G, Suite 800, Plano TX 75074; (214)-423-0024.* Reader Service number 482.

SMR WEATHER FACSIMILE RECORDERS

Two weather facsimile recorders recently introduced by SMR, Inc., can take the guesswork out of weather forecasting for the cruising yachtsman.

The SMR SF-505 offers numerous features. The unit provides receiving capabilities on six crystal-controlled channels with a frequency range of 3 to 24 MHz. Designed for vertical or horizontal mounting, the compact weather recorder offers approximately 29 hours of continuous receiving time on one roll of paper. Other features of the SF-505 include a heavy-duty cast aluminum cabinet, automatic and manual phasing, 120-rpm paper speed, vfo spot and fine tuning, built-in signal meter, and contrast control.

The SMR SF-502 is a sophisticated weather recorder that features 12 channels in three different frequency bands. Frequency bands, with four channels in each band, include 3 to 6 MHz, 6 to 12 MHz, and 12 to 24 MHz. Other features include three scanning speeds, multiple voltage capacity, automatic and manual phasing, black and white inversion capacity, crystal-controlled independent synchronizing, vfo spot and vfo fine tuning, built-in receiver, and a cast aluminum housing.

For further information, contact *SMR, Inc., 1401 N.W. 89th Court, Miami FL 33172; (305)-591-9433, FL (800)-432-7142, National (800)-327-6790.* Reader Service number 488.

EX-1000 DESOLDERING HANDPIECE

Automated Production Equipment has announced the Model EX-1000 desoldering handpiece with new improved heater element. The shorter element means shorter solder-travel path, resulting in clog-free operation. The shorter heater also requires less wattage, giving cooler operation for added operator comfort as well as significant energy savings.

For more information, contact *Automated Production Equipment Corp., 142 Peconic Ave., Medford NY 11763; (516)-654-1197.* Reader Service number 484.

SATELLITE RECEIVER/ DOWNCONVERTER

National Microtech, Inc., has announced the addition of the Apollo Q-1 satellite receiver and downconverter to its broad product line. The Apollo Q-1 features push-button transponder selection, automatic polarity control, an audio-in signal-strength meter display, a built-in modulator, and many more features. The Apollo Q-1 is packaged in a wood-grain cabinet with black anodized faceplate. A separate downconverter with integral LNA power block completes the package.

For additional information, contact *National Microtech, Inc., PO Drawer E, Grenada MS 38901.* Reader Service number 483.

UNGAR 9300 SOLDERING IRON USES THERMO-DURIC™ HEATING ELEMENT

A new System 9300 soldering iron introduced by Ungar, Division of Eldon Industries, Inc., uses Ungar's recently developed Thermo-duric heating element, which heats more efficiently and recovers faster than previous models.

The element is nonmagnetic, and the iron conducts static electricity from the tip to a grounded wall plug. Both factors prevent static-electricity damage to microcircuits.

A thinner, cooler handle than those of other models was made possible by the smaller heating element. An operating temperature of 700 or 800 degrees F is determined by the heater, which can be quickly changed. Any of five standard Ungar tips can be used with either heater.

Further information is available from *Ungar, Division of Eldon Industries, Inc., 100 West Manville St., Compton CA 90220; (213)-774-5950.* In Canada: *Eldon Industries of Canada, Inc., 500 Esna Park Dr., Markham, Ontario, L3R 1H5 Canada; (416)-495-9407.* Reader Service number 485.

HAL'S CWR6750 TELEREADER RECEIVE-ONLY RTTY/CW TERMINAL

Hal Communications Corporation has announced the new CWR6750 receive-only RTTY/CW terminal. The CWR6750 is the ideal companion to a shortwave receiver for printing amateur and commercial Morse code and RTTY transmissions. Its small size, the built-in green screen video monitor, and 12-volt operation make the CWR6750 a truly portable unit. The CWR6750 will receive all standard radio-teleprinter speeds from 60 words per minute (45 baud) to 300 wpm (300 baud). Both the standard press Baudot RTTY code and the computer ASCII RTTY code may be received. Stations using the continental Morse code may be received at speeds from 4 to 50 wpm. A computer-style ASCII printer may be connected to the CWR6750 to obtain a full printed copy of all received text. The CWR6750 measures only 10¼ inches wide, 6½ inches high and 11 inches deep. It weighs only 9 lbs. and operates from any 11- to 14.5-V-dc source, drawing 1.6 Amperes. The CWR6750 is easily installed in a camper or boat or right in your own home station because it occupies so little space. Connect the CWR6750 to your shortwave receiver and see what you've been missing.

Hal's CWR6750 Telereader receive-only RTTY/CW terminal.

For more information, contact *Hal Communications Corp., Box 365, Urbana IL; (217)-367-7373.* Reader Service number 486.

NAVAJO CALL-LETTER BELT BUCKLE

Lee-Art, Inc., has introduced an inlaid call-letter belt buckle hand-crafted by Navajo Indians. (The 73 logo is also available.) The nickel-silver buckle is highly polished and beautifully inlaid with genuine stones. The call letters may be inlaid with blue torquoise, rust coral, white abalone, mother-of-pearl, or ironwood brown. Each buckle has four lightning bolts carved and inlaid in yellow. The entire buckle is enhanced with carved designs around the call letters, the lightning bolts, and the outside edge of the oval, and carved feathers add a further touch. The buckles come in two sizes, medium (2.6" × 3.6" oval) and large (3" × 4" oval).

For further information, contact *Lee-Art, Inc., 112 N. Main Street, Shamrock TX 79079.*

Lee-Art's call-letter belt buckle.

REVIEW

FLICK OF THE SWITCH— KENWOOD'S TS-430S

Over the past several years, various solid-state HF rigs have been introduced to the ham marketplace. Some were small, some were large, and some recent units offered digital frequency readout, i-f shift, notch filtering, and even a memory frequency. Some of the rigs are only memories themselves.

This weekend I had the enjoyable use of Kenwood's most recent entry, the TS-430S. This small box is the most fascinating ham radio I have ever seen, and I have seen and worked on about all there is on the market. In addition to being a very state-of-the-art ham rig, the TS-430S is also a great SWL receiver.

The TS-430S is all solid-state with digital frequency readout, dual vfo's, and 8 continuously programmable frequencies, and that is just for starters.

Construction

State of the art requires careful planning and engineering in the design of a reliable and easy-to-operate piece of equipment. The TS-430S is an excellent example of state of the art.

Kenwood has maintained their usual grey colors on the new unit, and has, fortunately for my tired eyes, retained the blue fluorescent digital frequency readout. The front panel of the TS-430S is loaded with controls, 38 of them to be exact. But don't let all that scare you. This is a "no-tune" rig. Basically, you select the frequency and mode, set the volume and mike levels, and you are ready to go on the air. The other controls are used in selecting accessories such as the noise blanker, i-f shift, attenuator, etc. Also on the front panel is a small keyboard. This is the heart of the memory and program system. From here you can preselect frequencies and modes of operation to be later utilized at the flick of a switch.

Inside, the rig has a very clean layout with separate boards for each major functional block, with plug-in wiring harnesses used between them. Space has been left for user installation of optional filters and the FM unit (FM-430). The rig appears to be a technician's dream. There is even a provision for 10-Hz readout, requiring the clipping of a wire, and WARC band usage by clipping another wire. These operations are well documented in the well-written owner's manual.

On the rear panel is a very large heat sink to cool the finals, and a fan has been installed to aid in this cooling. Unlike other solid-state rigs with fans that run during all transmissions, this fan only operates when the temperature of the heat sink exceeds 122°F (50°C), and then it is ultra quiet.

Operation

The operation of the TS-430S proved to be more than expected from such a small package. Most of my normal hamming is on 40 and 75 meters, so naturally I started there with the new rig. Initially, I programmed the frequencies of nets I operate on into the rig, and then with a flick of the switch I was able to move from one frequency to the next. It is interesting to note that when programming a frequency into the unit, the mode (USB, LSB, AM) is also programmed. This is nice when moving from a 20-meter net to a 40-meter net. All you have to do is flick the switch. Early in the day, on 75 meters, I set the unit to scan the memory frequencies. This allowed me to monitor activity on each of several nets. I then set the squelch (yes, I said squelch) above the noise threshold and enjoyed quiet until a net became active. I note here that each programmed frequency is scanned; however, when a busy frequency is encountered, the unit will continue to scan unless you transmit, after which it will continue to scan.

Everyone I talked with remarked about the high quality of the audio signal. All said it was great, and more than one said it "must be a Kenwood." No station was apprised of what rig I was running until after signal reports had been exchanged. One glitch I found was that when using the speech processor, you must be very careful not to over-drive the unit, as distortion will result. This would no doubt vary depending upon the mike each individual uses. The only other glitch will be covered shortly.

Speaking of the speech processor, it worked quite well on DX. I found it particularly useful on 10 meters when the band was going out. Its use was the difference between QSO and no QSO.

On 40 meters SSB at night, the home of all those international broadcasting stations, I was able to enjoy easy communications; just a twist of the notch filter was needed. Herein lies the other glitch. The notch filter, while very effective, is very sensitive in adjustment. I found that I was able to silence a 20-dB heterodyne and work an S9 signal. Notice I said silence, not reduce. . . silence!

I made several DX contacts on 40 meters using split frequencies. Very easy to accomplish when you have two vfo's. I also found CW operation to be quite good, and this rig had no optional filtering installed. I utilized the i-f shift and notch filter. I have not mentioned the VOX or attenuator since they are commonplace on most rigs and work well on the TS-430S.

I had a guest over one evening, and since he is an avid SWLer, I turned the controls over to him. First he programmed in the frequencies of his favorite stations, and then we memory-hopped all over the world at the flick of a switch. The sensitivity and selectivity were judged to be just short of fantastic. Surprisingly, there are no apparent shortcomings or compromises made in this versatile little rig. It is equally suitable for SWL or ham. We did, however, agree that the 6-kHz optional filter would be an asset for SWL.

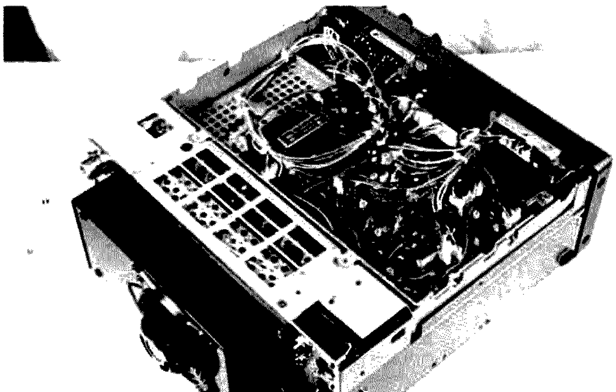
I am now able to listen to Radio Australia while I have breakfast, and the now famous

Transmitter coverage	160 to 10 meters
Receiver coverage	150 kHz to 30 MHz
Modes	SSB, AM, CW, FM
Size	10.6" × 3.8" × 10.8"
Weight	14.3 lbs.
Transmitter power	250 Watts PEP
	200 Watts CW
	60 Watts AM
Receiver sensitivity	SSB— .25 microvolts (160-10 meters)
	AM— 2.5 microvolts (160-10 meters)
	SSB—2.4 kHz at -6 dB
	AM— 4.4 kHz at -60 dB
Receiver i-f rejection	More than 70 dB (ham bands)
Receiver image ratio	More than 70 dB (ham bands)
Power requirements	13.8 V dc 1.2 Amps on rx, 20 Amps on tx

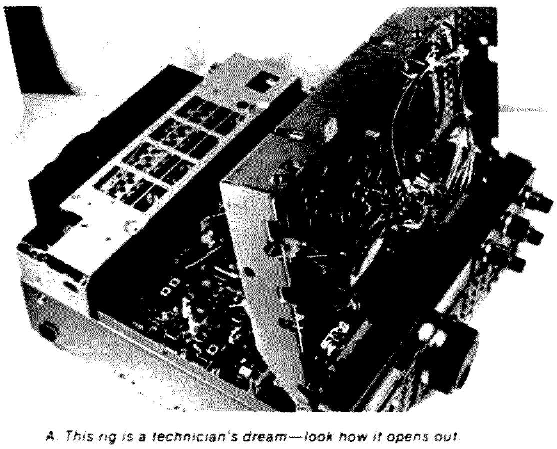
Table 2. TS-430S specs.

Antenna used	**160 meters**	**Marconi**
	10, 15, 20 meters	**Ground plane at 35'**
	40, 75 meters	**Inverted vee at 40'**
	SWL	**Marconi**
Power for operation	**12-volt storage battery**	
Mike	**Kenwood MC-50**	

Table 1. TS-430S testing conditions.



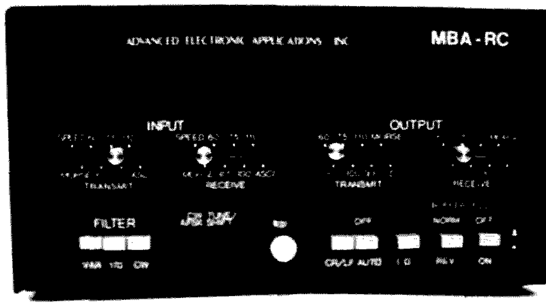
B. Note the size of the heat sink and see all those plug-ins used for interconnects. Space for the FM unit can be seen on the left.



A. This rig is a technician's dream—look how it opens out.

C. The fan and sockets for future expansion (transverter, remote, and accessories).

D. The TS-430S—38 controls, count 'em!



AEA's MBA-RC.

flick of a switch switches me to my morning net on 75 meters.

Recap

All in all, I feel that Kenwood has made the TS-430S a real winner. I am able to replace a whole deskful of equipment with this one small rig. Out goes the shortwave receiver, the tube HF rig with its external vfo and digital readout. I did not attempt mobile operation; however, I can see no reason for this unit not being tops in mobile HF operation. It can work 10-meter FM with the installation of the FM-430. Besides, if you get tired of hamming, you could always program your favorite AM band stations into memory and at the flick of a switch listen to music or news (arghhh).

Now I think I'll make a flick of the switch and get back on 75 meters.

For more information, contact *Trio-Kenwood Communications, 1111 West Walnut Street, Compton CA 90220.*

Bill Clarke WA4BLC
Fall Church VA

AEA MORSE/BAUDOT/ASCII READER/CODE CONVERTER

Can a ham find happiness with a modest dipole antenna and a CW-only rig? Sure he can; just throw in a high-tech accessory like Advanced Electronic Applications' Morse/Baudot/ASCII reader/code converter, the MBA-RC. AEA is no newcomer to the code reader business. For two years they've been getting plenty of raves about their MBA-RO, a read-only converter that was reviewed in the January, 1982, issue of *73*.

Don't let the MBA-RC's lunch-box size fool you. A natural for portable or even mobile operation, it will also hold its own in your home shack. Hookup couldn't be simpler: You'll need a 12-volt power supply (two Amperes or better) and cables to your rig's audio output for receive and to the microphone and key jacks for transmitting. AEA even includes a small kit of connectors to make your life easy. Gone are the days when RTTY operation required a roomful of clanking Teletype™ machines and a special terminal unit.

The MBA-RC consists of two converter circuits, one for transmitting, the other for receiving. The receiving converter accepts an audio input (Morse, Baudot, or ASCII) and outputs your choice of Baudot (serial only) or ASCII (serial or parallel). The transmit converter accepts Morse, Baudot (serial), or ASCII (parallel or serial) inputs and outputs your choice of Morse, Baudot, or serial ASCII either in a two-tone audio signal or transistor-level switching. The ASCII signals can be 110 baud, Baudot speeds are 60, 67, 75, and 100 wpm, and Morse may be 3 to 80+ wpm. Working in parallel with the receive converter output is a 32-character fluorescent display. Differences between input and output speeds are accommodated by a 1000-character buffer. Still confused? Perhaps the block diagram in Fig. 1 will help straighten things out.

All of this power is made possible by using two microprocessors and 43 other ICs. Three circuit boards hold all the parts: one for analog functions, a second for digital chips, and a third for the display and front-panel controls. Even with this modular approach, point-to-point wiring is kept to a minimum to ensure maximum reliability. Good design is backed up by careful construction and a 48-hour burn-in for all units. After the sale, service starts with, but is not limited to, a 90-day warranty.

Despite an impressive array of controls (13 on the front, six on the back), the MBA-RC is easy to operate. Ten minutes after unpacking the box, I was tuning across 40 meters. First I explored the Novice subband where an abundant source of sloppy fists let me check out the unit's ability to copy CW. Just as I expected, the computer reader worked well with only about two-thirds of the signals, failing on the others either because of QRM or poor character formation on the sending end.

Tuning down to 7.080 MHz, I found W1AW spitting out code practice at a brisk 30 wpm, too fast for me to copy without the aid of the reader. A change in speed didn't faze the MBA-RC a bit, with the display's rightmost two characters quickly updated with the new rate. When a jammer showed up frequency, I just tweaked the converter's passband control and missed hardly a letter, confirming my suspicion that the MBA-RC's two-stage active filter (300 Hz to 2 kHz) helped make up for the HW-16's lack of the bells and whistles found on most newer rigs.

I really put the MBA-RC's processing circuitry to the test on 80 meters where I found a few RTTY signals immersed in noise. It took a steady hand and the aid of the converter's LED mark-space indicators to copy anything meaningful. Later, when the QRN subsided, I even found a couple of stations using 850-Hz shifts and got a chance to try the variable shift filtering. Also available but little used is a Normal/Reverse switch for signals that are "upside down."

CW reception using the converter was as good as any I had seen with dedicated readers and better than what you might get with an interface/computer combination. This came as no surprise; the MBA-RC uses the same kind of decoding algorithm found in the MBA-RO. RTTY reception was successful when signal levels were strong, equaling the performance you would expect from a low- to mid-priced terminal unit.

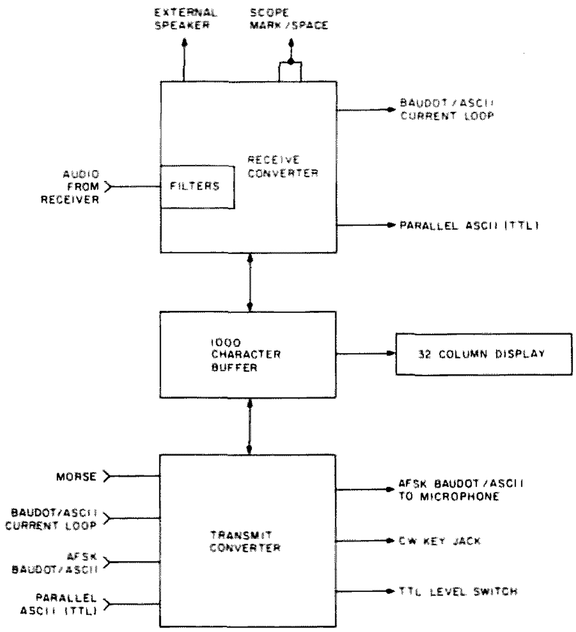


Fig. 1.

Although the 32-character display was long enough to display whole words and some sentences, it still took practice to keep up with its scrolling. Rather than rely on my head for storing information, I learned to use a pencil and paper, jotting down notes as the words marched by. At first I thought the converter was lapsing into gibberish, but later I discovered that the strange symbols I was seeing were just special teletype characters like BELL and CR (carriage return). And although I didn't encounter any, the MBA-RC is programmed to handle several foreign language characters in addition to the usual uppercase alphabet and numerals.

CW and RTTY reception turned out to be the easy part of the review. Limited to a CW-only rig, I couldn't take the quick and dirty way out and use the microphone jack for audio shift keying. My attempts at modifying the HW-16's vfo for frequency shift keying were only partially successful. The instability of the shift was enough to wreak havoc on the receiving end, but not so bad that I couldn't verify the converter's performance.

Using a straight key as an input and RTTY as the ouput, I started by just sending tones to a tape recorder and then playing them back to see how well I did. Luckily, the same forgiving CW-reading algorithim used on receive must be used for transmit, and I managed to prove that if you have a good enough fist, the fellow on the other end won't even know that you're generating RTTY without a keyboard. Of course, there is no provision for sending a carriage return or line feed with Morse code, so you have to rely on the converter to insert this automatically after each line. A nice bonus is the ID buffer. It allows you to store up to 40 characters which can then be used in any output mode. For example, you could load in your callsign and then identify in RTTY, switch to CW out, and identify again in Morse code. The ID capability is used in a similar fashion to set the transmit speed for CW output.

The strange feeling that accompanies sending RTTY via CW is topped only by the use of the MBA-RC as a speed converter for CW operation. You can rip along at 25 or 30 words per minute, storing the excess characters in the buffer, and at the same time hear what was being sent several seconds ago transmitted at ten or even five words per minute.

Moving from the unusual to the ridiculous, consider this possibility: You're receiving CW and printing it out on an ASCII printer driven by the MBA-RC's RS232 port. And on the other end, the station is receiv-

ing ASCII that you generated by typing on a teletype keyboard. The number of combinations and cross-combinations is mind-boggling. A natural for automated operating schemes, the MBA-RC could also find some interesting applications in other fields.

A bit closer to home, "Joe Ham" will find the MBA-RC to be a hassle-free way to get on RTTY. Drawbacks include the 32-character display—it's no match for the full-sized screen that accompanies a computer system. Nor is the MBA-RC's analog signal processing going to give the same performance that you would expect from an expensive dedicated terminal unit. Still, as a stand-alone unit, the MBA-RC offers more flexibility than any dedicated RTTY or computer CW/RTTY system that I know of.

The MBA-RC has a list price of $469.95. For more information, contact *Advanced Electronic Applications, Inc., PO Box C2160, Lynnwood WA 98036.* Reader Service number 476.

Timothy Daniel N8RK
Oxford OH

HY-GAIN'S TH7DX TRIBANDER

I had always wanted to have monobanders on 10, 15, and 20 meters, not only for the gain of the antennas, but also for the broadbandedness of them. When I saw the specs on the Hy-Gain TH7DX, I knew that I could get close to "the real thing" without having a monster Christmas tree array.

The TH7DX has seven elements in total. Two of these are fully-trapped driven elements. This is how the broadband effect is accomplished. The boom length is 24 feet, the longest element is 31 feet, and the turning radius is 20 feet. The TH7 will take up to a 2½-inch mast and weighs 75 lbs. The maximum wind survival is 100 mph, and the antenna turns just fine with my old Ham III rotor.

Electrically, the antenna claims 22 dB (±5) front-to-back ratio on 20 and 15 meters and 18 dB front-to-back on 10 meters. The maximum forward gain claimed on 20 meters is 8.0 dBi; on 15 meters, 8.7 dBi; and on 10 meters, 9.6 dBi. These gain claims appear to be fairly accurate according to just-calibrated S-meter readings and numerous on-the-air reports. The antenna is dc-grounded for lightning protection and can handle the maximum legal power limit.

Construction

The TH7DX is different than its predecessor, the TH6, not only in that it has one more element, but also in that Hy-Gain has included stainless steel hardware and lots of it! 724 nuts, bolts, screws, washers, tubing assemblies, and other assorted pieces of hardware have to be assembled into this monster antenna. The instruction manual is 22 pages long and includes all the information necessary to easily build the TH7DX, even if you are not technically inclined. The manual is very complete. It includes everything from troubleshooting charts to an extra copy of the pictorial page so that you don't have to constantly flip pages when referring to part numbers during construction. My only gripe is that the manual states that you "should allow at least 7 hours for assembly." This statement is not very accurate, at least for the antenna that I assembled.

Jeff DeTray WB8BTH and I had a perfect weekend to assemble the antenna. The temperature was about 65 degrees for the entire 3 days that it took us (and a few others) to assemble and raise the antenna. Hy-Gain suggests that a large clear area be chosen to assemble the TH7. The area has to be at least 24'×31' and should preferably be a concrete driveway. My location did not afford us the luxury of a paved surface. With this in mind, we paid careful attention to how we handled the hardware. I did not relish the thought of searching the lawn for a lost bolt after all the hardware stores had closed.

The assembly started on a Saturday morning; we put in 8 hours of actual construction time that day. On the following day, we spent another 9 hours on the job, working well into the night "under the lights." Finally, after 17 total hours, the antenna was assembled. Hy-Gain had thought of everything . . . including ropes to install inside the elements to eliminate premature metal fatigue from wind vibrations. On Monday, the tough part came.

My tower at home consists of 100 feet of guyed Rohn-25 sections topped with 20 feet of 2"-o.d. ¼"-wall aluminum tubing for mast. Already installed on the mast is a 2-meter vertical beam on top. Six feet below that is a horizontal 2-meter yagi. The spot I had chosen for the TH7 was well below those antennas at the bottom of the mast, just above the rotor and thrust bearing. It looked very simple from the ground.

All we had to do was hoist the antenna up with the boom horizontal, and use some ropes and the guy wires as guides. After about 2 hours of preparation and horsing it around, we got the antenna close to the top. The elements ran into and got entangled with the lower 2-meter antenna. We had to lower it back down to the ground again and use a different attack. This time around, we hauled it up with the boom perpendicular to the ground. When the boom and first elements got to the top of the tower, where Chris Brown KA1D had been patient during numerous strategy sessions, we manhandled it into place. It may sound simple in prose, but it really was a Herculean task! If it were not for Chris and all the ground crew (WB8BTH, WA2VSN, W1NHJ, and WA1YZN), we would have wound up with an aluminum scrap pile instead of the fine antenna that the TH7 really is.

The TH7 has performed excellently! It is a real pleasure to take full advantage of the bands instead of having to operate only in the portions where your antenna resonates. This is especially important in these days of swr-sensitive transistor finals. The swr curve is just as Hy-Gain states . . . under 2-to-1 for all bands. I would wholeheartedly recommend it to anyone who is looking for a no-compromise tribander.

For further information, contact *Telex/Hy-Gain, 9600 Aldrich Ave. So., Minneapolis MN 55420.*

Bob Cunningham K1XR
***73* Staff**

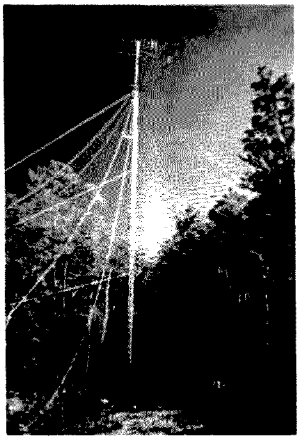


Photo A. Ropes are run to the top of the tower for hoisting the antenna. (Photos by Cindy Brown)

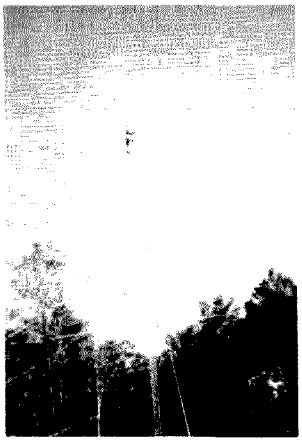


Photo B. The TH7 begins its slow ascent to the top.

Photo C. At the top of the tower, the TH7 is manhandled into place.

Photo D. Nuts and bolts get a final twist as the TH7 is locked securely into place just above the rotor and thrust bearing.

SEYCHELLES SAGA
V. C. Harvey-Brain ZL1BSO

V. C. Harvey-Brain was the first radio amateur to be licensed in the Seychelle Islands (as VQ9HB) and the *Seychelles Saga* is Harvey's story of how he got to the Seychelles in the first place. It is a cracking good adventure story, and really a saga, as it represents one man's search for his own personal paradise and the achievement of that dream through years of trial and tribulation.

Harvey (as he prefers to be called) began his adventure as the owner of a 36-foot English fishing smack called a Brightlingsea. He was living and working in pre-war England and had decided to chuck it all for a life of seafaring adventure aboard his small boat. So, in the summer of 1939, Harvey and his crew member set sail across the English Channel in the *Brian Boru*, bound for France and its extensive inland waterway to the Mediterranean Sea.

They had very little money, a cat, and enough provisions for a couple of weeks aboard the *Brian Boru*. There was minimal navigation equipment, a few spare parts, and some materials for any necessary minor repairs to sails or engine.

The engine was a gasoline-powered unit from a small pre-war Morris automobile, and its major virtue was reliability . . . it never failed them. By a combination of sailing and motoring, their voyage carried them through France and into the Mediterranean where his first crew, discouraged and helpless, left him. The fight with storms, damage to the boat, the interruption by World War II, adventures in Crete, Malta, and the Red Sea, and even shipwreck are woven into this fascinating story.

V. C. Harvey-Brain must be classed as untiring and unbeatable. Yes, he did achieve his dream; he made it to Mahe, Seychelle Islands, in 1946, where he lived for many years. He accompanied Gus Browning W4BPD to the Andaman Islands. He also has visited and enjoyed DX from Aldabra and other remote spots in the Indian Ocean, which he sailed for years before finally settling down to life in New Zealand and Australia. As ZL1BSO, he alternates his residence between them . . . alive and well, in his seventies.

Seychelles Saga is not a ham radio story *per se*, but it is an incredible tale nevertheless and bears reading for fun and education . . . and perhaps a bit of inspiration as well. With luck, we shall see more of Harvey as he has many more tales to spin for us, and we are hoping that he will tell us something about his hamming and DXpeditions in the pages of *73*.

Special price to hams for *Seychelles Saga* is $8 postage paid, via sea mail, or $12 air mail. Write to *V. C. Harvey-Brain ZL1BSO, 7 Hamilton Road, Surfdale, Waiheke Island, Hauraki Gulf, New Zealand.* Reader Service number 477.

Jim Gray W1XU
***73* Staff**

PATHFINDER II SATELLITE TRACKING PROGRAM

When UPS delivered Pathfinder II, it was like an unexpected reunion with an old friend. Pathfinder was and still is a microcomputer software package developed to assist in the location of amateur radio communications satellites. Of course, things had changed since our first meeting in 1981. The name was different, Pathfinder II instead of plain Pathfinder, and the program had been transformed into a slick commercial software package. But I was glad to see that my old friend still retained its fundamental appeal, the eye-catching graphics that earned it the label "satellite superstar" and the cover of the March, 1982, issue of *73*. Pathfinder II runs on an Apple II computer with at least 48K of memory, Applesoft Basic, and one disk drive. Optional but strongly recommended is an Epson "Graphtrax" printer.

First, a caveat: Pathfinder II is designed

to work to track any satellite with a circular orbit. That means it will work with amateur spacecraft like OSCAR 8 and the Soviet "radiosports" as well as non-amateur orbiters, including the NOAA 6 and 7 weather satellites. Pathfinder II, however, is not suitable for tracking satellites with elliptical orbits like the one planned for the Phase III amateur communications satellite.

Why pay Computer Applications for Pathfinder II when you can get it for free by using the listing in *73*? Well, for $34.95 you avoid the aggravation of lots of typing and you get about twice as much software as is presented in the published listing. Another incentive to buy is the package's "polish," including a comprehensive user's manual. With the exception of the high-resolution images and printing routine, *all* of the Pathfinder programs are written in Applesoft Basic. While this makes the program seem slow at times, it also makes it easy to customize. And since Pathfinder II is not copy protected, you can fiddle with a backup disk, leaving the original safe and secure.

Pathfinder II includes a program (also called Pathfinder II) that resembles the magazine version. After entering your longitude and latitude and choosing a satellite (data is pre-programmed for OSCAR 8, RS3-8, and NOAA 6 and 7), this module calculates the horizon, precision, and number of orbits in a 24-hour day. Then the orbit numbers and the equatorial crossings are calculated for a selected date. Next you choose the orbit you want to track and enter the number of intervals at which data is to be calculated (known as subsatellite points). You can choose as many as 120 points per orbit, or more than one per minute for orbits like those associated with OSCAR 8. For each subsatellite point, Pathfinder II computes the satellite's location (longitude and latitude), distance from your location, and the bearing (azimuth heading). If the satellite is visible at that point, the elevation angle is calculated, too.

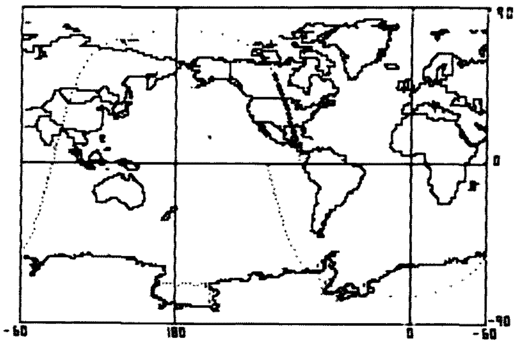


Fig. 1. Pathfinder II provides two real time tracking options. One resembles the illustrations in the March, 1982, 73 and is a map of North America with the states outlined. The second map is a Mercator projection of the world. The orbit shown crosses the equator east of Ecuador before passing through the central United States. Not shown here are several lines of text that accompany the map.

So far Pathfinder II has done what other tracking programs do: generate a bunch of numbers. But the way in which Pathfinder displays this data is unique. Oh, if you're a purist you can get the usual tabular printout, but wouldn't it be nice to see what the satellite is doing? Real Time Track allows you to do just that. Using the Apple's high-resolution graphics, Pathfinder II draws a map and then superimposes the satellite's path. Real time tracking is made possible through a software clock, with screen updates occurring at each subsatellite point.

Two kinds of real time tracking are available. One uses a map of North America, and just as shown on the March, 1982, *73* cover, the states are outlined. The second option, a Mercator projection world map, is new. The global image makes the program useful to DX stations and allows state hams a glimpse of what the satellite is doing when it is out of range.

Both real time tracking maps work pretty much like the magazine version. The main difference seems to be the absence of range circles in the commercial program. My enthusiasm for Pathfinder's real time tracking is tempered by the opinion that during an actual satellite pass, an operator can't afford to spend time looking at a computer screen; however, there is still plenty of incentive to use the program before an operating session, acquainting yourself with the upcoming orbits. Finally, Pathfinder II's graphics are a great teaching tool and I enjoyed playing—plugging in different combinations of orbital parameters and then observing the results.

Hard copy of the map images is available if you have an Epson printer with the Graphtrax option. My printer didn't qualify, but I did manage to get a "screen dump" by using a Grappler interface board and NEC 8023 printer. The result, shown in Fig. 1, is missing several lines of text but is otherwise identical to the screen display.

The package's second module, called "Pathfinder Predict," provides orbital data that can serve as the base for Pathfinder II calculations and provide quick feedback about those orbits that will be most useful. Data can be calculated for all future orbits, all accessible orbits, or just each day's first orbit. Using an "exclusive" algorithm, the program generates the acquisition of signal time, loss of signal time, total time in range, maximum elevation, range at the closest approach, and the time when the closest approach occurs.

Pathfinder Predict offers seven different kinds of printouts, making a printer almost mandatory. Using Pathfinder Predict you'll be able to generate tables of data similar to those presented in *73*'s "Satellites" column. And you can go one step further by printing out detailed data for just those orbits that will be in range. Serious satellite users may even find Pathfinder Predict to be more helpful than the graphics-oriented Pathfinder II module.

My only complaints could almost be labeled nitpicking. Error-handling leaves room for improvement, there should be a default entry for your location, and the manual has occasional misspellings. But, as with any old friend, I tended to overlook the minor defects and so I was not disappointed by my surprise reunion. Written by hams for hams, Pathfinder II does all that Computer Applications says it will do, does it well, and does it for a reasonable price. Pathfinder II sells for $39.95 and is available from *Computer Applications, 3628 A Court, Oxnard CA 93033.* Reader Service number 478.

Timothy Daniel N8RK
Oxford OH

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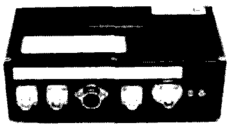

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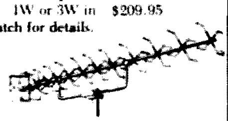

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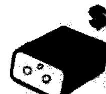

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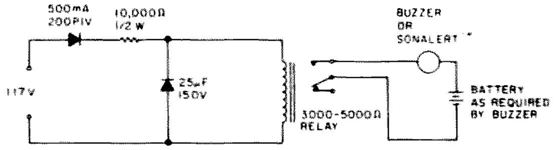
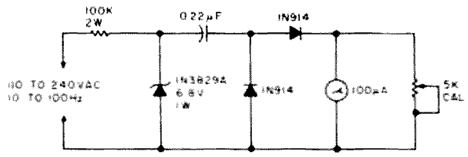
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

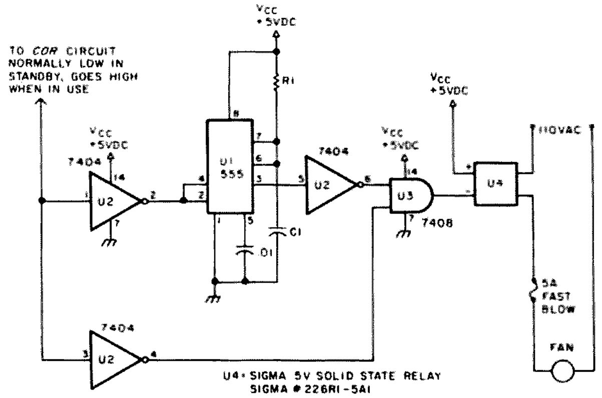
In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73 Magazine, Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



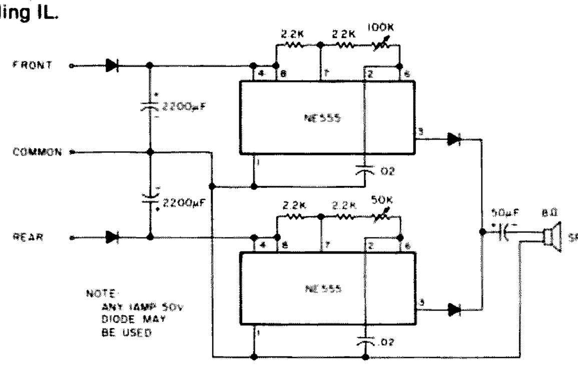
POWER-FAILURE ALARM: Don't get caught in the dark wondering what time it is. While power is on, the relay is held open, but when the power fails the buzzer-circuit contacts close. The relay can be a radio-control type with a pull-in of 3-5 mA.—Ed Schilling K5RSO, Fairfax VA.



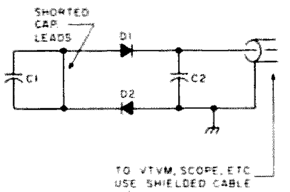
HANDY POWER-LINE FREQUENCY METER: A great piece of gear for Field Day, this meter will indicate the frequency from a power generator. Incoming sine waves are converted to square waves by the 100k resistor and the 6.8-V zener. The square wave is differentiated by the capacitor and the current is averaged by the diodes. The average current is almost exactly proportional to the frequency and can be read directly on a 100-mA meter. To calibrate, hook the circuit up to a 60-Hz power line and adjust the 5k pot to read 60 mA.—Joe Tracy K1LSP, Brookfield CT.



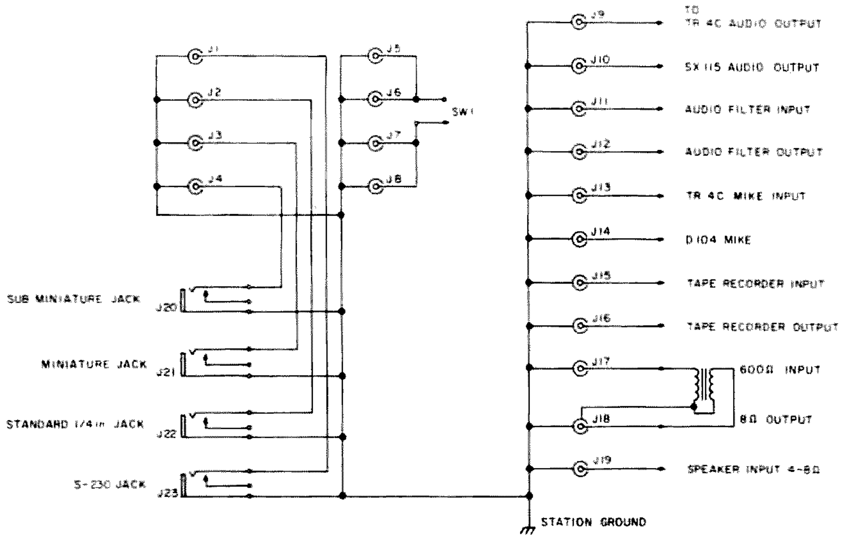
TIME-DELAY CIRCUIT FOR A REPEATER COOLING FAN: Keep your finals cool with this circuit which will start the fan when the system is in operation and leave it on for a short time after use. The values of R1 and C1 determine the time delay.—Richard Little K9EEH, Sterling IL.



ELECTRONIC DOOR BELL: Frequently the ding-dong of a door bell is unheard because you are in a remote part of the house. This electronic alert is much louder and requires no change in the original transformer or the push-button wiring. Most door-bell transformers are 16-24 V ac and when rectified and filtered, they provide sufficient dc to operate the NE555 oscillators at an adequate speaker volume. The two oscillators may be adjusted to distinguish between the front and back doors.—W. W. Davey W7CJB, Missoula MT.



LOW-LEVEL RF SNIFFER: This simple detector will provide indication of very low levels of rf, such as those on the outside of coax or inside enclosures. C1 is a disc capacitor of any value, C2 is from .001 to .005 uF, and D1 and D2 are 1N60 diodes or their equivalent. House the circuit in a plastic enclosure with only a portion of C1 protruding. The sensitivity of the probe is a function of the indicating device being used. For example, a high-impedance meter will show several volts in the presence of a low-level field.—Edwin Lawrence W8IGN, Seminole FL.



SIMPLE PATCH PANEL: This panel will provide all the necessary hookups between dissimilar equipment. The diagram shown is merely a prototype; the panel can be expanded with ease. SW1 provides for two or four multiple outputs. J1 through J19 are RCA-type phono jacks. J20 through J23 use jacks which fit your particular equipment needs.—Harry Longerich W4ANL, Fredericksburg TX.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

WORLD COMMUNICATIONS YEAR RTTY CONTEST

Contest Periods:
0000 to 0800 GMT June 11
1600 to 2400 GMT June 11
0800 to 1600 GMT June 12

Formerly the VK/ZL/Oceania RTTY DX Contest, the contest is organized and conducted by the Australian National Amateur Radio Teleprinter Society with trophies donated by the secretary of the ITU, Mr. Butler. Entry classes include single-operator, multi-operator, and SWL. Each station may be worked only once per band, but may be worked on another band for further multipliers.

EXCHANGE:

Serial number consisting of RST, zone number, and time in GMT.

SCORING:

As per CARTG Zone Chart, multiplied by the number of countries worked, multiplied by the number of continents worked (6 maximum). After the above calculations, world stations add 100 points for each VK/ZL station worked on 20 meters, 200 points for each on 15 meters, and 300 points for each on 10 meters. Countries count as per the ARRL list of countries, except that each VK, ZL, JA, VE, VO, and W/K district counts as a separate country. Contacts with one's own country count zero points for multipliers.

AWARDS:

Trophies to first-place single- and multi-operator entries on world basis donated by Mr. Butler of the ITU. Trophies to first-place single- and multi-operator entries in VK donated by ANARTS. Trophies will be presented by Mr. Butler at the IREE convention to be held in Sydney between September 5th and 19th. Certificates will be issued for second- and third-place entries on a world basis and for the winner in each country. A certificate of participation signed by Mr. Butler will be issued to all contestants.

ENTRIES:

Logs must show (in this order) date and time (GMT), callsign of station worked, serial number sent and received, points claimed. Logs of multi-operator stations must be signed by all operators, together with a list of their callsigns. Incomplete loggings are not eligible for scoring. Logs must be received by the Contest Committee by August 19th. Address all logs to: W. J. Storer VK2EG, 55 Prince Charles Road, French's Forest 2086, N.S.W., Australia.

Summary sheet must show callsign of station, name of operator(s) and address of same, bands used (a separate log is required for each band), the points claimed for each band, the number of VK/ZL stations worked, total points claimed, and signature(s).

The judges' decision regarding the placings in the contest will be final and no correspondence will be entered into regarding the same. The logs become the property of the Contest Committee on completion of checking.

SUMMER SMIRK PARTY CONTEST

Starts: 0000 GMT June 17
Ends: 2400 GMT June 19

The contest is sponsored by the Six-Meter International Radio Club (SMIRK). No crossband contacts, multi-operators, or partial contacts are allowed. Check logs or dupe sheets are not needed.

EXCHANGE:

SMIRK number and ARRL section, foreign state, province, prefecture, or country. Count ARRL sections in the 48 US states only; KH6 and KL7 count as countries. Washington DC counts as a section, as well. Canadians count as provinces; all others count as states, provinces, prefectures, or countries.

SCORING:

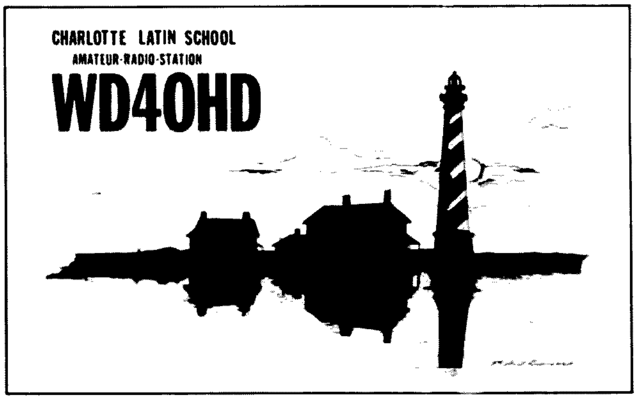
Count 2 points for each SMIRK contact, 1 point for each non-SMIRK QSO. Add QSO points and multiply by number of ARRL sections, foreign states, provinces, and countries worked for final score.

AWARDS:

Trophies for high-score SMIRK in two divisions: US/Canada and foreign. Certificates for high score in each ARRL section and foreign state, province, prefecture, or country.

ENTRIES:

Entries must be submitted on the fall, 1981, edition of the official SMIRK log. Single copies are available for an SASE and photocopies may be used. Send log requests and entries postmarked by July 11th to: Spencer F. Ritchie KC2TX/5, 5122 Sagamore, San Antonio TX 78242.



QSL OF THE MONTH

Who says kids aren't interested in ham radio anymore? This month's winning QSL comes from the Charlotte Latin School club station in Charlotte NC. The school is a private, coeducational institution located on a 92-acre campus on the south side of Charlotte. Bob Olson WD4OHD, director of the school's ham club, said that the card was designed by one of the students, and he added that the club is active and growing. And with all the new members, the book they requested for winning the contest was an obvious choice: *73's Novice License Study Guide*.

If you think your QSL is a winner, put it in an envelope with your choice of a book from 73's Radio Bookshop and send it to 73, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries which do not use an envelope or do not specify a book will not be considered.

NINE-LAND CW CONTEST

Starts: 1700 GMT June 18
Ends: 1700 GMT June 19

This is really an "everybody works everybody" contest sponsored by the Joliet Amateur Radio Society. The same station may be worked once per band. Operating categories include single operator (1 transmitter), multi-operator (1 transmitter), and multi-operator using portable field conditions with a maximun of two transmitters.

EXCHANGE:

Consecutive serial number beginning with 001 followed by state, province, or DX country.

FREQUENCIES:

1805 and 60 kHz up from lower edge of 80, 40, 20, 15, and 10 meters; Novices use 25 kHz up from lower edge of Novice bands.

SCORING:

Contacts with 9-land stations count 2 QSO points each; others are 1 point each. Multipliers are the number of states, Canadian provinces, and DX countries worked. Count a bonus multiplier for every 20 9-land stations worked.

AWARDS

Certificate to high score in each category in each state, province, and DX country.

ENTRIES:

Dupe sheets are required for over 200 contacts. Logs must be postmarked by July

CORRESPONDENT zone

YOUR zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	2	14	10	13	16	18	22	20	25	30	36	37	39	21	22	19	20	17	11	25	29	29	22	22	16	28	25	31	39	35	14	36	25	29	34	39	40	47	44	15
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3	10	15	2	8	11	9	13	14	18	21	28	28	30	26	28	27	29	27	21	32	37	39	32	31	24	37	33	40	43	35	11	32	29	35	35	42	48	50	52	20
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9	25	16	18	12	10	10	6	5	2	8	10	14	15	23	25	29	33	35	34	29	35	43	41	45	41	50	50	55	52	45	28	38	21	30	20	27	35	32	38	21
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18	17	20	27	26	26	33	36	32	35	43	41	49	48	14	13	8	5	2	7	12	12	12	6	11	14	15	16	20	30	35	29	40	18	15	27	28	24	31	27	14
19	11	19	21	22	24	29	33	30	34	41	43	48	49	18	18	13	12	7	2	18	19	16	10	10	9	16	15	20	30	32	21	36	23	21	33	34	30	38	33	16
20	25	19	32	26	35	34	33	29	29	26	30	39	37	7	6	6	7	12	18	2	6	14	14	20	26	21	25	25	34	43	19	49	8	3	15	16	15	22	20	12
21	29	25	37	33	32	40	40	35	35	42	34	42	39	14	11	10	8	12	19	6	2	9	11	17	24	16	21	20	28	37	40	43	14	6	18	16	11	19	15	19
22	29	31	39	37	38	47	46	42	43	51	42	49	46	21	18	15	12	12	16	14	9	2	6	10	18	17	13	11	21	29	36	35	22	14	26	22	15	22	16	24
23	22	26	32	32	33	40	42	38	41	45	45	53	50	19	17	12	8	6	10	14	11	6	2	6	13	8	12	11	24	30	31	37	22	16	29	26	21	28	22	20
24	22	30	31	34	35	40	44	42	45	52	51	58	56	25	23	18	14	11	10	20	17	10	6	2	8	6	6	10	20	24	26	30	28	22	35	33	25	32	25	25
25	16	28	24	30	31	33	38	37	41	45	52	50	51	27	27	22	19	14	9	26	24	18	13	8	2	13	9	15	23	30	18	27	32	28	41	40	33	40	33	25
26	28	35	37	40	41	46	50	47	50	50	49	52	50	27	25	21	17	15	16	21	16	7	8	6	13	2	6	5	16	22	31	29	29	21	33	29	21	27	20	29
27	25	35	33	38	40	42	46	46	50	52	55	52	52	30	29	24	20	16	15	26	21	13	12	6	9	6	2	7	15	18	25	25	34	27	40	35	27	32	26	30
28	31	40	40	44	45	49	53	51	55	54	49	48	46	32	30	26	22	20	20	25	20	11	14	10	15	5	7	2	10	17	31	24	34	25	36	30	22	26	19	34
29	39	50	43	52	54	47	49	54	52	44	42	37	37	42	39	36	32	30	30	34	28	21	24	20	23	16	15	10	2	9	15	32	42	33	39	31	24	24	20	44
30	35	50	35	44	46	38	40	44	45	37	41	33	34	49	47	42	38	45	32	43	37	29	30	24	30	22	18	17	9	2	24	7	51	42	47	10	33	32	29	48
31	14	25	11	20	22	17	22	24	28	28	37	32	35	34	36	33	32	29	21	39	40	36	31	26	18	31	25	31	15	24	2	22	39	42	46	53	52	56	51	28
32	36	47	32	40	41	32	34	38	38	31	35	27	29	55	54	49	45	40	36	49	43	35	37	30	27	29	25	24	32	7	22	2	57	48	47	42	38	34	33	50
33	25	14	29	21	19	28	26	21	21	28	22	31	29	5	6	10	14	18	23	8	14	22	22	28	32	29	34	34	42	51	39	57	2	9	10	14	18	22	23	10
34	29	21	35	28	27	36	34	30	30	36	29	37	34	10	7	9	10	15	21	3	6	14	16	22	28	21	27	25	33	42	42	48	9	2	13	12	12	18	16	16
35	34	21	35	26	24	30	26	23	20	24	16	34	21	15	15	20	22	27	33	15	18	26	29	35	41	33	40	36	39	47	46	47	10	13	2	7	15	15	19	20
36	39	28	12	33	31	37	33	30	27	29	20	27	24	19	18	21	22	28	34	16	16	22	26	33	40	29	35	30	31	40	53	42	14	12	7	2	8	8	11	24
37	40	33	48	40	38	44	40	38	35	38	28	33	30	21	19	21	20	24	30	15	11	15	21	25	33	21	27	22	24	33	52	38	18	12	15	8	2	7	5	28
38	47	36	50	41	39	43	38	36	32	31	23	27	24	26	25	27	27	31	38	22	19	22	28	32	40	27	32	26	24	32	56	34	22	18	15	8	7	2	6	32
39	44	37	52	44	42	48	44	41	38	38	29	33	30	26	24	25	23	27	33	20	15	16	22	25	33	20	26	19	20	29	51	33	23	16	19	11	5	6	2	32
40	15	6	20	14	13	22	22	18	21	29	27	34	34	6	8	9	12	14	16	12	19	24	20	25	25	29	30	34	44	48	28	50	10	16	20	24	28	32	32	2

World Communications Year RTTY Contest (CARTG) exchange points table.

CALENDAR

Jun 11-12	ARRL VHF QSO Party
Jun 11-12	World Communications Year RTTY Contest
Jun 17-19	Summer SMIRK Party
Jun 18-19	Nine-Land CW Contest
Jun 25-26	ARRL Field Day
Jul 2-3	Venezuelan Worldwide Contest—SSB
Jul 9-10	IARU Radiosport Championship
Jul 15-17	A5 Magazine SSTV DX Contest
Jul 30-31	Venezuelan Worldwide Contest—CW
Aug 6-7	ARRL UHF Contest
Aug 19-21	A5 Magazine UHF FSTV DX Contest
Aug 20-21	SARTG Worldwide RTTY Contest
Sep 3	DARC Corona 10-Meter RTTY Contest
Sep 10-11	ARRL VHF QSO Party
Sep 10-11	Cray Valley Radio Society SWL Contest
Oct 8-9	ARRL QSO Party—CW
Oct 9-10	ARRL QSO Party—Phone
Oct 15-16	ARRL Simulated Emergency Test
Oct 22-23	MF Rumde SW Activity Weekend
Nov 5-6	ARRL Sweepstakes—CW
Nov 6	DARC Corona 10-Meter RTTY Contest
Nov 19-20	ARRL Sweepstakes—Phone
Dec 3-4	ARRL 160-Meter Contest
Dec 10-11	ARRL 10-Meter Contest

23rd. Enclose a business-sized SASE for results. Send logs, dupe sheets, and summary sheet to: Paula Franke WB9TBU, PO Box 873, Beecher IL 60401.

STATIC SHEET

NEWSLETTER OF THE MONTH

Some club newsletters contain little more than the date and time of the next meeting, late dues notices, and a bimonthly request for more member participation in club events. But the *Static Sheet* stands out from that crowd like 75 wpm in the Novice band.

The *Static Sheet* is the monthly publication of the Des Moines Radio Amateurs Association, and it runs an average of 20 pages each issue. The newsletter, which is about the size of a playbill, is held together with a saddle binding rather than just stapled in one corner, which gives it a true magazine-like appearance. The front cover usually has artwork or photographs, and the masthead is striking against the white background.

But there is more good stuff inside the *Static Sheet*. "Honest John Says" brings the humor of a Don Rickles to the pages of the newsletter. With a sure aim, Honest John throws humorous barbs and one-liners at the members of the club. Other regular features include "DX in the 80s" and "The Last Word," where straight-shooting editor Ron Kinton WB0MBZ turns his thoughts loose.

The *Static Sheet* also has feature articles on local hams and offers the reader voluminous club news in its never-ending effort to keep the members active and informed.

Just as static is composed of many different frequencies mixing together, many voices comprise the *Static Sheet*, and editor Kinton deserves the credit for bringing it all together into a coherent whole.

To enter your club's newsletter in *73's* Newsletter of the Month Contest, send a copy to *73*, Pine Street, Peterborough NH 03458.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

I dedicate this column to all of you, the readers I love to hear from, who have made this column grow over the past six years. I enjoy your comments, suggestions, and questions and shall share some of them forthwith.

A short note from N4AN, whose signature is as illegible as mine, regarding the February, 1983, column and various types of encoded RTTY. He states, "There is some stuff on the air that *no one* will copy except the people it is intended for." I agree. But isn't it fun trying to decipher such undecipherables? At least, in a strange sort of way.

Regards to Bernard P. Ginsberg, M.D. KC6P (ex-WA3WNA), a physician in family practice and gynecology out in Santa Monica. Bernie was a familiar voice on the Baltimore Amateur Radio Club repeater when he lived here in the Baltimore area, and I'm sure he is just as noisy in Los Angeles. Bernie is working on interfacing his Sinclair ZX-81 (AKA Timex 1000) to RTTY. I keep asking, Bernie, but have heard nothing. Will keep the gang posted when I know something.

The 6800 crowd continues to be heard from. You know, I read in most of the computer magazines that the eight-bit processors are dead, especially the 6800. I don't know. Mine is still going strong and judging from the mailbag, so are many of yours. John H. Davison W0ZFN runs his 6800 in a Motorola D1 evaluation board. His homemade systrem runs fine, and he is trying to get his system up on RTTY. Hopefully, some of the stuff printed here will help.

T. Nick Hulbert KG5N of Lubbock, Texas, is another 6800 owner still with us. His SWTP 6800 is waiting for the conclusion of that RTTY program we talked about a while back. It may take a while, and it may be presented for more than one system at one time, but it will be here; just hang in there.

Ditto to Colonel B. J. Smith (USAF-Ret.) W5RYW. The colonel, who signs himself "B. J." (shades of M★A★S★H), is another SWTP 6800 owner trying to interface his computer to his amateur station.

Somewhat more adventurous is Harold B. Blethen WB1HBD. Harold is looking for a dedicated microprocessor to build into a RTTY system, using the James keyboard as an input device. Well, I reviewed the James keyboard in this column many months ago, and except for the fact that it cannot generate two of the ASCII control characters and that the CAPS LOCK key affects many of the symbol keys strangely, this is a good keyboard. In fact, I am typing this column on one, right now.

Another item mentioned here before, the Kilobaud Klassroom single-board computer, may well serve as the heart of your project. This small 6800-based computer is available from Star Kits, PO Box 209, Mt. Kisco NY 10549. Pete Stark K2OAW, the proprietor up there, produces quite a few items of interest for the 6800 crowd, several of which I have yet to see but would like to. Tell him "RTTY Loop" sent you! You're also going to need some kind of video display. My favorite is the GIMIX board, but there are several around these days. Look around, and good luck.

Interfacing computers with radios is always fun, and each camp has its advocates. Another 6800 user, Peter Bennett VE7CEI, passes along his favorite circuit. Peter uses this to interface a 60-mA loop to a TS-820 FSK input, and he also has a suggestion for a transistor-output switching to ground. Fig. 1 shows Peter's two ideas.

Rob Lawson WB4BSZ in Pensacola, Florida, mentions that he has a Color Computer (TRS-80C*) and has been trying to get it onto RTTY. One of Rob's hopes is to use the TRS-80 graphics on the air for some "creative RTTY." You know, this is one area about which little has been written, and now that ASCII is legal over the air, I expect more will show up. I can visualize an adventure-type game which would use back-and-forth transmissions to move through a game. This should be easier than a real-time game like Pac-Man™ or such.

John F. Deane KA1FL from Hanover, Massachusetts, is another Color Computer user. He casts his vote for chip-of-the-year for the 6809. His reasons for the 6809, housed in the CoCo system, include the opinions that the 6809 is a versatile chip, and that the CoCo is an inexpensive, "almost RFI-free" computer with a good keyboard. At least there are real keys! He mentions the built-in interfaces for the RS232C and SS-50 buses, and that the family can use it when the ham is not. Sounds like some convincing arguments for using this system. Along with some of the RTTY interfaces we have mentioned here over the past few months, I think this may well make a fine entry into computerized RTTY.

Another CoCo devotee is Joe Ryan WB5LLM of Florence, Mississippi, who passes along information on his RTTY setup. Joe indicates that his "low-cost" station includes a TRS-80C reading RTTY off an old CV-89A demodulator. This is a tube-type boat anchor of the same vintage as an old Northern unit I once had. He has copied all kinds of RTTY with this setup, using an optoisolator to connect the demodulator to the computer. Well, there's always a way.

Not to be left out, there are users of non-68xx systems who like to get their two cents in now and then. Charles W. Hoppesch KD4JG of Merritt Island, Florida, is one of them. He has been trying to get his TRS-80 Model III up on RTTY. Again, there are several interfaces available with different features for different money. Several have been discussed here in the past few months; drop their makers a line. I am sure that they will be able to provide literature to help you compare. Let me know how things work out.

Bob Workman WA4ZZN, Atlantic Beach, North Carolina, is trying to get onto RTTY with an old Teletype® Model 15 and a Northern Radio Convertor Type 152, Model 2.

* TRS-80C is a registered trademark of Tandy Corporation.

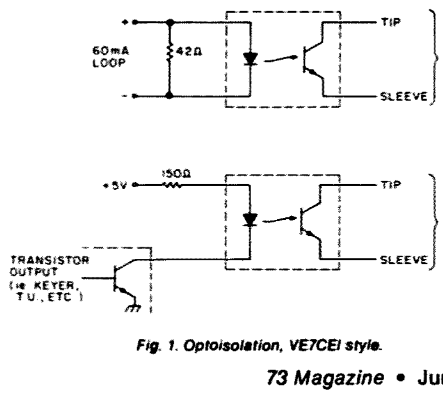


Fig. 1. Optoisolation, VE7CEI style.

This brings back memories of that same old Northern type 107 mentioned above. It was a boat anchor, but it copied RTTY "real good." Bob relates that the filters for mark and space are missing, and he wants to try to substitute for them. My presumption is that you will be able to use mark and space filters similar to the ones used in so many home-brew RTTY systems. For 170-Hz shift RTTY, it really does not matter what two frequencies you use as long as they are separated by 170 Hz. But just for the sake of compatibility, let's use the "standard" tone pair of 2125-Hz mark and 2295-Hz space.

All you need to do to put such a filter together is parallel a coil, typically an 88-mH toroid that can be purchased from many mail-order suppliers, and a capacitor of the appropriate value to resonate at the desired frequency. For 2125 Hz, this is nominally 0.068 uF, and for 2295 Hz, 0.056 uF *plus* a tad. These values are starting ones. Add capacitance a little at a time until the combination resonates at the desired frequency. Use the setup in Fig. 2 to view the moment desired.

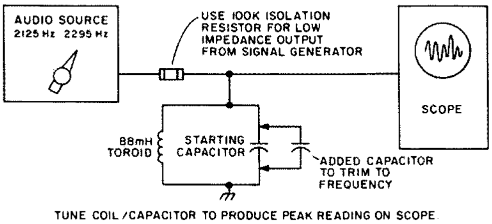


Fig. 2. Tuning a toroid filter.

RTTY Books

Back in the mid-1960s, when I got my first RTTY station on the air, I went to my mentor, Ted Fisher W3EOV, for guidance. After discussing the whys and wherefores of RTTY, Ted copied down a list of numbers and pressed them into my trembling hands. I don't remember how many of those numbers, frequencies in the HF spectrum, panned out, but that was the first list of non-ham RTTY frequencies I ever saw.

From that list, culled by one individual's listening, we have come quite a way: This month, the mail brought several new RTTY frequency books, from two sources we have mentioned before.

The first offering is from Oliver P. Ferrell, whose second edition *Guide to RTTY Frequencies* is being published by Gilfer Associates, Inc. This book, just short of 200 pages, is a storehouse of information about quite a variety of RTTY signals. It begins with a brief but accurate introduction to RTTY, with some general information about various forms of RTTY. There are some pointed remarks which the author terms "Putting Newscasts In Perspective" which I think are worth paraphrasing here.

The RTTY listener looking to latch onto the "hot" news wire can expect that less than ten percent of all RTTY newscasts will be in English and can be copied in North America. Stations transmitting RTTY are not bound by published frequency lists; they can—and do—change frequencies every few months, and newscasts are not sent continuously—that mark signal you tune across now may be sending what you were looking for fifteen minutes or fifteen hours ago.

After these explanations (either cream or fat depending on your point of view) comes a list of over 5000 signals, listed in frequency order. For each listing, information supplied included frequency in kHz, callsign if available, location if known, service (fixed, aeronautical, etc.), mode (shift, speed, orientation), power, and special remarks. Listings are included from 4 to 28 MHz and feature all kinds of transmissions, from press to embassy to weather to traffic.

Following the frequency list is a reverse list ordered by callsign. So, if you hear a call, you can look it up and get the same kind of information as if you looked up the frequency alone. Unfortunately, my review copy was missing one set of pages—the one that ended the frequency list and began the callsign list—so I cannot tell you whether or not the stations that have no call in the frequency list are represented in the callsign list, and if so, how. If I remember, and ever find out, I will let you all know.

A list of Z-codes follows the frequency lists. The Z-codes are the military equivalent of Q-signals and should be familiar to all of you who have ever checked into a MARS net. How well I remember the days of sending ZKE QRU, which roughly translates as "checking into the net (ZKE) with no traffic (QRU)." If you monitor military stations, this list can render what might seem like a meaningless string of three-letter codes into a meaningful string of statements.

After all these listings, an article is included called "Getting to Know Cyrillic." This is an overview of RTTY used by Soviet stations, which employ the Cyrillic alphabet of the Russian language. The basic information presented includes the second- and third-register Cyrillic systems. Unfortunately, I don't think there is enough there to really enable you to make much of what you will receive should you tune in such a station, but it makes for good reading.

Finally, a list of abbreviations used in the listings clarifies any remaining questions you might have about what the book says. All in all, this is a rather complete text. It sells for $9.95 and is available from Gilfer Associates, Inc., PO Box 239, 52 Park Avenue, Park Ridge NJ 07656.

In past columns, we have covered several of the publications from another source, Universal Electronics, Inc., and now we have two more which are described in this issue of *73* under "New Products." Be sure to check them out. See you next month in "RTTY Loop."

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

It is hard to believe the years which have passed since our initial announcement of the famous *73* Awards Portfolio. During this period, we've seen the program grow significantly to become one of the most sought-after challenges facing amateurs today.

Consisting of five domestic incentives and six DX achievement programs, the awards portfolio has captured the interest of almost everyone on the bands, whether a rag-chewer or a big-time contester.

In the paragraphs to follow, I am listing the awards individually. Read through the rules with caution. The requirements are not as easy as one might first imagine. We want our award recipients to realize they had to earn their recognition, and therefore have designed each award to be somewhat of a challenge. Here are the six DX awards.

WORK THE WORLD DX AWARD

To enhance the enjoyment of working DX, the editors of *73* take special pleasure in introducing the most complex and probably the most sought-after award in existence today—the green and black Work the World DX Award.

1. The WTW Award is available to licensed amateurs the world over.

2. To be valid, all contacts must be made on or after January 1, 1979. There are no band or mode restrictions, but applicants will be given recognition for single-band or -mode achievements upon their request. Only DX countries shown on the WTW DX Listing qualify.

3. The Work the World program consists of six continental awards (North American, South American, European, Oceanic, Asian, and African), each of which is a worthy accomplishment on its own. Once application has been made for all six, the ultimate award, the Worked the World DX Award, will be issued automatically without charge. The operator who earns WTW recognition has truly "worked the world."

4. Requirements for the individual continental awards: North American Award—work 13 North American countries; South American Award—work 12 South American countries; European Award—work 12 European countries; Oceanic Award—work 12 Oceanic countries; Asian Award—work 12 Asian countries; African Award—work 12 African countries.

5. To apply for any of these awards, prepare a list of claimed contacts for each continent, listing all callsigns in prefix order. Include date and time in GMT, and the band and mode of operation.

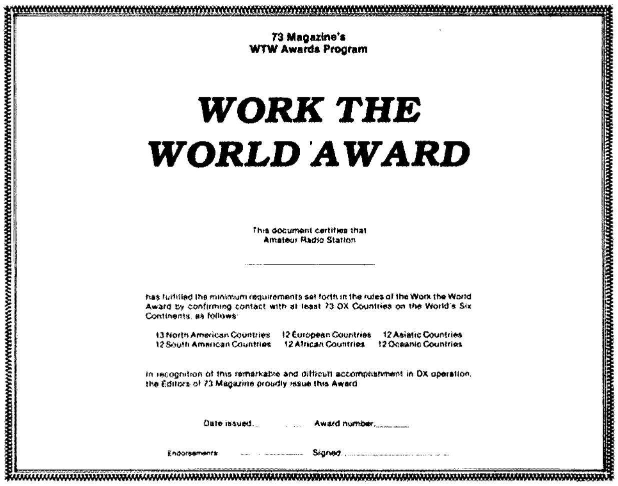
6. If you are submitting the sixth award application, please emphasize this fact to speed processing of your WTW Award.

7. Do not send QSL cards! Have your list(s) verified by two amateurs, a radio club secretary, or by a notary public.

8. Each continental award has an award fee of $4.00 or 20 IRCs.

DX COUNTRY CLUB AWARD

1. Sponsored by the editors of *73*, the *73* DX Country Club Award is available to licensed amateurs throughout the world.


73 Magazine's
WTW Awards Program

WORK THE WORLD AWARD

This document certifies that
Amateur Radio Station

has fulfilled the minimum requirements set forth in the rules of the Work the World Award by confirming contact with at least 73 DX Countries on the World's Six Continents, as follows:

13 North American Countries 12 European Countries 12 Asiatic Countries
12 South American Countries 12 African Countries 12 Oceanic Countries

In recognition of this remarkable and difficult accomplishment in DX operation, the Editors of 73 Magazine proudly issue this Award

Date issued ________ Award number ________

Endorsements ________ Signed ________

WORK THE WORLD DX LISTING

NORTH AMERICA

C6	Bahamas
CO	Cuba
FG	Guadeloupe
FG, FS	Saint Martin
FM	Martinique
FO	Clipperton Is.
FP	St. Pierre & Miquelon
HH	Haiti
HI	Dominican Republic
J3, VP2G	Grenada & dependencies
KC4, KP1	Navassa Is.
KG4	Guantanamo Bay
KL7	Alaska
KP4	Desecheo
KP4	Puerto Rico
KS4, KP3, HKØ	Serrana Bank and Roncador Cay
KV, KP2	Virgin Islands
OX, XP	Greenland
PJ6, Ø	Saba Is.
VE	Canada
VE1	Sable Is.
VE1	St. Paul Is.
VO	Newfoundland, Labrador
VP2A	Antigua, Barbuda
VP2D	Dominica
VP2E	Anguilla
VP2K	St. Kitts
VP2L	Montserrat
VP2S	St. Vincent & dependencies
VP2V	British Virgin Islands
VP5	Turks and Caicos Islands
VP9	Bermuda
W, K, N, A	United States of America
XE	Mexico
XF4	Revilla Gigado Islands
ZF	Grand Cayman Islands
6Y	Jamaica
4U	HQ, United Nations
8P	Barbados

SOUTH AMERICA

CE	Chile
CEØA	Easter Is.
CEØX	San Felix
CEØZ	Juan Fernandez
CP	Bolivia
CX	Uruguay
FY	French Guiana
HC	Ecuador
HC8	Galapagos Is.
HK	Colombia
HKØ	Bajo Nuevo
HKØ	Malpelo Is.
HKØ	San Andres & Providencia
HP	Panama
HR	Honduras
HRØ	Swan Is.
KZ	Canal Zone
LU	Argentina
OA	Peru
PJ	Netherlands Antilles
PY	Brazil
PYØ	Fernando de Noronha
PYØ	St. Peter & St. Paul
PYØ	Trindade & Martim Vaz Is.
PZ	Surinam
TG	Guatemala
TI	Costa Rica
TI9	Cocos Is.
VP1	Belize
VP8	Falkland Is.
VP8, LU	South Georgia Is.
VP8, LU	South Orkney Is.
VP8, LU	South Sandwich Is.
VP8, LU	South Shetland Is.

VP8W	South Grahamland
YN	Nicaragua
YS	Salvador
YV	Venezuela
YVØ	Aves Is.
ZP	Paraguay
8R	Guyana
9Y	Trinidad and Tobago

ASIA

A4X	Oman Is.
A5	Bhutan
A6X	United Arab Emirates
A7X	Qatar
A9X	Bahrain
AP	Pakistan
BV	Taiwan
BY	China
CR9	Macao
EP	Iran
HL, HM	North Korea
HL, HM	South Korea
HS	Thailand
HZ, 7Z	Saudi Arabia
JA-JR	Japan
JR6, KA6	Okinawa (Ryukyu Is.)
JO, KA1	Ogasawara
JT	Mongolia
JY	Jordan
KA	US Military in Japan
OD	Lebanon
S2	Bangladesh
TA	Turkey
UA, UK, UV, UW9-Ø	Asiatic RSFSR
UD6, UK6C, D, K	Azerbaidzhan
UF6, UK6F, O, Q, V	Georgia
UG6, UK6G	Armenia
UH8, UK8H	Turkman
UI8, UK8I	Uzbek
UJ8, UK8J, R	Tadzhik
UL7, UK7	Kazakh
UM8, UK8M, N	Kirghiz
VS6	Hong Kong
VS9K	Kamaran Is.
VU	India
VU7	Andaman & Nicobar
VU7	Laccadives
XU	Khmer Republic
XV	Vietnam
XW	Laos People's Dem. Republic
XZ	Burma
YA	Afghanistan
YI	Iraq
YK	Syria
1S	Spratly
4S	Sri Lanka
4W	Yemen
4X, 4Z	Israel
5B4, ZC	Cyprus
7O	People's Dem. Republic of Yemen
8Z4	Neutral Zone Saudi Arabia/Iraq
9H	Malta
9H4	Gozo & Comino
9K	Kuwait
9M2	West Malaysia
9M6	North Borneo
9M8	Sarawak
9N	Nepal
9V	Singapore, Abu Ail, Jabal Attair

OCEANIA

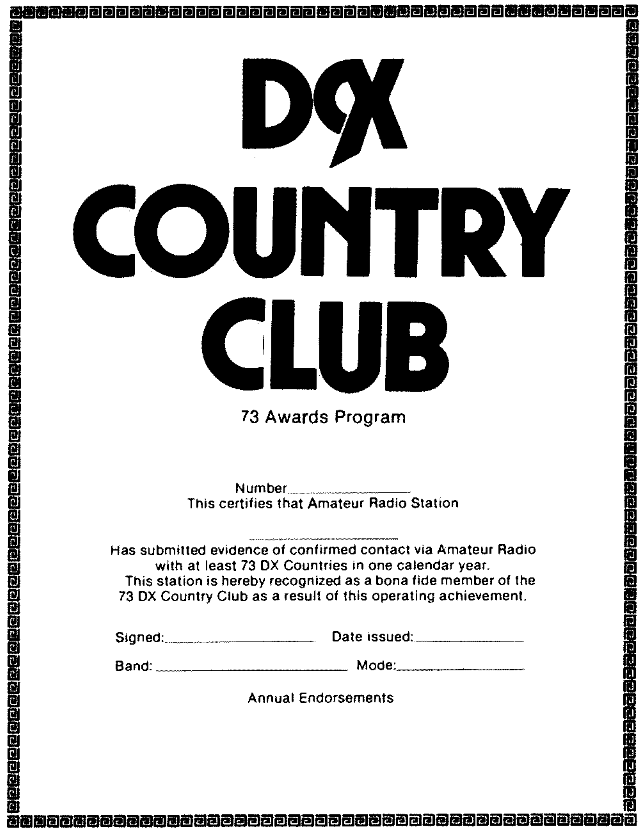
A3	Tonga Republic
CR8	Portuguese Timor
C2	Republic of Nauru
DU	Philippines
FK	New Caledonia
FO	French Polynesia
FW	Wallis & Fortune Islands
H4, VR4	Solomon Islands
JO, KA1	Minami Torishima
JO, 7J1	Okino Torishima
KB, KH1	Baker, Howland, American Phoenix
KC6	Eastern Carolines
KC6	Western Carolines
KG6, KH2	Guam Island
KG6R	Rota
KG6S	Saipan
KG6T	Tinian
KH6	Hawaiian Islands
KH7	Kure Island
KJ, KH3	Johnston Island
KM, KH4	Midway Island
KP6, KH5K	Kingman Reef
KP6, KH5	Palmyra
KS6, KH8	American Samoa
KW, KH9	Wake Island
KX	Marshall Islands
P2	Papua New Guinea
T2, VR8	Tuvalu Island
VK	Australia
VK	Lord Howe Island
VK9	Willis Island
VK9	Christmas Island
VK9	Cocos (Keeling) Island
VK9	Mellish Reef
VK9	Norfolk Island
VKØ	Macquarie Island
VR1	British Phoenix Islands
VR1	Gilbert Island
VR1	Ocean Island
VR3	Christmas Island
VR6	Pitcairn Island, Line Island, South and Central
VR8	(see T2)
VS5	Brunnei
YB, YC, YD	Borneo
YB, YC, YD	Celebes
YB, YC, YD	Java
YB, YC, YD	Sumatra
YB, YC, YD	West Irian
YJ	New Hebrides
ZK1	North Cook Island
ZK1	South Cook Island
ZK2	Niue Island
ZL	New Zealand
ZL	Auckland & Campbell
ZL	Chatham Island
ZL	Kermadec
ZM7	Tokelaus
3D2	Fiji Islands
5W	Western Samoa

EUROPE

C3	Andorra
CT	Portugal
CT2	Azores
DA-DL	Federal Republic of Germany
DM, DT	German Democratic Republic
EA	Spain
EA6	Balearic Islands
EI	Republic of Ireland
EJØ	Aran Is.
F	France
FC	Corsica
G	England
GD	Isle of Man
GI	Northern Ireland
GJ, GC	Jersey
GM	Scotland
GM	Orkney Islands
GM	Shetland Islands
GU, GC	Guernsey
GW	Wales
HA	Hungary
HB	Switzerland
HBØ	Liechtenstein
HV	Vatican
I	Italy
IC	Ischia
IA	Tuscan Archipelago
IS	Sardinia
IT	Sicily
JW	Bear Is.
JW	Svalbard Is.
JX	Jan Mayen
LA	Norway
LX	Luxembourg
LZ	Bulgaria
M1	San Marino
OE	Austria
OH	Finland
OHØ	Aland Is.
OJØ	Market Reef
OK	Czechoslovakia
ON	Belgium
OY	Faroe Islands
OZ	Denmark
PA	Netherlands
SM	Sweden
SP	Poland
SV	Greece
SV	Crete
SV	Dodecanese
SV	Mount Athos
TF	Iceland
UA, UK1, 3, 4, 6	European RSFSR
UA1, UK1	Franz Josef Land
UA2, UK2F	Kaliningradsk
UB, UK, UT, UYS	Ukraine
UC2, UK2	White RSFSR
UO5, UK5O	Moldavia
UP2, UK2B, P	Lithuania
UQ2, UK2G, Q	Latvia
UR2, UK2R, T	Estonia
YO	Romania
YU	Yugoslavia
ZA	Albania
ZB	Gibraltar
3A	Monaco
4U	ITU, Geneva
9A	(see M1)

AFRICA

A2	Botswana
C5	Gambia
C9	Mozambique
CN	Morocco
CN2	Tangier
CR3	Guinea Bissau
CT3	Madeira Is.
D2, 3	Angola
D4	Republic of Cape Verde
D6	Comoros
EA8	Canary Islands
EA9	Ceuta and Melilla
EA9	Ifni
EA9	Rio de Oro
EL	Liberia
ET2	Eritrea
ET3	Ethiopia
FB8W	Crozet
FB8X	Kerguelen Is.
FB8Z	Amsterdam & St. Paul
FH	Mayotte
FR	Glorioso Island
FR	Juan de Nova, Europa
FR	Reunion
FR	Tromelin
H5	Bophuthatswana
IG	Lampedusa Island
IH	Pantelleria Island
J2, FL8	Djibouti
S7	Seychelles



DX COUNTRY CLUB

73 Awards Program

Number________________

This certifies that Amateur Radio Station

____

Has submitted evidence of confirmed contact via Amateur Radio with at least 73 DX Countries in one calendar year. This station is hereby recognized as a bona fide member of the 73 DX Country Club as a result of this operating achievement.

Signed:________________ Date issued:________________

Band:________________ Mode:________________

Annual Endorsements

73 Magazine
Awards Program

Presented to Amateur Radio Station

____

In recognition of confirmed contact with the Capital Cities of 50 DX Countries

Award#________ Date:________

Endorsements:________________

Signed:________________

2. To be valid, all contacts claimed must be made in a single calendar year (January 1 through December 31), beginning January 1, 1979.

3. This red and maroon award is issued for all phone, all CW, and mixed modes. Should you wish to recognize a single-band or mixed-band accomplishment, merely state your request when submitting your application.

4. To qualify for any of the *73* DX Country Club Awards, a minimum of 73 DX countries must be worked and confirmed from the *73* WTW (Work the World) DX Listing which appears elsewhere in this column. Once again, all contacts must be made in the same calendar year for which application is made.

5. Annual endorsement stickers are available for each succeeding year in which application is made and which shows a minimum of 73 countries worked.

6. To apply, prepare a list of claimed contacts in prefix order. Include each station's callsign, date and time in GMT, mode, and band of operation.

7. Do not send QSL cards! Have your list of contacts verified by two amateurs, a local club secretary, or by a notary public.

8. Award fee is $4.00 or 20 IRCs for each award. Endorsements are granted for a fee of $2.00 or 10 IRCs.

9. For all *73* award applications: Enclose your verified list and award fee(s) to: Bill Gosney KE7C, *73* Awards Editor, 2665 North Busby Road, Oak Harbor, Whidbey Island WA 98277, USA.

SPECIALTY COMMUNICATIONS ACHIEVEMENT AWARD CLASS A

A significant number of amateurs throughout the world find their primary interest in the operation and development of specialty-type communications. It is the efforts of these many pioneers in their respective fields which have created many state-of-the-art improvements in technology today. The editors of *73* wish to recognize those amateurs who make positive steps toward expanding the use of their respective mode or type of amateur operation. As a result, in the paragraphs to follow, learn of our latest communications award, dedicated to "communicator specialists." Both Specialty Awards are green and black.

To be eligible for the award, all contacts must be made on or after January 1, 1980. In addition, only communications via SSTV, RTTY, EME, and/or OSCAR satellite will be recognized for this award. Contacts between stations on OSCAR or EME may be made using any authorized mode allowed in your country. Mixed-mode contacts, however, are NOT valid.

To qualify, applicants must work and confirm contact with each of the 50 US states. There are no band requirements, but specific band accomplishments will be recognized if requested at the time of application.

To apply, applicant must prepare a list of claimed contacts in alphabetical order by state. Include the date and time in GMT, the band and mode of operation, and a signed declaration of the type of equipment and antenna system utilized.

Do not send QSL cards! Have your list verified by two amateurs, a local radio club, or a notary public. Enclose with your application a $4.00 award fee or 20 IRCs.

SPECIALTY COMMUNICATIONS ACHIEVEMENT AWARD CLASS A-1

1. Sponsored by the editors of *73*, this award is dedicated to amateurs worldwide who take pride in active participation in the field of specialty communications.

2. To be eligible for this award, some very rigid requirements must be met. All contacts must be made on or after January 1, 1980. Only communications via SSTV, RTTY, EME (Earth-moon-Earth), and/or OSCAR will be recognized for award credit. Contacts between stations on OSCAR and EME may be made using any mode authorized in your country. Applicants must be cautioned, however, that mixed-mode contacts are not valid.

3. To qualify, applicants must work a minimum of 10 DX countries from the WTW DX Listing. Special recognition will be made for those exceeding the 10-country minimum.

4. To apply, the applicant must prepare a list of claimed contacts in callsign prefix order. Include the date and time in GMT, the band and mode of operation, and a signed declaration as to the type of equipment and antenna system utilized to make your contacts.

5. Do not send QSL cards! Have your list verified by two amateurs, a local club secretary, or a notary public.

6. The award fee is $4.00 or 20 IRCs.

DX CAPITALS OF THE WORLD AWARD

1. Sponsored by the editors of *73*, the blue and black DX Capitals of the World Award is made available to licensed amateurs the world over.

2. To be valid, all claimed contacts must be made on or after January 1, 1979. There are no band or mode restrictions, but special recognition will be given for single-band or -mode accomplishments if requested in the application.

3. To qualify, applicants must work and

DX Decade Award

Whereas: Continued activity on all amateur bands is vital to the preservation of those bands for amateur use; and

Whereas: It is particularly desirable to encourage utilization of the 10 Meter Band; and

Whereas: The applicant has demonstrated the ability to communicate on the 10 Meter Band using channelized AM equipment;

73 Magazine hereby presents this award to station

____

in recognition of communication with at least 10 foreign countries.

Date:________________ signed:________________

Wayne Green

Certificate #________________

confirm 50 different capital cities of the world. Only capitals of those countries which appear on the WTW DX Listing qualify. Should a country be contacted and its capital city not commnly known, you may list it on your application and the awards editor reserves the right to make a final determination as to its acceptance for award credit.

4. To apply, make a list of contacts made in prefix order. Indicate the station callsign, date and time in GMT, band and mode of operation, name of the capital city, and the DX country.

5. Do not send QSL cards! Have your list of contacts verified by two amateurs, a radio club secretary, or a notary public. The award fee is $4.00 or 20 IRCs.

TEN-METER DX DECADE AWARD

1. Sponsored by the editors of *73*, the black-on-blue Ten-Meter DX Decade Award is available to licensed amateurs worldwide.

2. All contacts must be made on the 10-meter band using only channelized converted Citizen-Band equipment or similar-type commercial units operating a maximum of 15 Watts PEP output. External amplifiers may not be used.

3. To be eligible for this award, all contacts must be made on or after October 1, 1978. Contacts may be claimed for all AM, SSB, CW, or FM. Mixed-mode accomplishments are not valid for this award.

4. To qualify, the applicant must work and confirm at least ten DX countries from the WTW (Work the World) Listing. Endorsements will be given for 25, 50, 75, and 100 countries confirmed.

5. To apply, make a list of contacts claimed, giving the callsign of each station worked in prefix order. Include the date and time in GMT, band, mode, and a brief description of the equipment used in making each contact. Special recognition will be given for QRP mobile achievements.

6. Do not send QSL cards! Have your list of contacts verified by two amateurs, a local radio club secretary, or by a notary public. The award fee is $4.00 or 20 IRCs.

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Now here are the five domestic awards, also being sought after by award seekers the world over. These awards were not meant to be an overnight venture nor were they designed to duplicate any in existence today. Each offers its own degree of difficulty and creates a sense of accomplishment in those who are happy recipients.

WORKED ALL USA AWARD

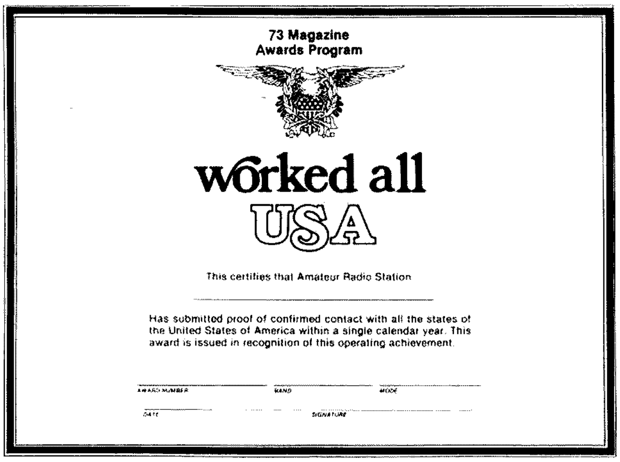
Sponsored by the editors of *73*, the black and maroon Worked All USA Award is available to licensed amateurs throughout the world. To be valid, all contacts must be made on or after January 1, 1979. There are no band or mode restrictions, but single-band and single-mode accomplishments will be recognized.

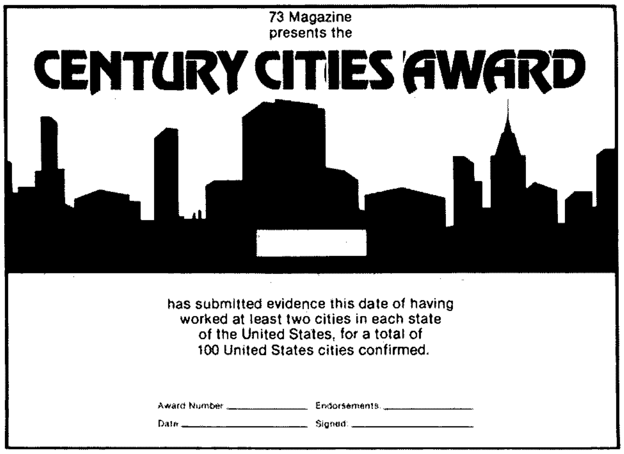
If you're looking for an award with challenge, this definitely is one. To qualify, applicants must work each of the 50 US states within the same calendar year (January 1 through December 31). Annual endorsements will be awarded applicants who can verify their claim.

To apply, prepare a list of claimed contacts in alphabetical order by state, beginning with Alabama. List the state, the callsign of the station worked, the date and time in GMT, and the band and mode of operation.

Do not send QSL cards! Have your list of contacts verified by two amateurs, a local radio club secretary, or by a notary public.

The fee for the basic award is $4.00 or 20 IRCs; endorsements are $2.00 or 10 IRCs.





The Worked All USA Award, with its 12-month limitation, separates the men from the boys. To date, only a few have mastered the 80-meter band, while 10, 15, and 20 have been more popular. Only a few aplicants have mastered all states on 6 meters, and 160 meters has been conquered only once. Does your station have what it takes to Work All USA in a calendar year?

CENTURY CITIES AWARD

Designed as a Dual-Worked-All-USA effort, the editors present this maroon and black Century Cities Award to the most demanding of amateur operators. The applicant who applies for this achievement realizes he has accomplished what is probably the greatest feat available in award programs today.

As with all *73*-sponsored awards (with the exception of the ten-meter incentives), all contacts must be made on or after January 1, 1979, to be valid.

To qualify, the applicant must work and confirm a minimum of two cities or towns in each of the fifty US states, for a total of 100.

To apply, prepare a list of claimed contacts in alphabetical order, by state. As shown below, include the full callsign of the station worked, the date, the band, and the city. Beginning with Alabama, your list will look something like the following: Alabama—W4ZZZ, March 31, 1979, 14 MHz. Decatur; N4XXY, February 1, 1979, 21 MHz. Mobile; Alaska—KL7AB, January 22, 1979, 7 MHz, Anchorage, May 19, 28 MHz, Fairbanks; and so on.

Do not send QSL cards! Have your list of claimed contacts verified by two amateurs, a radio club secretary, or by a notary public. Enclose this list along with your award fee of $4.00 or 20 IRCs.

TEN-METER 10-40 AWARD

What would an awards program be like without a QRP incentive? With 10 meters at an all-time high, the editors of *73* take pride in announcing the Ten-Meter 10-40 Award. Printed in black on blue, and designed specifically for owners of converted Citizens-Band equipment, the 10-40 Award is probably the roughest worked-all-states award program in existence. Ask those who have tried numerous times and failed!

Available to licensed amateurs the world over, the award offers a challenge second to none. To be valid, all contacts must be made on the ten-meter band using only "channelized" Citizens-Band equipment or similar commercial units. Power is limited to 15 Watts PEP output. External amplifiers are prohibited.

All contacts must be made on or after October 1, 1978, on SM, SSB, CW, or FM modes. Mixed-mode contacts NOT valid.

To qualify for this award, the applicant must work and confirm at least forty of the 50 US states. (An endorsement will be issued if all 50 states are worked.)

To apply, make a list of contacts in alphabetical order by US state beginning with Alabama. Include the call of the station worked, the date and time in GMT, the band and mode of operation, and a brief description of the equipment and antenna system utilized.

Do not send QSL cards! Have your list verified by two amateurs, a radio club secretary, or by a notary public. The award fee is $4.00 or 20 IRCs.

THE Q-5 AWARD OF EXCELLENCE

If you frequent the American Novice bands, you will be pleased to hear of an exclusive award for these bands. Sponsored by the editors of *73*, the black and maroon Q-5 Award of Excellence is available to amateurs worldwide who meet the requirements.

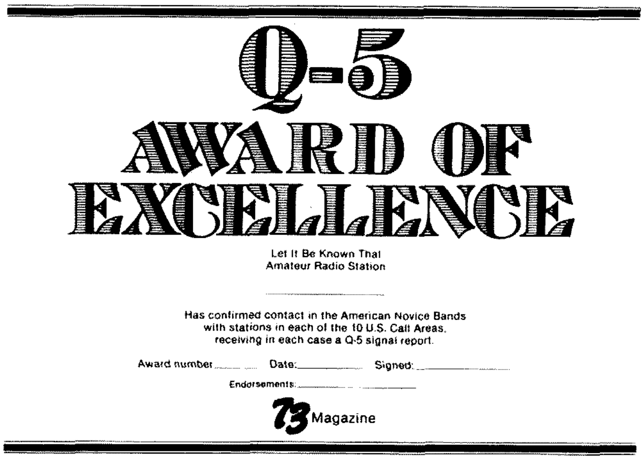
To be valid, all contacts must be made on or after January 1, 1979. All contacts must be made operating the CW mode on those frequencies assigned the American Novice. Applicants are cautioned that power limitations are 250 Watts input. There are no band restrictions, but applicants may request special band endorsement on the award if the request is made at the time of application.

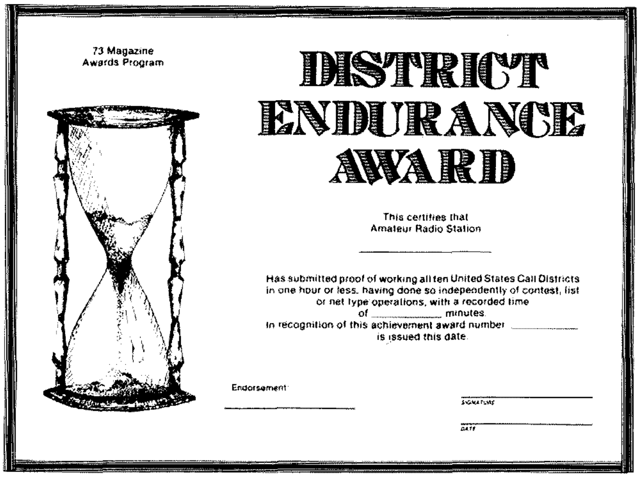
To qualify, applicants must work all ten US call districts and receive no less than a Q-5 report. A valid RST might be 559, 539, 579, etc., while an RST of 449, 349, or 479 would not quaify.

This award is not meant to be an overnight accomplishment. Stations meeting the challenge of these requirements will be proud to display this unique award depicting the excellence and superiority of the station's transmitted signal.

To apply, prepare a list of claimed contacts, logging each contact in order of the US call district. Include the station callsign, date and time in GMT, the frequency utilized, and, most important, the RST as noted on your confirmation card. Also required is a brief description of the station equipment and antenna system utilized to complete this award.

Do not send QSL cards! Have your list verified by two amateurs, a local radio club





secretary, or a notary public. Enclose with your application the fee of $4.00 or 20 IRCs.

DISTRICT ENDURANCE AWARD

If any of you feel our awards are too soft for you, take a hard look at our next award! This one, in black and maroon, was designed to appear fairly simple at first glance, but it will drive you up the wall with frustration as it is pursued. It is known as the District Endurance Award. You'll need to find yourself an accurate timepiece, as you'll have exactly 60 minutes to work all 10 US call districts! Simple, huh? Best time so far—8 minutes!

Sponsored by the *73* editors, the District Endurance Award is offered to licensed amateurs throughout the world. To be valid, all contacts must be made on or after January 1, 1979. There will be no band or mode restrictions, but if you are fortunate enough to work these requirements on a single band, we will be happy to recognize this feat when processing your award.

One of the most important rules applicable to this award is that all contacts must be made independent of nets or any net-type operation and must not be made while any contest is under way.

To qualify, applicants must work all ten US call districts in one hour or less. The time will commence the moment the first contact is established and end with the time logged for the last district required.

To apply, applicants must prepare a signed declaration that all contacts were independent of net or contest operation. Applications must include a list of stations worked in callsign order by district, the date and time worked in GMT, the band and mode of operation, and the state.

Do not send QSL cards! Have your list of contacts verified by two amateurs, a local radio club secretary, or by a notary public. Accompanying your application should be a $4.00 award fee or 20 IRCs.

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For applicants for the awards offered by *73*: I would like to give you some insight on how we process the paperwork. Upon receipt of an application, each award requirement is carefully scrutinized to see that the applicant has met each one to the letter. If approved, an award work sheet is prepared. The original copy of this and applicable award fee is mailed to Peterborough NH for the *73* art department to process. It is there that your award is given a personal touch and later mailed to your door. A copy of the award work sheet is mailed to the applicant to acknowledge receipt of the application. (Should the applicant feel it necessary to follow up, he or she should write a letter to the Assistant Publisher, *73*, Peterborough NH 03458. Writing directly to 73 headquarters will speed things up since the awards editor does not retain your paperwork once the request for issuance is mailed.)

We hope you enjoy the challenges of the *73* Awards Program and will share its rules with your amateur friends. While we hope you all will pursue the objectives these awards have to offer, we also hope you will send any information you might have on other award programs which have never appeared between the covers of this magazine. Looking through my files, I see where we have gone many, many months without duplicating information on a single award. Our files are getting bare, however, and it is the input of readers that keeps the image of this column original and creative. If your club has an award it sponsors, why not share it with our thousands of readers?

OHIO WINE WEEK

The Wireless Institute of Northern Ohio (WINO) will be on the air with a special-events station to commemorate Ohio Wine Week on Saturday, June 11, and again on Sunday, June 12. On Saturday evening we will be operating between 7 and 11 pm EDST (2300Z May 10 to 0300 May 11), on 3900 MHz and 7235 MHz. On Sunday afternoon we will be on between 11 am and 4 pm EDST (1500Z to 2000Z) on 7235 MHz and 21360 MHz. The station will be located at an actual winery in Madison, Ohio, using the call KØ8O, and a special QSL certificate will be available from: Scott Farnham KØ8O, 7126 Andover Drive, Mentor OH 44060, for a legal-sized SASE and an additional 40¢ (in postage or coin).

NAS MEMPHIS ARMED FORCES DAY

In recognition of the 34th annual Armed Forces Day celebration, amateur radio station W4ODR, located aboard Naval Air Station Memphis, Millington TN, will be operating on Saturday, May 21, from 1400Z to 2200Z. Plans call for operation on 7.230 (± 10 kHz), 14.280 (± 10 kHz), and 21.370 (± 10 kHz). The CW frequency will be 21.145. 146.52 will be the 2m frequency. It is hoped that operation will be continuous on all bands, but check all frequencies to be sure. Special certificates and QSL cards will be available to those who work W4ODR. QSL to amateur radio station W4ODR, PO Box 54278, Millington TN 38054.

MICHIGAN TORNADOES

The Macomb Emergency Communication Association will operate special-event station KA8KTV in commemoration of Michigan tornado season from 1300Z June 11, till 2100Z June 12. They will be on 20-meter RTTY (14.080-14.090), on 2-meter FM (146.07/.67), and on the upper General-class phone portion of 15, 40, and 80 meters as propagation allows. QSL with a certificate-sized addressed envelope to: KA8KTV, Box 291, Utica MI 48087. No return postage needed.

WORK THE BETHLEHEMS

W1FHP and the Hen House Gang will operate on 10, 15, and 40 meters from Bethlehem, Connecticut, The Christmas Town, Field-Day weekend, June 25 and 26, 1983. They also will operate July 9 from Bethlehem, New York and July 16 from Bethlehem, Pennsylvania. Awards will be available for working four Bethlehems from around the world. Send log information and a 20¢ stamp to Robert O'Neil W1FHP, Hard Hill Road, Bethlehem CT 06751.

NATIONAL HOLLERIN' CONTEST

Cape Fear ARS, Spivey's Corner, North Carolina, will operate WB4YZF from 1300-2100Z, June 18, from the 15th Annual National Hollerin' Contest. Frequency—phone, 7.235. Certificate available. For details, contact: Lee Brown N4DTB, 462 Shoreline Drive, Fayetteville NC 28301.

JAMBOREE IN THE HILLS

Special-event station W8QZ will be on the air during the Jamboree in the Hills on July 15-17, 1983. Operators from the Northern Panhandle Radio Club of Wheeling, West Virginia, will be on 7.280 and 14.280, ± 5 kHz, and a special QSL certificate will be offered to all stations worked. To receive the certificate, send an SASE to: Joe McCready WB8CTC, 111 Chase Ave., Bridgeport OH 43912. The event is being sponsored by broadcast station WWVA of Wheeling WV.

73 AWARD WINNERS

NORTH AMERICAN AWARD

269	WA2FYW	283	WA7GCS
270	KI2G	284	WB4GRC
271	OE2SXL	285	KC8RH
272	HK5CKH	286	N5ACU
273	W2GVX	287	DK4SY
274	KA6QPL	288	HI3VAK
275	KA5IUK	289	WA9MTP
276	IØAOF	290	N1APE
277	KB8CU	291	YB2BLI
278	KAØIAR	292	I1ZXT
279	OZ5EDR	293	OZ1ACB
280	W2-6893	294	PY2AJK
281	K8IU	295	PY6ABZ
282	W4CKD		

SOUTH AMERICAN AWARD

237	PT9OK	251	IØAOF
238	OE2SXL	252	K4KYI
239	KI2G	253	KA5IUK
240	KA2IAL	254	W4CKD
241	KA6QPL	255	K8IU
242	W2GVX	256	I5HOR
243	PY1EWN	257	HI3VAK
244	HK5CKH	258	DK4SY
245	OE2-207181	259	DA2LI
246	KA1CLV	260	KC8RH
247	N9CQB	261	PY2RAN
248	KA2LHO	262	PY6ABZ
249	KAØIAR	263	I1ZXT
250	KB8CU	264	DFH-1000742
265	YB2BLI	267	WA9MTP
266	N1APE	268	4W-16260

EUROPEAN AWARD

314	PT9OK	325	IØAOF
315	OE2SXL	326	KB8CU
316	KI2G	327	KAØIAR
317	KA3FUR	328	KA2LHO
318	G2VF	329	N9CQB
319	PY1DEA	330	W2-6893
320	HK5CKH	331	K8IU
321	K9IML	332	KK2Y
322	W2GVX	333	JM1IFB
323	KA6QPL	334	W4CKD
324	KA5IUK	335	WA2KDC
336	DA2LI	343	HI3VAK
337	WB4GRC	344	I5HOR
338	OZ1ACB	345	N2BFG
339	VE5ADO	346	N1APE
340	KC8RH	347	YB2BLI
341	N5ACU	348	I1ZXT
342	DK4SY	349	PY6ABZ

ASIAN AWARD

184	KI2G	190	WB3BVL
185	PT9OK	191	W8UMP
186	OE2SXL	192	KB8CU
187	KA6QPL	193	IØAOF
188	W2GVX	194	PY1DWM
189	K9IML	195	I5HOR

196 HI3VAK
197 DK4SY
198 W2-6893
199 K8IU
200 PY2RAN
201 PY6ABZ
202 PY2AJK
203 OZ1ACB
204 I1ZXT
205 YB2BLI
206 N1APE

166 HI3VAK
167 DK4SY
168 PY6ABZ
169 PY2AJK
170 I1ZXT
171 YB2BLI
172 PY1DWM
173 N1APE
174 K8IU
175 W2-6893
176 4W-16260

OCEANIA AWARD

190 8P6OV
191 OE2SXL
192 KI2G
193 KA5BOM
194 HI3AMF
195 KA6QPL
196 W2GVX
197 JA1NVG
198 HK5CKH
199 K9LJP
200 4W-16260
201 KA0IAR
202 KB8CU
203 I0AOF
204 KA5IUK
205 ZL2LO
206 JR6GSE
207 I5HOR
208 HI3VAK
209 DK4SY
210 N5ACU
211 KC8RH
212 W2-6893
213 PY2RAN
214 PY6ABZ
215 PY2AJK
216 OH6CS
217 I1ZXT
218 YB2BLI
219 PY1DWM
220 N1APE
221 K8IU
222 W9CC

WORK THE WORLD AWARD

154 OE2SXL
155 KI2G
156 N4AKO
157 KA6QPL
158 W2GVX
159 K9IML
160 OE2-207181
161 HI3AMF
162 KB8CU
163 I0AOF
164 I5HOR
165 PY2RAN

WORKED ALL USA AWARD MIXED BAND

79 KA2LHO
80 KA1HFN
81 KA4EOX
82 WB9KUV
83 JA1VDJ
84 KB4AUD
85 N4HVV
86 KA7MPJ
87 KA9JKK
88 VE7EIK
89 N4HPX
90 I0AOF (RTTY)
91 I0AOF (CW)
92 KI2G
93 PY1DWM
94 YB2BLI (RTTY)

WORKED ALL USA AWARD 75/80 METERS

7 WA0RVK
8 N4QH
9 W4PCK
10 WB2ZEL
11 K9LJP
12 KI4Y
13 KQ7Y

WORKED ALL USA AWARD 40 METERS

1 WA2SRM
2 N8AZD
3 WD4DBJ
4 WD0BOS
5 N5AHZ
6 N4QH
7 KA1DNB
8 K4NRR

WORKED ALL USA AWARD 10 METERS

6 VE1BWP
7 N4QH
8 N5CSW
9 KA9HVV
10 VE2FOH

WORKED ALL USA AWARD 30 METERS

1 K3WGA (first award issued on the new 10-MHz WARC band.)

DX CAPITALS OF THE WORLD

29 VE3JPJ
30 HI3AMF
31 W2-6893
32 I8HZT
33 JA1VDJ
34 SV1MO
35 K12G
36 FM7WD

73 SSB DX COUNTRY CLUB

118 DJ9ZB (1980)
119 DJ9ZB (1981)
120 DL5LV
121 HK5CKH
122 KA6QPL
123 OE1-111080
124 DE0DXM
125 DA2LI
126 I8HZT
127 IK1AOD
128 KA2CDE
129 DE1ULF
130 OZ1ACB
131 OH6CS
132 I2JIN
133 KI2G

73 MIXED-MODE DX COUNTRY CLUB

22 WB5LBR
23 WD6EEQ
24 NL7J
25 KA0MMD
26 W2GVX
27 W9CC
28 JH7VHZ

73 CW DX COUNTRY CLUB

20 PY2BTR
21 DF5UT
22 OZ5EDR
23 PT2ACZ
24 KK4Y
25 PY2FK

SPECIALTY COMMUNICATIONS CLASS A

1 WA6VGS (OSCAR)
2 KE7C (RTTY)
3 YB2BLI (RTTY)

SPECIALTY COMMUNICATIONS CLASS A-1

22 I1ZXT
23 IW3OIO
24 W4CKD
25 IW1PED
26 YB2BLI
27 FM7WO

10-METER DX DECADE AWARD

9 WB8LSV
10 WB9WFZ
11 W8AKS/6
12 KA3FUU
13 W2-6893

CENTURY CITIES AWARD

39 K9LJP
40 KA9LYH
41 HC2RG
42 PY2DBU
43 KX5U
44 WA8BIJ

Q5 AWARD OF EXCELLENCE

107 KA9LYH
108 N8CYS
109 WB9UIA
110 NS4J
111 VE6CNV
112 KA2LHO
113 KA0IAR
114 KA6OGC

LETTERS

NERVES

I enjoyed your editorial in the March, 1983, issue of *73*. I had difficulty with code because of a nerve condition, not a memory problem. As a result, I was excluded from ham radio. I have been a microwave technician for 30 years and am a 1963 graduate of RCA Institutes, NYC. I always resented being excluded from a wonderful hobby because of a stupid rule. I wish there were more understanding people like you in the field.

Thomas Costigan
East Setauket NY

One is enough.—Wayne.

RETURN TO THE FOLD

Back in 1942, as a marine radio operator in the Navy Department, I operated CW circuits at speeds in excess of 50 wpm. On one occasion, I was timed over a three-minute period at 64 wpm, with a total of four mistakes. At the close of WWII, I lost all interest in radio and did not regain it until a group of CBers asked me to teach them the code. Now they all have their ham tickets, and I am a 62-year-old Novice, having received my license in January, 1980. I thoroughly enjoy the Novice bands because I can always find some poor struggling soul to lend a hand to in learning how to communicate. Because of this I will not upgrade my license until I join the ranks of the annuitants. Even then I will look for that Novice needing my assistance. I relate this to you in order to set the stage for what is really on my mind. Wayne, I am with you 100% on the no-code license. I totally disagree with the ARRL in their approach to this, and since they refuse to print anything but the silliest of objections to the code, I decided to let my membership die with the February, 1983, issue of *QST*. Lo and behold, on page 65, there with his bare face hanging out was W2NSD/1! Are they beginning to see the light, Wayne? Or did you and Carl sneak that one in one them? By golly, I may renew my membership if that keeps up!

Bill Haddad WD0HXH
Whiting IN

Surprised me, too.—Wayne.

SOGGY VIDEO

During the recent storms, two pieces of electronic equipment went into the "Mighty Blue Pacific," and both were saved. The first was my Icom IC-2AT hand-held. It slipped off my belt and was inundated with salt water before I could retrieve it. The key to saving it and a $5,000 Sony BVU-110 broadcast video recorder that got caught by a misguided wave the next day was to get it, while still wet, into a deionized water ultrasonic cleaner. In the case of the BVU-110, the machine was dissassembled and pressure cleaned, after which it was dried at 130 degrees for 36 hours. I then replaced all rubber, including belts, drives, etc. It has been in service for a month with no problems.

The HT was handled in a similar way, washing out all corrosive salt water before the salt began to dry and start its corrosive process. After 36 hours of drying, the transmitter and tone pad functioned properly, but the receiver would only emit toilet noises. After a quick consultation on the phone with Icom America, it was decided to send the unit for repair via the dealer it was purchased from. I dropped the unit at Ham Radio Outlet/Van Nuys on the Tuesday following the incident and had it back within 7 days, operating to perfection and at a very reasonable price. The sevice rendered by both HRO and Icom deserves acclaim. It's rare in this day and age to be satisfied the first time out. So, with thanks to the folks at HRO and to Mr. Tom Snelling at Icom, this letter is made possible.

Bill Pasternak WA6ITF
Saugus CA

DEATH THROES

I've been going to a local ham club's meetings for two months now. Unfortunately, the ham club does not. And then, guess what? Well, first they can't get quorums. Without quorums, there are no elections, nor can there be a vote on new membership applications (like mine). Second, without member attendance, there are no project proposals or programs. Then there are the somewhat outspoken, non-attending former members (including charter members) who apparently say, "The club is dead and the officers should stop keeping it artificially alive," or something to that effect, as reported by the club paper (the editor does a super job).

Well, I'm afraid that the club is about to die and the few attending members (mostly officers) are discussing solvency (ironically, they need a quorum to do so). Whether or not the club will formally dissolve is speculation, because one officer has pseudo-formally resigned (again, need a quorum). And I cannot hold it against him for doing so.

I wonder if nobody attends meetings for fear of being elected to office, or is it because nothing happens (except gab) when they do go? After all, it seems rather ludicrous to have a formal meeting to just gab when you can do it at your rig.

Perhaps the elimination of about 75 percent of the formalities, like the need for officers or structured meetings or running a treasury, would improve the situation. So that way, if the group does want to do something, they can "pass the hat" to finance it. Then, if nobody wants to do anything (or very many), nothing is lost and "members" could have a gab session without being put in an office position (the horrible dread).

Oh well, it looks like my two ventures to the meetings will be a loss. I'll just bet there are many, many "clubs" in the very same sinking boat.

Duane Grotophorst KA9HKL
Sauk City WI

Duane, you're right. Clubs should be for fun, with virtually no business meetings. There should be classes on code, theory, talks about DX, repeaters, show and tell of RTTY, slow scan, computers, packet radio, discussions of the articles in the latest magazines, club participation in contests such as Field Day, DX contests, sweepstakes contests, and so on. Get rid of the turkeys who try to conduct business meetings and replace 'em with a hot-to-trot program chairman. Bring in active local hams to talk, manufacturers, dealers, have QSL card showings, home-built gear shows, flea markets, auctions, and get some action going there.—Wayne.

OOPS

This letter is in response to one I wrote which you published in your magazine in March, 1983.

In the previous letter, I mentioned two operators who were on CB, supposedly running ham gear. Since this letter has been published, I have received many comments about it.

First, let me state that I never should have written about it or at least should never have mentioned the club calls I thought they were using. I admit that I should not have written the names they were using, although when I was a CB operator (not always legal), it was almost always common practice to say you were

somewhere other than where you were and be called by something other than your own call.

Secondly, I never meant to give the impression that the Mercury Sideband Club members were all illegal operators with no brains.

It seems as if I really struck a wrong note here in the area and I apologize for all the mess.

I still feel, however, that if there are any amateur radio operators who are in the club and are operating illegally, they should reconsider their actions. It would seem that their ham licenses are really of no importance to them if they don't.

Wayne, it seems that you and I are two of a kind, always out of step with everyone else. Guess that makes America what it is—a place where you can disagree and still be free.

So, in closing, once again I state my apologies to the many good operators in this area who are members of the Mercury Sideband Club and wish for them continued success in furthering the improvement of CB radio.

Wayne, thanks again for your help.

Jerry Rogers KA8PTL
Monroe OH

Oh, baloney. I'll bet you were right the first time. Don't be so wishy-washy.—Wayne.

GUAM GROANS

In your January issue, you said, "DX is out there, where are you?" I would like to reply to part of that question from a possible DX point of view. I am over 7,000 miles from Kansas so I think I may be a DX station, but I have two problems. I work the Novice bands on 10 and 15 because I am a Technician and the nearest FCC examination point is 3,000 miles from here. The FCC sure doesn't come to us. I also work CW because I sincerely enjoy it.

That was problem number one. Problem number two is that I have a California "6" call because of my address. Wayne, I have answered CQ DX calls from all over the states, most with a 559 or better signal, and I often get, "I was calling DX; do you know what DX is?" I was even interrupted once while in QSO with a VK station by a K6 that wanted to make a DX contact with VK-land. That's all fine, and no problem, but when I went back to him with N6HSC/KH2, he said he wasn't interested in California. My standard reply is "73 from Guam" and then I ignore the commotion as they realize they blew it.

I suppose most Novices have drawers full of KH2/KG6 QSLs, but I sure don't have any quanity of their cards. I can work JAs and VKs anytime I want and, when the bands open, cause a pileup in Europe, but I can't get a KA to come back to me unless I pretend I'm in California and drop the /KH2. At least one KA6/DU2 shares my frustration. I would like to get Guam in a few more Novice logs. I average one contact in the states for each five hours of operation and that's ridiculous. I know you guys can hear me when the band is open. Please inform your readers that there are stateside calls all over the world operating portable something or other, and most would welcome a call. Almost 100 percent of my QSLs say "Thanks for my first Guam contact."

Wayne, we're out here trying, but probably not for much longer. I, for one, will go back to my JAs and VKs and say to hell with the stateside guys.

Preston Allen N6HSC/KH2
Agana, Guam

Those DX snots don't know how to fill out a QSL anyway.—Wayne.

FREE TAPE

The Wichita Amateur Radio Club invited Dick Abraham, corporate engineer for Multimedia Cablevision, the Wichita cable franchise, to speak before our group at our December 1, 1982, meeting. Dick did a lot of homework and made an excellent presentation.

We recorded his presentation and will be happy to make a copy available to anyone who would like a copy. To obtain one, mail a C-90 cassette and an SASE to me. We have bulk duplicating equipment and will be able to get copies out immediately. Any request without a C-90, SASE, or both will be thrown away.

I don't believe Dick's presentation has any real "news" value; however, it would be helpful to those who are having trouble with their local cable operators and especially helpful to those whose communities will soon be building cable systems.

The Wichita cable system is not tight. There are leaks on 145.25 MHz all over town. But Dick has promised to fix those that exist, at least to the letter of the law and better than that if he can. All we have to do is notify him of their existence. Amateurs in Wichita don't like having to coexist with cable but realize they have a much better situation than most. At least our local cable operator has made helpful overtures.

Dick Houser WDØENU
PO Box 1402
Wichita KS 67201

SCHOLARSHIPS

The Atlanta Radio Club announces that three cash ($500) competitive scholarships will be awarded to graduating high school seniors who will enter an accredited college or university in the fall of 1983. Recipients must be duly licensed amateur radio operators at the time of application. The scholarships are awarded on the basis of both scholastic attainment and outstanding efforts as amateur radio operators.

This is the fifth consecutive year in which the Atlanta Radio Club has been able to award scholarships to deserving amateurs.

For additional information and application forms, write to: Phil Latta W4GTS, Secretary, Atlanta Radio Club Scholarship Committee, 259 Weatherstone Parkway, Marietta GA 30067.

Completed applications along with the required high school transcripts must be postmarked not later than July 31, 1983.

Atlanta Radio Club, Inc.
Atlanta GA

BEACON

On January 5, 1983, I put KA1YE/B on the air from Oakdale CT. The beacon is running 2 Watts output to a vertical antenna on 28.284 MHz. The beacon operates 24 hours a day and provides a consistent signal source for checking out 10-meter propagation. At this time, the ID is on FSK, but it will changed to an all-CW format soon. I am also putting beacons on 6 and 2 meters, hopefully by May 1, 1983.

I would like to receive some reception reports from US and Canadian amateurs, especially this summer during the sporadic-E (short-skip) season. Any unusual propagation noted would also be of interest. Reception reports can be sent to my 1983 *Callbook* address, or foreign reports can be sent to the W1-land bureau, c/o my call.

So far, the only reports I have received from US amateurs have come after I requested them to listen specifically for the beacon. Many amateurs, even those who are consistently on 10 meters, do not seem to be aware of the extensive DX beacon system on from 28.200 to 28.300 MHz. In the last 2 months, I have logged over 30 DX countries, in all continents except Asia, on the beacons. Many times I have heard the beacons S7-9, only to hear some stateside station say, "Gee, 10 meters was great when it was open." Give a listen down there. Ten meters is open much more than most hams realize. Let's use the band. See all of you on ten.

W. Keith Hibbert KA1YE
Niantic CT

RAVE REVIEW

I want to commend you and your staff for the excellent product reviews. I find them superior to those of the other ham magazines.

Frank Vogel WB5PMU
Cherokee IA

You are very perceptive.—Wayne.

FCC

NO-CODE COMMENT EXTENSION

The FCC has extended the deadline for comments on the no-code license by 60 days, giving hams until June 28 to file their suggestions.

In February, the Commission released a Notice of Proposed Rulemaking setting forth two alternatives for a theory-only amateur license which would offer VHF privileges similar to those for the present Technician license. When the notice was released, the comment deadline was dated April 29, with reply comments due one month later.

The extension came in response to a March request by the ARRL which argued that the League's members needed more time to discuss the issue and that members' responses would not be considered until the April 21 and 22 Board of Directors meetings.

In its statement, the FCC said, "We concur . . . that a no-code amateur radio license is a core issue for the amateur community. Since we want the input from amateur radio operators to reflect thorough and dispassionate consideration, we will grant the requested extension of time."

HAM HELP

Wanted: the manual, or a copy of it, for the Clegg Thor RF 6-meter rig and the Heath GR-81. I will pay postage and copying costs.

R. L. Lyon N8BQV
2425 W. Bennington Rd.
Owosso MI 48867

I am in desperate need of a schematic for the Brimstone 144 transceiver made by Satan Electronics. I will reimburse any expenses.

Phil Taylor KA9LAA
517 Hendricks
Berne IN 46711

CORRECTIONS

Although the tunable Pocket Weatheradio used in "Put 2 Meters in Your Shirt Pocket" (March, 1983, p. 46) is no longer available from Radio Shack, the crystal-controlled Weatheradio (RS no. 12-151) will work even better. It draws only 10 mA, needs no squelch, and modification is simple.

Remove the 16-MHz weather crystal and replace it with a 2-meter transmit crystal approximately 455 kHz above or below the intended receive frequency. If a standard transmit frequency does not fall exactly 455 kHz above or below the intended receive frequency, the i-f detector transformers can be shifted at least 50 kHz and there is also an internal trimmer capacitor and variable inductor to shift the crystal frequency. The two-meter crystal can be either 12- or 16-MHz fundamental. The crystal I use is from an Icom 22A and has an 18-MHz fundamental. Add a 5-pF capacitor across the 2 rf amplifier inductors and spread or compress it to achieve maximum sensitivity.

Lester Kolb K3PJG
Lebanon OR

An error appeared in the schematic for "QRM Eliminator for Computer CW," which was part of the Circuits feature on page 105 of the April, 1983, issue. The junction of C2 and C3 on U1 should be grounded.

Avery L. Jenkins WB8JLG
73 Staff

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 6

ARRL. What would happen to a *Relay* League based upon Morse-code-trained operators if automation was permitted to set in and allow messages to be sent without these operators? The whole concept struck at the heart of the League. Well, here we are 33 years later and the ARRL has every reason to be very proud of itself. They have managed to fight off modern communications techniques for over three decades, keeping us in the medieval days.

Is it any wonder that people working in the communications field look on hams as hangers-on from the long-gone past of radio? We've been left so far behind current technology that it is going to take us years to catch up. Our communications systems are so irrelevant and wasteful of people that no one really takes us very seriously. Oh, they would like to get the radio spectrum we've managed to hold onto over the years. Every shortwave channel is worth many millions of dollars when used for an efficient communications system.

So please don't do the old Captain Queeg bit and try to get anyone to seriously think that hams are ever going to use Morse code for anything but a monument to our resistance to progress and our insistence on wasting billions of dollars in radio channels for little more than entertainment. I suppose that we do agree that it is entertaining to sweat out a CW contact with someone a few hundred miles away, managing to get his name, location, rig model, type of antenna, and a brief on the weather as the reward for fifteen minutes or so invested. It must be fun or we wouldn't see so many hams devoting the declining years of their lives to this.

I'll agree that using the good old Morse code can be fun, but it isn't anything I can take seriously as a means of communications, and it hasn't been for years. I don't think anything can happen that will put us back into the spark days. Heck, it's getting difficult to come up with an old Ford coil these days. Old-timers will fondly remember those little wooden boxes we used to hook to number 6 dry cells and generate tens of thousands of volts. They came from the good old Model T cars and were everywhere... for a while. You could hear 'em for a mile on *any* radio.

It may be time for us to stop looking at the past and take a more serious look around at where the commercial firms are with their communications in the 1980s and see if we can at least catch up. The time was when amateur radio waa ahead of the commercials, not lagging them by 50 years. We have plenty of ICs to work with and the support of a growing number of ham-oriented firms to help us get going with high-speed digital communications.

We may want to continue our traffic nets as they are... much like keeping antique cars running and preserving Williamsburg or New Hampshire's Strawbery Banke. But this shouldn't stop us from developing some high-speed error-correcting traffic systems. One automated system with two ops sitting back drinking coffee should be able to handle more traffic than all of the Morse code nets in the country combined. If emergencies come, we're going to need modern services, not relics of the 1939s.

VIVA THE CODE!

One of our readers has come up with what appears to be a wonderful idea. He noted the strong support of the code for amateur licenses by a large part of the brethren and suggests that if this really is a necessary skill, amateurs should be retested at regular intervals to be sure that they have not lost their skill. I'm recommending that as a first-rate idea.

If anyone agrees with the majority of ARRL members that Morse code really is a necessary skill, let's see a petition to the FCC asking that every ham be re-examined every two or three years to make sure that he or she has not slipped in code skills. Or would every year be better? It sure doesn't take long to get rusty at the code, right? And I don't think you want anyone wasting our time on our valuable ham bands who managed to sneak through without knowing the code or who has gotten rusty.

You know, since there is such general agreement on the importance of code, perhaps we should start to take it seriously and stop being so namby-pamby about it. Is there really any reason why we shouldn't require everyone to move up a step in code with each re-examination? That would move all the Novices and Techs, who virtually don't know the code at all. At five words per minute you really don't have to have any code-handling skills... the skill comes in at 13 per, not at five. Okay, so let's make sure that we really do require the skills the majority agrees we should have... put our skills where our mouths are, so to write. Techs would then have to demonstrate an honest skill... 13 words per minute the second time down. And the third time they would be expected to show that they can copy at 20 wpm. I really don't see where anything less is honest or fair... if we are in agreement on the importance of code.

Well, you are saying (yes, I hear you), this just means that everyone can memorize the Bash tape translations, the way so many have been doing in recent months, and not even have to really learn the code. No, I'm willing to put the facilities of *73* at the disposal of the FCC... and at our cost, which is a heck of a lot less than they're paying right now... and turn out computer-generated Morse-code tapes, complete with an exam grading chart geared to each tape. That's a cinch. We'll just put about a hundred different on-the-air-type contacts on a disk and have a computer pick at random a call, name, QTH, rig, and so on for each tape, complete with an individual printout of the tape. No problem for us at all. We can grind out dozens of such tapes a day, each one entirely different, and the cost will be miniscule. If you agree that we really should get cracking with this code business in earnest, I'll get a bid in to the FCC to supply the tapes for them or for any clubs which give the exams, if we go that route.

Just think, if we stop pussy-footing around about the code and make sure that every ham has this skill, every one of us will be able to copy 20 wpm! The code is an absolute snap for me, always has been, so I'm 110% in favor of getting rid of all the old fogies who are too lazy to keep up this skill, one which a high percentage of you agree is important. And any Techs who are too busy gabbing on two meters to take off the few hours it takes to learn the code won't be missed... right?

I don't know why we should give people two years to increase their code speed when it takes just a few hours of work. Why not stop coddling the lazy and make it so you can get your Novice ticket at 5 wpm, then one year later you will have to have passed your 13 per, and a year after that 20 per. It makes a lot of sense to me, and I don't think you'll find anyone at the ARRL opposing the code.

Should we tighten up that schedule a bit? Giving new hams a year to increase their code speed will only tend to encourage them to put off practicing until the last minute. So why not make the last minute closer to the first minute and not have them fretting and fussing for eleven months and 28 days before starting to practice.

I haven't seen any recent figures on this, but I do know that a good friend of mine in New York has been teaching people the code from scratch at 20 wpm in one weekend. But let's agree that some people are a bit slower and might take a couple of weekends, and some might even have other things to do for one or two weekends which would keep them from practicing. Would a month do it? Certainly anyone seriously interested in his ham ticket can find a few hours in a month to get his code speed up.

You know, one of the saddest days in amateur radio was when the FCC under George Sterling, a ham and chairman of the FCC, forced us to have the Novice class license. The ARRL fought it tooth and nail and hated it, and still, as far as I know, doesn't really think of Novices and Techs as real hams. When I came into amateur radio, the first test was at 13 words per minute. That meant that you darned well had to really know the code and be able to copy it as a skill, not just by memorizing the characters and translating each one as heard as one does at five words per minute. *That* really isn't a code skill at all.

So let's petition the FCC to dump the 5-wpm test and start right out the way we used to at 13 wpm. *That* really proves some code skill. And then a month later, 20 wpm. That way we'll get all those darned CBers off our bands and stop all of the stupid pileups on DX, jamming on repeaters, bad language, and so on.

You know, most of the commercial CW circuits used to perk along at 35 words per minute. It probably takes a few weeks of practice to go from 20 to 35, but I'm not sure that is too much to ask any ham who is serious about this hobby. Let's have some letters on this. Should we go on up to 35 wpm for everyone... allowing perhaps six months to get there? Or is that too long? I'm 60 years old and as anyone will tell you, my brain is obviously going soft, but I'm sure I can get right on up to 35 per in a few weeks if we all agree on it. And you can bet that if I have to do that, I'm going to make sure that everyone else who comes along later isn't going to have to do any less, even if it kills the hobby.

So let's get together and put the no-code wishy-washies where they belong... on CB. And if they want to work DX, let 'em go on the 27-MHz HF band with the rest of the CW illiterates.

WHAT ARE YOU READING?

The results of a recent poll of the amateur radio community showed some interesting patterns. They're not really surprising, if you stop and think about it, but amid the flurry of claims and baloney flying around, it is nice to see what the surveys show is really going on.

To achieve a statistically valid survey, one can poll as little as a few hundred people, as you know if you've ever had to sit through a course on statistical analysis. That was not one of the more interesting courses I had to live through in college, but at least the experience did help to clear away the mystique of that field for me. In the *73* survey, we received responses from 5,720 hams, which is an overkill of about ten times that actually needed for dependable results.

Since we like to be sure that the content of *73* is right down the middle of the alley, so to speak, one of the questions had to do with how this content is perceived by hams with a comparison of how the content of the other ham magazines is perceived. Here's the result:

Mag	Too Complex	Just Right	Too Simple
73	6.1%	86.6%	7.3%
QST	24.9%	62.6%	12.5%
HR	32.6%	57.6%	9.8%
CQ	7.3%	57.3%	35.4%

Okay... what does that tell us? Looking first at the "too complex" column, we see that two of the ham magazines are turning off readers by making them feel stupid. Mind you, the material covered is not much more complex than is covered in *73*, it's just that the editors are not making the material easy enough to understand. It's the writing that makes it complex, not the material covered.

We hams, like anyone else, tend to be turned off if we are unable to understand what we are trying to read. And we also get bent out of shape if we think we are being catered to with condescending copy, which brings us to the "too simple" column. Isn't it curious that *73* did the best on both the "too simple" and "too complex"? No, not all that curious when you remember that our editors know what you want and see to it that the articles are neither condescending nor too esoteric in technical language.

Remembering that we're trying to be all things to all hams, there is no way to really get to 100% on "just right." There are always going to be newcomers trying to learn about what is going on who need to have plenty of hand-holding, so material must be made reasonably simple. Then there are the scientists who want to keep up with the state of the art and who will never admit even to themselves that anything is too complex. I'm not sure that anything much over 85% is ever going to be attainable, considering the wide variety of ham interests.

The perception of interest of articles obviously will reflect in an interest, or lack of it, in spending the money for a ham magazine. This brought about the next obvious question on the survey... asking which ham magazine, if any, the respondent had dropped during the past year. Almost one quarter of those surveyed had dropped at least one ham magazine subscription, so tha degree of interest of a magazine does turn out to be a most significant factor. Further, the dropping of subscriptions is unsurprisingly parallel to the perception the magazines are giving of their relevance to the ham reader.

The magazine dropped by the highest percentage of those surveyed was *Ham Radio*, with an 11% loss. This is consistent with the 32.6% "too complex" perception of the magazine. *QST*'s loss was second, running 9% and reflecting, one would suppose, the 24.8% "too complex" as well as the 12.5% "too simple"... and despite all of the pressure to "support the League, right or wrong." *CQ* fared better with only a 7% drop,

largely resulting, one would suppose, from the 35.4% "too simple" perception. *73* came out with only a 4% subscription loss, which might be considered as a minimum which is possible when you remember that there are going to be reader losses due to many factors other than magazine quality. There will always be non-renewals resulting from readers being out of work (which seems to have been a minimum for hams in this recession) or suffering from some personal disaster... such as getting married. We'll always lose a few.

What does this mean to you, the reader? Well, it means that we're giving you what you seem to like best in an article/column mix. Mind you, we're wide open for any ideas on change. *73* has changed substantially down through the last 23 years it has been published and will continue to do so. Older readers will remember back when the magazine first started and pushed the heck out of sideband. Then, when the so-called incentive licensing proposal was put before the FCC, we fought that, feeling that it would stop the growth of amateur radio and hurt the industry. Alas, we were right in that, even if powerless to stop the League at the time. Now we all have to live with the disastrous results of those black days... including the new management of the League.

Next we plugged for solid state while the other magazines were still pushing tube circuits, and then we pioneered FM and repeaters, at first a very lonely and controversial position. Our record is good for keeping you really up to date on new technologies and encouraging the building of ham gear.

Advertisers should find the results of the survey of particular interest, too. There is always the question of where it is best to invest in ads in order to reach the active, buying ham. The large number of retired hams getting *QST* has always made that magazine seem like a good deal for ads... after all, look at how many readers there are! It turns out there is a big difference between the buying interest of retired old-timers and active younger hams. Would you believe that surveys of *QST* readers have shown that about one-third of the subscribers don't even look into the welter of ads in the back of the magazine at all? Their equipment budgets are zilch, so why bother?

Speaking of ham buying, the recent survey showed very clearly the impact of the recession. The 5,720 hams surveyed said that they averaged about $567 each spent during the last year. When asked what they had budgeted for ham gear purchases for this year, they estimated an average of $640. This is the first time in several years that hams have said that they intended to go out and buy a lot more gear than they had in the previous year.

What are they going to buy? Unless the *73* readers are exaggerating, there are going to be a lot of low-band rigs sold this year... about 32,000 just to the *73* readers alone. The second product in mind for the readers is a new HF antenna... please make note KLM, Cushcraft, et al. Surprisingly, perhaps the third most wanted new item is a microcomputer, with an estimated 22,800 budgeted for purchase. That comes down to around $1M a month in computers just for the *73* readers, so we may be looking at a substantial rise in interest in RTTY and other computer-related communications.

At least 20,000 HTs are in the budget for this year and, with any encouragement from repeater groups, I'll bet that could be doubled.

By the time you add up what the approximately 150,000 readers of *73* tell us they are going to spend, it comes to around $7,5000,000 per month. Who says the ham business is dead? With that kind of market... and growing... I think we'll be seeing more and more small firms getting into the business to get a piece of the action.

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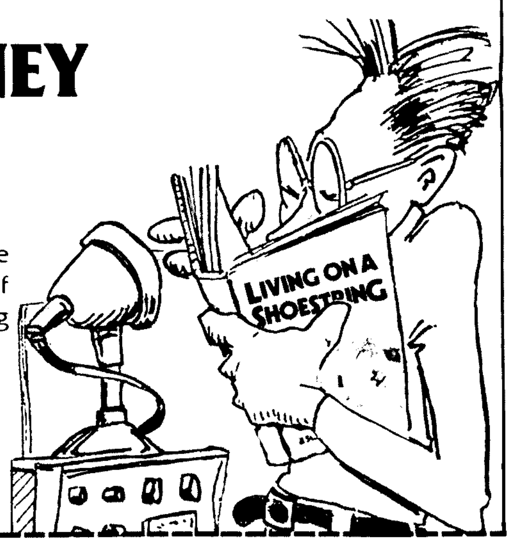

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EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	7A	14	14
ARGENTINA	21	14A	14A	14	7A	7	14	14	21	21A	21A	21A
AUSTRALIA	14A	14	14	14B	7B	7B	7	7	7B	7B	14	14A
CANAL ZONE	14A	14	14	14	7	7	14	14	14	14A	21	21
ENGLAND	14	7	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	14A	14	14	14B	7B	7B	7	14	14	14	14	14A
INDIA	14	14	7B	7B	7B	7B	14	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7	14	14	14	14
MEXICO	14	14	14	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
PUERTO RICO	14	14	7	7	7	7	7A	14	14	14	14	14
SOUTH AFRICA	7B	7B	7B	7B	7A	14	14	21	21	21	14	14B
U.S.S.R.	14	7A	7A	7	7	7A	14	14	14	14	14A	14
WEST COAST	21	14A	14	7	7	7	7A	14	14	14A	21	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	7A	14	14
ARGENTINA	21	14A	14A	14	7A	7	7A	14	21	21A	21A	21A
AUSTRALIA	14A	14A	14	14	7B	7B	7	7	7B	7B	14	21
CANAL ZONE	14A	14A	14	14	7	7	14	14	14	21	21	21
ENGLAND	14	7	7	7	7	7	7	14	14	14	14	14
HAWAII	14A	14	14	14	7A	7	7	14	14	14	14	14A
INDIA	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7	7	14	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	14	7B	7B	7B	7B	14B	14	14	14
PUERTO RICO	21	14A	14	14	7	7	14	14	14	14A	21	21
SOUTH AFRICA	7B	7B	7B	7B	7B	14B	14	14	14	14A	14	14B
U.S.S.R.	14B	7A	7A	7	7	7B	7B	14B	14	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	7A	14	14
ARGENTINA	21	14A	14A	14	7A	7	7	14	21	21A	21A	21A
AUSTRALIA	21A	21A	21	21	14	7	7	7	7B	7B	14A	21
CANAL ZONE	14A	14A	14	14	7	7	7	14	14	21	21	21
ENGLAND	14	7	7	7	7	7	7	14B	14	14	14	14
HAWAII	21A	21	21	14A	14	14	7A	14	14	14	14A	21
INDIA	14	14	14	14	7B	7B	7B	14B	14	14	14	14
JAPAN	14A	14	14	14	14B	14B	7	7	14	14	14	14A
MEXICO	14	14	14	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14A	14	14	14	14B	7	7	14	14	14	14
PUERTO RICO	21	14A	14	14	7	7	7A	14	14	14A	21	21
SOUTH AFRICA	7B	7B	7B	7B	7B	7B	14B	14	14	14A	14	14B
U.S.S.R.	14B	7	7	7	7	7B	7B	14B	14	14	14	14
EAST COAST	21	14A	14	7	7	7	7A	14	14	14A	21	21

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

JUNE

SUN	MON	TUE	WED	THU	FRI	SAT
			1 F/G	2 G/G	3 G/G	4 G/G
5 F/G	6 F/G	7 F/G	8 F/G	9 F/G	10 F/G*	11 P/F*
12 F/F*	13 F/F	14 P/F	15 F/F	16 P/F	17 F/G	18 G/G
19 G/G	20 F/G	21 F/F	22 F/G	23 F/G	24 G/G	25 G/G
26 G/G	27 F/G	28 F/G	29 G/G	30 G/G		

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Code-Lovers' Special Issue

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W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

THE DAYTON DAZE

Two of the manufacturers exhibiting at Dayton were in a heated argument as I passed by, with one holding that the Hamvention officials were lying through their teeth about the attendance... that there certainly were no more than 27,000 hams there instead of the 30,000 official count at that time. Well, during the rainy early Saturday morning, I'll tell you this: You could hardly move from one place to another.

Once the sun came out, the hordes poured into the flea-market area and eased the pressures a tad. It was still crowded inside, but at least you could move around.

After trying to communicate with a packed roomful of people last year, fighting the thunderous noises from the two adjacent meeting rooms and what seemed like 100° heat and humidity, I wasn't even going to try this year. But the Hamvention people suggested I give it another try in a more isolated room... and at a more isolated time. So I got up there on the podium Friday afternoon, before many of the brethren had yet arrived for the hamfest, and did my stint. It was better, but still marginal. Next year, I'm told that there will be some new meeting rooms where we'll have quiet.

Since many of those present indicated that they preferred a stiff code test as part of our amateur entry fee—never mind what the lack of growth has done to our country, with the loss of one consumer electronics industry after another, a loss getting up into the dozens of billions of dollars a year... and never mind what this is doing to us in the way of military weakness (it's better to lose the country than acknowledge the changes in technology and cope with them)—keeping that in mind, I came out strongly in favor of Morse code and was met with great enthusiasm.

Fine... let's by all means go with what everyone wants, no matter how destructive it is. Let's make it so that we put our licenses where our mouths are ... if code really is important, then let's make sure that each and every ham has to requalify every year and prove the ability to copy.

None of this silly five words per minute. *That* isn't code! That's baloney. The ability to copy code starts at 13 per, so that should again be made the irreducible minimum. That should be the starting speed. But then, remembering that we are now agreeing that code is of high importance, can we honestly support anything other than a new "incentive licensing" plan which will move us on up to at least 35 words per minute? Any ham really worthy of being a ham should be able to get to that speed in a few weeks... so let's set that as the ticket for holding your license.

Many of those present were nodding eagerly in total agreement, licking their chops at the thought of being able to knock 90% or more of the hams out of the hobby and back into CB where they belong. When I suggested 50 wpm for everyone, they were wildly enthusiastic. That could easily knock out 98% and QRM would be a thing of the past. Good grief, we might even have enough room so that we could go back to spark!

A couple of spoilsport women, obviously too lazy to really care about being hams, got mad over this and stormed out of the room. They probably never learned the code anyway... being licensed by a good friend who overlooked that little requirement.

The talk was fun.

In looking around the exhibits, I noticed that good old Bash was there, but everyone was giving this booth a wide berth. There were even some chaps talking about a "trash Bash" move to stop this prostituting of the ham ticket. And not a few hams came to me wondering what all the fuss about no-code was when with the new Bash code tapes one could pass the code test without even being able to copy the code. I had a good friend who got his Extra ticket that way. He had only slight ability to copy code... and virtually no theory understanding. He just wanted to see if one could Bash one's way to success without knowing a damned thing and was greatly surprised when he walked out with a lovely one-letter call suffix.

The development of ever smaller Morse-code readers has brought us to the tiny hand-held decoder. With that, anyone can copy code at almost any speed... certainly up to around 100 words per minute. If we can take that in with us for the license exam, that should solve the whole code problem... right? Oh, I can hear the purists bitching... "Yes, but what if the battery burns out?" We heard the same complaint when kids started using hand calculators instead of learning their multiplication tables. The answer to that is so simple: *solar power.*

They have inexpensive solar power cells which can run the decoder just from the glare of a Morse-code fanatic's eye. So

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QSL OF THE MONTH

This eye-catching card from Lalo Santos HK3EQJ in Bogota, Colombia, easily outshined the competition to win this month's QSL card contest. This colorful card features a modernistic shack resembling Mission Control, a motif which is reinforced by the large dish in the background and a quad antenna which literally sparkles. Further back, the stars shine over a haloed sun setting into the Andes mountains—a scene which would be beautiful from any shack.

If you would like to enter *73*'s QSL of the Month Contest, enclose your card in an envelope and send it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries without an envelope or book choice will not be considered.

let's stop worrying about the code, okay? It has turned out that kids do just fine without memorizing the multiplication tables. Those calculators don't wear out much...and solar power keeps 'em charged.

Speaking of the code, for those who think the code can be fun, AEA has a new gadget which will drive you crazy. They showed the first version of it last year at Dayton and this little bugger simulates a CW contact with you. Now they've updated it and you're in there fighting with a bunch of other stations trying to work some rare DX...all done by computer. I see this as a great gadget for hamfests to use for simulated DX contests. Hotshot DX ops can sit down at a DX simulator and see what kind of a score they can make in ten to twenty minutes of operating. That should be a ball.

With more and more of the CW ops using keyboards and code copiers, unless we stress the fun of the code, we may find that few, if any, hams are actually able to copy the code anymore. Almost all of the high-speed CW you hear on the bands these days is computer-generated and -copied. The Novice bands still have a few people hanging around chirping out half-hour CQs, hoping that no one will answer.

OTHER DAYTONIA

Out in the outer fringes of exhibitors, I was surprised to find a booth run by the CIA. It seems they are pepping up their communications facilities and are in need of technicians. I've got some pretty good friends who went into this kind of work and they've certainly had interesting lives as a result. If you're the kind of person who likes to travel and see unusual places, this might be worth checking out.

Icom was wowing 'em with their 1200-MHz repeater. It's set up for FM use, but I'll bet if they modify it a bit so that it will handle television, they'll have a bunch of customers. Ham television really should be up on 1200 MHz and not crammed onto one channel on 420 MHz.

And both Kenwood and Yaesu had new rigs which were showstoppers. You'll be seeing reviews of 'em here as soon as we can get our mitts on the rigs to check them out. Ten-Tec had a nice little 2m HT which I suspect is going to be very popular. We've been promised one of those soon, too.

The Hamvention is always a seething mass of hams going around the exhibits and then scouring the enormous flea market for bargains. If the show gets any bigger, I don't know where they could put it. The poor old Hara Arena in Dayton is just plain overwhelmed. Cars fill almost every neighboring field and the huge lots at the arena and line the streets for almost a mile around. The people in the neighborhood are uptight over the cars, but when about 30,000 hams descend on one place, it takes a lot of parking to handle 'em.

There was some sort of hassle over the flea market not being opened on Friday and a good deal of flak went up over that. And just to make the situation worse, the opening on Saturday was accompanied by a deluge. It cleared off in the afternoon just fine, but there were an awful lot of very unhappy fleas for a while.

Ohio has a new law aimed at getting tax payments on sales by flea-market exhibitors. This is mainly for the few professional flea-market salespeople who make a living at it and have been thus avoiding paying the stiff Ohio sales tax. The Hamvention crew shelled out $5 each for the flea-market exhibitors to keep the authorities off their backs. I think they remembered the problems at Rochester, where the police came in and virtually closed down the flea market... and the regular exhibitors, too. That disaster almost ruined the Rochester Hamfest, which has been struggling to get back to strength ever since then.

For a show of its size, the Hamvention went very smoothly. It's three days long and it takes you that much time to really see just the inside exhibits, much less cover the flea market...which had about 600 exhibitors this year, I understand. Nine in the morning until eight at night is a grueling job for the poor exhibitors, but perhaps it's worth it so that everyone has more of a chance to see everything. It's only once a year.

REAL HAMS

One thing the mail about the proposed code changes has made crystal clear is that there still are a substantial number of Real Hams around, despite the decimation of our ranks by what the communists called "incentive licensing."

For instance, the Real Ham does not use sideband...that's for wimps. The Real Ham sticks to the Real Ham communications mode: CW. Oh, the Real Ham gets on two meters, too, but no Real Ham signs his call more than once every half hour or so. After all, the Real Ham only talks to damned good friends...other Real Hams... and everyone knows who's who by the voices, so who needs an ID? The more often you sign your call, the more of a wimp you are. And no one but a leaping faggot would prissily demand that the breaker identify himself.

Real Hams, when they develop Parkinson's Disease, which a growing number of them have, and can no longer make that old straight key talk, do go on phone...but you can be damned sure they go on AM, not wimpy sideband with the ducks and other fruits.

Real Hams have a key in one hand and a six pack of cool 807s by the other. They eat pretzels while hamming and steak and potatoes for dinner. Pringles? You've got to be kidding! You ought to have your keying hand mashed in the door for even thinking such an obscene thought.

DANGEROUS DXING

Alas, I didn't see any mention of amateur radio in the news reports of the ill-fated Spratly DXpedition. You've probably read about it. It had to do with a group of German DXers heading to Spratly on a catamaran. They unfortunately managed to find the islands and were shot out of the water by the Vietnamese, who killed one of the DXpeditioners. The other five drifted for nine days in a dinghy, with one dying of dehydration before the rest were picked up.

As I recall, the last bunch of DXers who tried to get Spratly off the endangered DX list got shot at, but not with quite such disastrous results. You'd think that DXers would take a look at history before going to Spratly.

The first ham to put Spratly on the air, back in the 60s, the chap who invented the 1S call (much to the annoyance of the ITU), figured out how to get all the contacts he wanted from there without all that danger. As far as I know, he did his entire Spratly exercise from up in central Thailand, the same place he used to make his Burma and Cambodia exercises, I suspect. I have the cards from those operations and they are acceptable for DXCC.

DXpeditioning used to be a lot easier...and more fun...when the ARRL didn't put hams in danger of their lives. No one really gave a damn whether the DXpedition was exactly precisely where it claimed to be or not.

Continued on page 124

You Can Build This Code Trainer

More than a mere code-practice oscillator, this CPU-controlled trainer features burned-in practice groups. Flick a switch and you have a keyer.

If you are a ham who wants to upgrade or a ham to be, or if you know someone who wants to be a ham, there is now a low-cost, single-chip microcomputer for you. It is called the CPP1. The CPP1 is a single-chip microcomputer that contains copyrighted software for teaching Morse code. It also doubles as an electronic keyer (iambic) for added versatility.

The unit can be built in one evening. This makes it ideal for the time-pressed person who would rather be involved with amateur radio than with computer technology. Virtually everything is contained on the chip except the dot clock and the tone generator. These are built around the low-cost 555 timer chip.

Learning Morse code using tapes and records is a frustrating experience. It's difficult to concentrate when you have to keep stopping and rewinding to the beginning of a particular practice group. Also, tapes and records never seem to have the right speeds to practice at. They are either too fast or too slow.

Personal computers are far better. However, their cost is a problem, especially

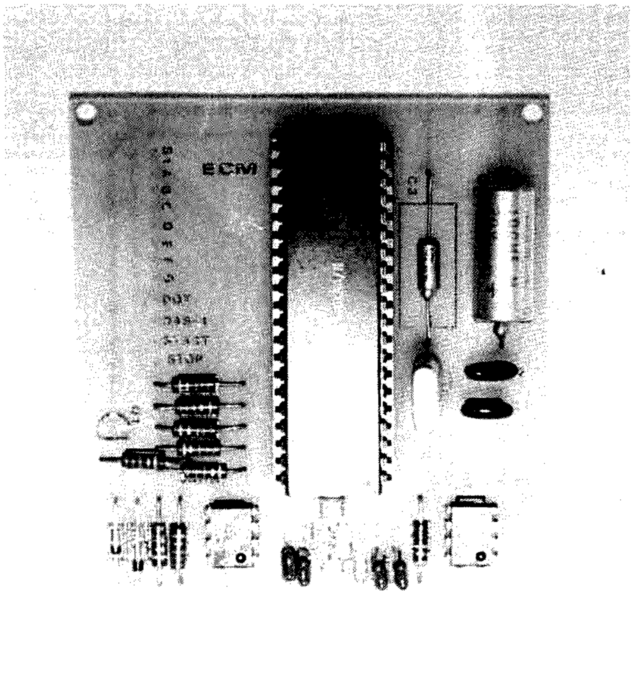

Photo A. The CPP1 circuit board.

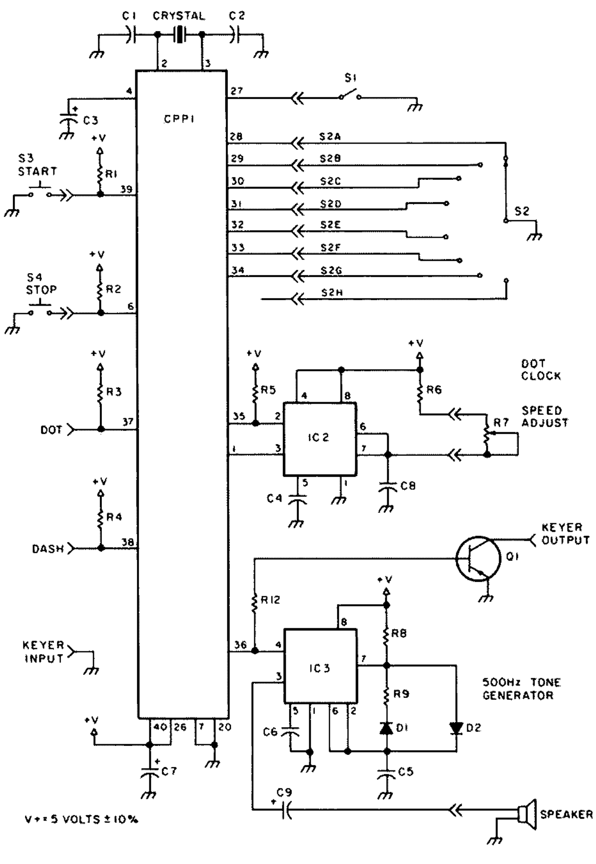

Fig. 1. Schematic.

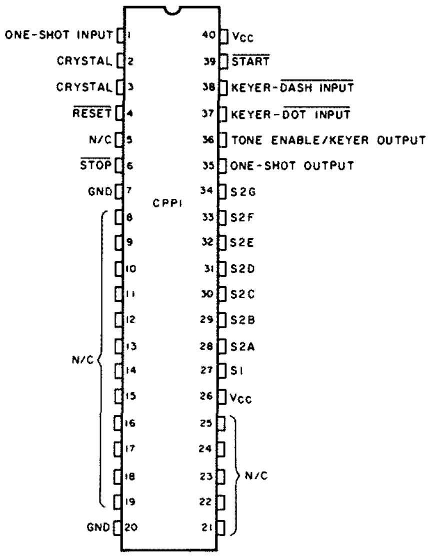

Fig. 2. Pin description.

if your budget is tight. In addition, most people do not have the technical or software knowledge to make this approach viable.

The CPP1 solves both of these problems. The chip contains 15 practice tables. They are organized to provide for ease of learning. When a particular table is selected, it will repeat until the user decides to move on. Speed is virtually unlimited, however; with the components called out later, the processor will send perfect code from 2 wpm to over 40 wpm. Finally, it is simple to use. No need for a degree in computer sciences to use it; just select and go.

Circuit Description

The heart of the code trainer/keyer is the CPP1. Contained in this 40-pin package are 128 bytes of RAM, 2K of ROM, an 8-bit CPU, a reset circuit, a clock, and predefined I/O ports. It is a true system on silicon.

To get the CPP1 to function requires a simple crystal/capacitor addition to pins 2 and 3 of the processor (see Fig. 1). The crystal can be from 1 to 6 MHz. A 3.57-MHz color-burst crystal is recommended because of its availability and low cost.

In order to ensure proper start-up, the chip contains a reset circuit that holds the processor in a known state until power is stable. The chip must stay reset for at least 50 milliseconds. This is accomplished by capacitor C3 on pin 4 of the CPP1. When power is applied, the capacitor will hold this line low. An internal pull-up resistor will then start charging the capacitor. When the capacitor reaches a high level, the processor function will start.

The processor at this time will set the I/O ports up per its internal program. It will then start testing the start button for a closure (pulled to ground). When a valid switch closure is recognized, the program will next test switch S1 to see if it is open or closed.

Switch S1 determines which table is to be executed (see Tables 1 and 2). If switch S1 is open, Table 1 will be selected. If switch S1 is closed, Table 2 will be utilized.

Next, the processor will test switch S2 to determine which subgroup to run. There are a total of 8 subgroups per selected group. Seven require that one of the pins, 28 through 34, be pulled to ground through switch S2. The eighth group is selected when all eight pins are open.

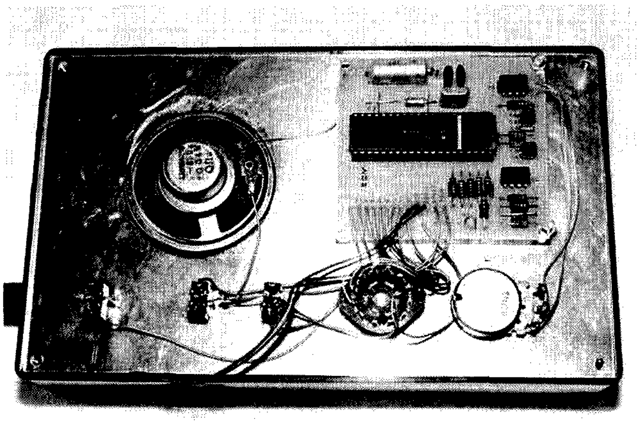

Photo B. The inside top panel of the CPP1.

Upon determining which subgroup has been selected, the processor will start sending at the rate of the dot clock, IC2. All timing is based on the dot clock.

The processor will send out a short pulse from pin 35 of the CPP1 to fire the one-shot (IC2). It will then test pin 1 for it to time out. This is one dot time. For dashes, it will do this three times.

The tone is generated by IC3, a simple 500-Hz tone generator. Pin 36 of the CPP1 will go to a high level whenever the tone is on; it

S1 Open

S2A closed	**S2B closed**	**S2C closed**
E I S H 5 U F	T N D B 6 - K Y	? 2 V 3 4 A R
S2D closed	**S2E closed**	**S2F closed**
() C ; X / -- M G	L W P J 1 . "	Z 7 O 0 9 8 : Q ,

[- hyphen; ? question mark; () parentheses; ; semicolon; / fraction bar; --break; . period; " quotation mark; : colon; , comma]

S2G closed

E?LTZ I2WN() SVPD7 JOT1A H3BCJ 654.X KUAIO YFR"M ,GVK9 A;JQ-- /80EL :-ZBI Z()7JX OM9--L ITNDC .1"KQ EBLWP B4ARV J0Z?2 V35UF G;8-E ISH6K Y,A/: XLCQP V2FEK :J--DK WR?U-6/79N "LAZ5 8HAM() T1B40 3;S,Z O1.EB JVGIY

S2H closed

Electronic Keyer Option

Practice Groups With Morse Code Pattern

S2A closed		**S2B closed**		**S2C closed**	
E	.	T	-	?	..--..
I	..	N	-.	2	..---
S	...	D	-..	V	...-
H	....	B	-...	3	...--
5	.....	6	-....	4	....-
U	..-	-	-....-	A	.-
F	..-.	K	-.-	R	.-.
		Y	-.--		

S2D closed		**S2E closed**		**S2F closed**	
()	-.--.-	L	.-..	Z	--..
C	-.-.	W	.--	7	--...
;	-.-.-.	P	.--.	O	---
X	-..-	J	.---	0	-----
/	-..-.	1	.----	9	----.
--	-...-	.	.-.-.-	8	---..
M	--	"	.-..-.	:	---...
G	--.			Q	--.-
				,	--..--

Table 1.

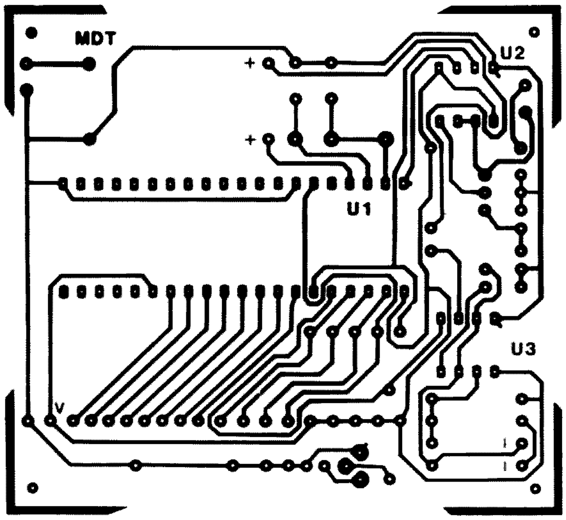

Fig. 3. Circuit board, foil side.

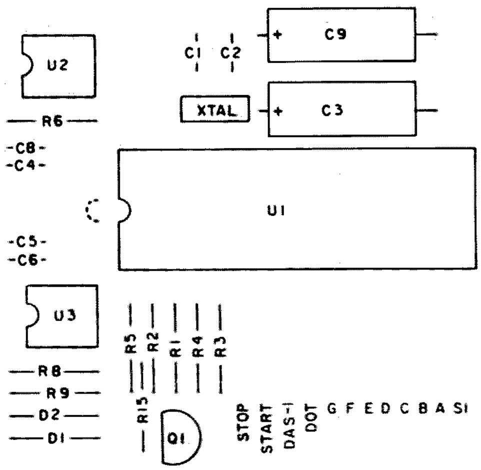

Fig. 4. Circuit board showing parts placement.

goes low to turn it off. To stop the sequence, pin 6 of the CPP1 must be pulled to ground through the stop button. (It should be noted that the start and stop buttons can be either normally-open push-buttons, as shown in Fig. 1, or toggle switches.) At this time, the processor will start testing the start pin again, except in the keyer mode.

In the keyer mode (switch S1 and S2 open), when the start is pressed, the chip will enter the keyer mode. To leave it, the power must be turned off. This is to eliminate any chance of the keyer going out during transmission.

Construction

Assembly is very straightforward. The circuit can be hand-wired in about an hour or two, or a simple single-sided PC board can be used.

The crystal should be located as close as possible to the CPP1. This is standard for any microprocessor.

C7 must *not* be left out. This stabilizes the power to the chip when the tone is on. If it is left out, it is possible that the internal program will jump out of sequence.

Custom tailoring the CPP1 to your particular needs can also be done. Some examples are:

- replacing the speed control with a rotary switch with fixed resistors,
- replacing R9 with a potentiometer for tone control, and
- adding a volume control.

These are just a few of the many variations possible.

Operation

The CPP1 is extremely easy to use. Apply power. Set switch S1 to the appropriate practice table. Set switch S2 to the desired subgroup. Press start and adjust speed. That's it!

Your selected practice group will cycle until stop is pressed. At this time, another practice group can be selected. Speed may be adjusted any time.

To use the keyer function, set both switches S1 and S2 to the open position. Then press start. You are now in the keyer mode.

When pin 37 is brought to ground, a series of dots will be sent. When pin 38 is brought to ground, a series of dashes will be sent. Finally, when both pins 37

S1 Closed

S2A closed								
HEFSU	5IEUH	H5EIF	USH5H	I5SFE	EI5S5	FEIHS	SUI5F	UEFHE
FUI5E	SIFHE	5UESH	HEFIU	FEH5I	USEFI			
S2B closed								
B-YTD	N6KBY	-KTD6	TYNKD	BKNT-	DY6D-	TBDKT	YKTND	-6KYK
BN-TB	KYTDN	6-KYD	D6YTK	YBTND	K6NYT			
S2C closed								
V4R2A	?3R42	A?VR3	24VA?	3A?V3	A23?3	24RAV	RRVV?	43?4A
V?A23	RAV42	3R2V4	AVR?2	V4R2V	?RV42			
S2D closed								
X;()GC	/--MXG	()XGCM	M/XM--	;C()--X	CGM--X	GXCM--	()MGX()	
;--X/C	X/()M;	MXCGM	--X;C/	GM/;C	CXM--G	M;/()X		
S2E closed								
J.L1P	"WPJ1	LW1."	L1JWP	.PJWL	P1"PL	1J.WW	LPJ1W	.WI1J
J"LWP	LJWP1	".JPL	1PWJL	LJ"P1	W.1JP			
S2F closed								
0:,ZO	798Q:	ZQO87	O9:,8	,OQ9Z	0:78Z	ZQ8,9	,8O:Q	:9Q9O
07ZO,	ZOO9:	Q.9:Z	9OZ70	QZ0:9	8O7,Q			
S2G closed								
92837	46510	49628	53709	96821	13579	25680	95062	13467
53751								
S2H closed								
:.--"/	-:()?,	-:;.--	()"/,:	:;--.?	?"()/:	.-:--,	:(),;.	
?"-.;/	()"/-?							

Table 2.

Photo C. Adding a key turns the CPP1 into an iambic keyer.

and 38 are held to ground, alternating dots and dashes will be sent.

A final operating note concerning speed: Selecting the proper speed for practice may be done in one of two ways. The simplest way is counting dots. This is accomplished by setting the CPP1 to the keyer mode and pressing start. Hold the dot input line low and count the dots for one second. Once the number of dots per second has been determined, it is a simple case of calculating the speed by the following formula: speed (wpm) = 2.4 × dots/sec. For example, if 5 dots are counted in one second, then speed = 2.4 × 5 dots/sec = 12 wpm.

The second method is based on a known fixed resistor value. Since all timing is based on a dot time, it is a simple matter of using the following formula for determining the one-shot time: dot = 1.1 × (R6 + R7) × C8.

Conclusion

Learning Morse code, or increasing one's speed, has been a problem since the early days of ham radio. Learning Morse code should be fun and easy. However, traditional means using tapes and records generally make it less than desirable.

The CPP1 puts learning Morse code into the computer age without the hassle. Using the CPP1 makes learning code fun and easy. Using this device 15 or 20 minutes a day, followed by listening to actual ham conversations for about the same amount of time, will make code learning exciting and rewarding. ■

Parts List

QTY		ICs
1	IC1	CPP1 code practice processor
2	IC2, IC3	NE555 timer
		Capacitors
2	C1, C2	22 pF ceramic
1	C3	1 uF, 10 V dc
3	C4, C6	.01 uF
2	C5, C8	.1 uF
1	C9, C7	100 uF, 10 V dc
		Resistors
9	R1-R5, R8-R9	15k, ¼ Watt
1	R6	220k, ¼ Watt
1	R7	2 meg potentiometer
		Miscellaneous
2	D1, D2	1N914 or equivalent
1	S1	SPDT toggle switch
1	S2	8-position rotary switch
2	S3, S4	normally-open push-buttons
1	crystal	1-6 MHz (3.57 MHz nominal)
1	speaker	8-Ohm speaker
		Keyer Option
1	R12	4.7k, ¼ Watt
1	Q1	2N3904 or equivalent

The CPP1 code practice processor chip is available from Micro Digital Technology, PO Box 1139, Mesa AZ 85201, for $19.95 ppd., PCB, $5.00. Checks, Visa, and Mastercard accepted. On credit card orders, please include card number, expiration date, telephone number, and full name. For phone orders, call (602)-897-2534. OEM and dealer inquiries welcome. Complete parts kits available from the following distributors:

Greenbrier Marketing
International, Inc.
509 S. 48th St., Suite 105
Tempe AZ 85201.
Price: $49.95 postpaid.

Chaney Electronics
PO Box 27038
Denver CO 80227
(303)-781-5750

Circuit Specialists
PO Box 3047
Scottsdale AZ 85287
(800)-528-1417

Radiokit
Box 411
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*Kirsti Jenkins-Smith VK9NL
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The True Story Behind Heard Island

Fighting bad weather, shady ship owners, and bad press, the HIDXA expedition forged its way to the DXer's dream. But getting there was only half the battle.

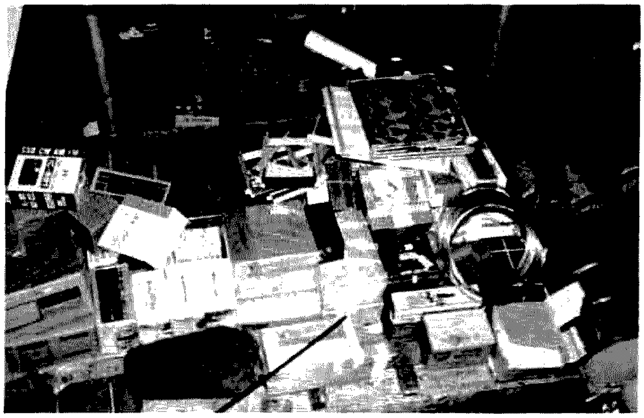
The idea of a possible DXpedition to Heard Island came to Jim VK9NS while he was still P29JS and living in Papua New Guinea. Heard Island, in the southern Indian Ocean, is situated in one of the world's stormiest seas, uninhabited, inhospitable, and not really "en route" to anywhere. So the only way to get there would be to catch a lift or charter a vessel for the voyage. The vessel would have to be sturdy and suitable, with an experienced skipper for those waters. The cost for such a lengthy trip would be high, but if the money could be found, such a DXpedition could take place. So the Heard Island DX Association (HIDXA) was formed early in 1980, and the long and stormy road to Heard Island commenced.

Assistance was asked for, and many an amateur contributed. Jim, in his dealings with the authorities, met with goodwill and interest from all concerned. A set of guidelines was formulated for private expeditions visiting Heard Island, and he got permission to visit, pending a firm proposal. License for Heard Island was issued —VKØJS.

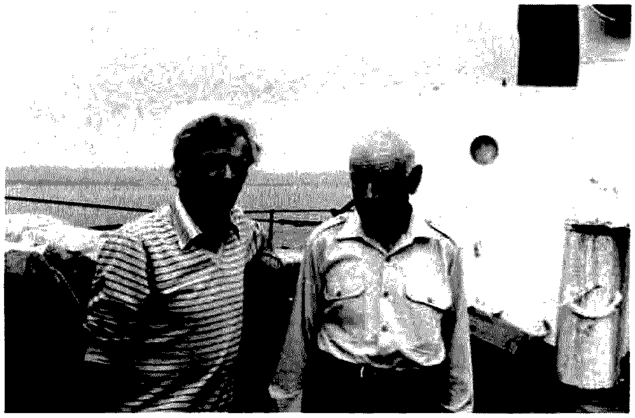
Meanwhile, the hunt for a suitable vessel was on, and word was out for interested operators. The season for visiting Heard Island is very short, involving January through March of each year. A vessel was in fact found for the 1981 season, but the enormous cost involved could not be met at the time, and this very suitable charter and experienced skipper had to be abandoned.

Unfortunately, HIDXA was now led astray by promises regarding a West Australian shipping firm who said that they intended to send a fishing-survey ship to Heard Island waters in the 1981 season and would take a group of amateur radio operators along for a reasonable sum of money. This proposal sounded just too good to be true, and of course, as we all know, it turned out to be just that.

Preparing for departure.



Equipment and stores in the hold of Cheynes II.



Jim and Tom VK6MK in Albany.

Months of not knowing and being put off with "we will know for sure next week" persisted until the season was over. During 1981, it was a continuation of "next week for sure," regarding plans for 1982, until it became clear that "next week" would never come. We heard that Dr. Lewis might be going to Heard Island on the *Dick Smith Explorer* in 1982 and we had berths booked on that ship should they be headed that way. As it turned out, they went to Antarctica instead.

So the hunt for a vessel for 1983 went on. The problem was mainly financial. People do not really want to give money to a project which is not 100% guaranteed. Money might be promised *after* the expedition, but shipowners want payment in advance. So we were really faced with a sort of "catch 22."

Now came the surprising news that IDXF and NCDXF had pledged $20,000 in order to send 2–3 operators along with a group of mountaineers who were planning an expedition to Heard Island to climb Big Ben. At the same time, concentrated efforts to discredit HIDXA and statements that Jim would never go to Heard Island and had no intention of even trying began to appear on the bands. Jim had always stated that if the expedition did not take place, he would refund donations. Four out of 300-odd persons who had donated to HIDXA asked for their money back; so it goes to show that most people do not take as gospel truth whatever they hear on the grapevine.

SoJo VKØSI spent Easter of 1982 on Norfolk Island. He and Jim spent long days working on the Heard Island project. SoJo proved himself to be just what we needed most—someone with know-how, interest, and "get up and go." He went back to Tasmania and started looking for a vessel. Jim was reluctant to go on the air and say "we are going in 1983" until he was fairly certain that this time it would happen. So it was not until early September of 1982, when the contract with the owners of the ex-whale-chaser *Cheynes II* had been signed, that we could really start our publicity campaign. We sent out masses of brochures, "stuffers," and letters. Now that the vessel was secured, it was smooth sailing ahead. The beauty of this contract was that the vessel was big enough to take up to 20 passengers. So, if we could find even 10–12 people with other interests, and 6–8 operators, with all of us paying $3000 out of our own pockets, we could pay nearly the whole charter cost.

Universities were informed of this chance to visit Heard Island and advertisements were placed in several Australian newspapers. Gradually, the team started to take shape. A firm proposal to the government was drawn up. This was several pages long since it had to include details of all personnel, equipment, landing gear, supplies, etc. But once submitted, it did not take long for the official blessing to come through in writing.

Meanwhile, on the bands, word had it still that we would never go and were just daydreaming, that the ship was a floating coffin, it was no good, etc. Some of the DX outlets took the trouble to print some of the material we had sent along, but others must have filed it straight into the wastepaper basket since their publications were quite innocent of any mention of HIDXA. IDXF and NCDXF, on the other hand, were never out of the news!

There was talk of "the race to Heard Island" in those publications in which we did rate a mention. It was of course never a race. It was a matter of two groups, with different objectives, going more or less at the same time. We were just continuing what Jim had started in 1980. No doubt the mountaineering group had also been planning for some time, but without amateur-radio involvement, the world of ham radio would not know. Heard Island was high on the "wanted" list and you could probably put five successive groups on the island, all of whom would work tremendous pileups. For goodness sake, we work endless pileups from Norfolk Island where there are 6 licensed resident amateurs! So this "race" idea was a bit silly. One publication topped that by advising its readers to "put their money" on IDXF/NCDXF, as if we were horses. It passes all understanding, for sure.

We got a lot of support from individual amateurs in many countries, and we received a lot of encouraging letters with the donations, so we knew we had the support of the individual amateur. Some of the small DX clubs also contributed, but the big clubs did not come forward; an approach to NCDXF proved futile. The lack of publicity left many in doubt as to our intentions. When we received $100 from LIDXA, it was with a stern request to send the money back should the expedition not take place. We had already paid $6700 as a deposit on the *Cheynes II*, but they received our money-back guarantee in writing.

The cost of an expedition to such a place as Heard Island is immense. Apart from the remainder charter cost which was paid by the expeditioners themselves, HIDXA had to find money for fuel, landing gear, food, generators, tents, tarpaulins,

Do we go on or don't we? Chief Mate and Skipper make the decision.

Battling headwinds on the way to Heard Island.

gas cookers, gas, and a number of bits and pieces. A suitable first-aid kit and supply of pharmaceuticals had to be provided. Rigs and antennas were mostly on loan, but with a guarantee to return or replace them if lost, thus requiring expensive insurance in addition to the freight cost. It made me wonder about certain people's sanity when I heard inane remarks about "going on an expedition to get rich." The idea that a green stamp with a QSL card is clear profit and it costs nothing to mail a card back is fondly believed by some people.

Life became very busy from September through December. Jim left for Tasmania in November to be on the spot for all the last-minute arrangements that had to be made. I remained on Norfolk Island to handle incoming correspondence and hold the fort. We kept in touch via radio or telephone, but with everything else on our minds, we both forgot our wedding anniversary on December 5; 2 years—you would think we had been married for 20.

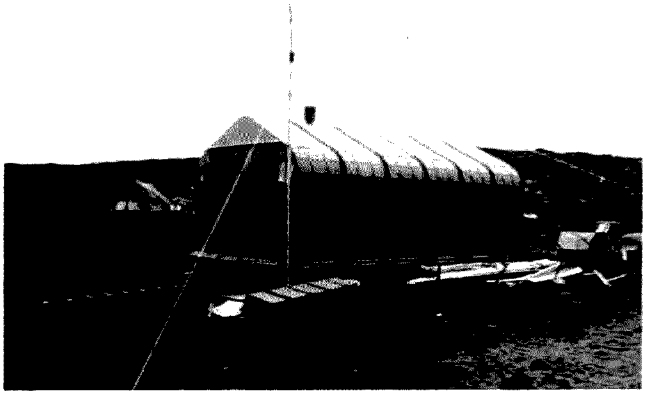
I arrived in Tasmania on December 29. Those last few days before departure were very hectic. What with the holiday season and all the festivities, it seemed impossible to organize the final details, and departure had to be postponed for a couple of days. The rest of the team had already arrived. We were 17 people, including 5 scientists, 5 mountaineers, a journalist, and a cinecameraman. A mixed group for sure, but as it turned out, a very balanced group. We all got on well with each other. Maybe the fact that each and every one of the expeditioners was required to pay $3000 ensured that no one who was not very strongly motivated and did not really want to go to Heard Island was included in the expedition. We could have filled the ship with people who wanted to come for nothing, but our policy did not permit any freeloaders who might cause arguments and backbiting if the going got rough. A very wise move as it turned out.

Peter VK6VR, Walter OE1LO, Kirsti VK9NL, SoJo VK0SI, Bernie VK6KI, and Walt W7SE at Albany.

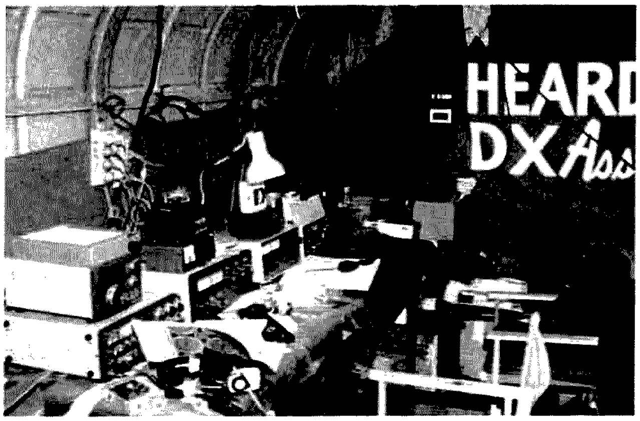
Our troubles should now have been over, but this was not to be. We departed Hobart January 4 and struck a strong gale immediately. After battling ahead for 24 hours, the skipper advised that due to the high rate of fuel consumption and slow progress, we should return to Hobart to await more reasonable weather. Turning around in those mountainous seas was a frightening experience. The *Cheynes II*, which had been tossing around violently for hours already, now laid over momentarily to a 40° angle which sent everything crashing and broke the lashings on the two dinghies stowed on the foredeck. During the night, a wave had shot up under the boat deck and knocked a 3" plank clean out, so it was a slightly battered *Cheynes II* that returned to Hobart the following morning.

We now had three days of hanging around Hobart, impatiently waiting for the weather to improve. It did improve somewhat, but we still stayed with no explanation forthcoming. Finally, we were scheduled to leave on Sunday morning, but Saturday evening we learned that departure had been postponed once again since the skipper/owner had decided not to come with us. A new skipper was found, and on Sunday afternoon, Captain Laurin MacEwan arrived and we were off again.

The southern route was abandoned. We took a westerly course while the skipper made himself familiar with the vessel. He soon found that the fuel consumption was alarmingly high. It bore no relationship to facts and figures quoted on our dealings with the company. In fact, Captain MacEwan found that we could not go to Heard Island from Hobart. The ship just did not have the range, in spite of all the expert advice and calculations which had been done by professionals. The only thing to do now was either to cancel the expedition or go to Albany, in western Australia, to refuel and make Heard Island from there. Naturally, we all agreed it would have to be Albany. There was no question of the ship not having the range for that distance. The mystery of the fuel consumption followed us all the way. Tanks were dipped



Our home on Heard Island.



VKØJS shack.

and charts consulted. Nothing seemed to add up. It was a worry for several days before they thought they had the problem licked.

We continued our voyage after refueling in Albany, and for some days everything ran smoothly. We settled down to a routine for shipboard life. All expeditioners were rostered for duty in the galley or on the bridge. Three would do the cooking, with cooks changing each day, and normal 4-hour watches were kept on the bridge, around the clock. The expeditioners got to know each other and the crew of 8, and with so many people with different backgrounds and experiences, there was always a lot to talk about.

Unfortunately, one of the operators, Walt W7SE, found it necessary to withdraw from the expedition in Albany. By then we were already so much delayed that he just could not risk further delays which would make him late back for work. Another scientist joined us in Albany so the number of people remained the same.

It now became apparent that we did not have enough water on board for the boilers. This was another mystery, but nevertheless a fact. We were supposed to carry 170 tons of water, but in fact, had only about 80 tons, another reason why the vessel did not have the range. The only thing to do now was to call in at Kerguelen Islands to take on water. This would cost us extra fuel which we could ill afford. Arrangements were made with the owner that he would meet us on the way back with the necessary fuel to take us back to port in Australia.

Thus, we made a stop at Kerguelen. The French were kind and helpful. It seemed to us that we had been at sea for a lifetime, when in fact, it had been just two weeks since Albany. We had a lot to learn yet! The French invited us all ashore for lunch, and we savored every morsel of that meal. There was of course no chance of operating from Kerguelen. It was an unplanned-for port of call, and the necessary license could only have been issued in Paris, well in advance. In any case, we stayed only a few hours, so time would not have permitted operating from there.

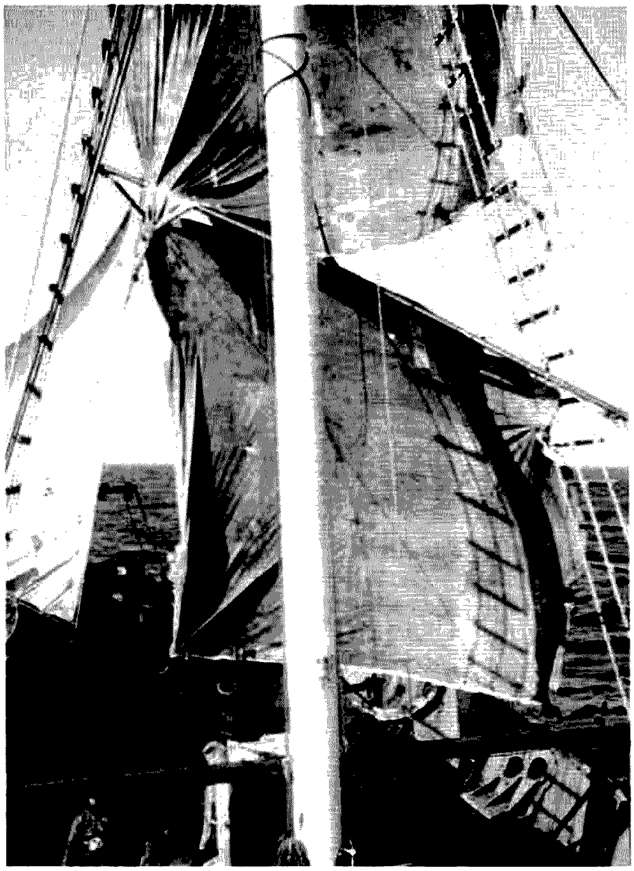
Once again the expedition nearly came to a full stop. The *Cheynes II* dragged anchor and we could hardly believe our eyes when we dismally observed her drifting onto the rocks. It was very fortunate that nothing vital was damaged and we were able to continue on to Heard Island.

Finally, on February 5, there it was: Heard Island. We arrived in rain and mist, but it was reasonably calm, so unloading commenced right away. Plans for landing equipment and personnel had been made during the voyage. All gear and food had been wrapped securely in plastic and sealed, so offloading went smoothly. We had had breakfast at 4:30 am in order to make an early start.

Now began a back-breaking day. We had two Arbec huts for our use. The scientists and film crew settled into the one closest to the beach, and the hams had the other, smaller one up the hill. These huts are mere shells of unlined metal. They are completely devoid of furniture or amenities. But, they were waterproof even if somewhat drafty. Our hut was about 500 meters away and every bit of equipment, antennas, food, gas, cookers, generators, etc., had to be hand-carried all the way from the beach. The trips to and fro were many, and I think we had all reached the stumbling stage by the end of the day. It rained; the black volcanic sand stuck to everything and the path was rocky and uneven. Finally, the beach was empty and we could think about getting a rig on the air and see about sleeping space and something to eat.

It was dusk by now. Our hut did not have a door. In spite of the rain which now came in torrents, the icy wind in the doorway, and the cramped conditions inside the hut, we got ourselves into some sort of order. Bob got one of the generators going and with a vertical antenna he was ready to open up from VKØJS. His first QSO went to ZS6IW. He worked some Europeans, but with the rain pouring down onto the unprotected generator, there suddenly was a power surge

The day the sun came out; Big Ben.



Tarpaulins made makeshift sails for the Cheynes II.

which put a stop to operations. We all retired to our sleeping bags. Being utterly exhausted, we slept extremely well.

I was the first one awake the next morning. Jim, SoJo, and Bob looked like three blue elephant seals in their sleeping bags. It had stopped raining, and soon we were all busy putting up more antennas, making the hut more livable, and getting properly organized. A 3-element ten-meter beam and a 3-element 15-meter beam were unpacked and erected without any trouble. We had brought a Minooka Special for 160 meters, but unfortunately, even with all expeditioners lending a hand, putting up this huge vertical proved too much in the strong wind. She bent beyond repair and had to be abandoned. The TH3 tribander was the last one to go up, complete with rotor. The other beams had a hand-operated turning arrangement. One of the tents was put up to house the generators, and inside the hut, Jim hung other tents to keep some of the draft out, the final one being hung in the doorway to act as a door. We had four rigs ready for use and had brought spare rigs just in case.

A solar flare made radio conditions extremely poor. I suppose we were lucky it did not put a full stop to propagation for the duration of our stay, but it was very unfortunate that it had to happen at all. We worked. One of us would monitor the bands and call CQ regularly. If there was an opening, we knew about it and made the most of it. Openings sometimes lasted only a few minutes, but after a few days, we found that 20 meters was usually open to America in the early morning hours. Europe was around in the evenings, and Asia and Pacific at odd times during the day. Nighttime was a bit unpredictable, but we kept watch on the bands around the clock.

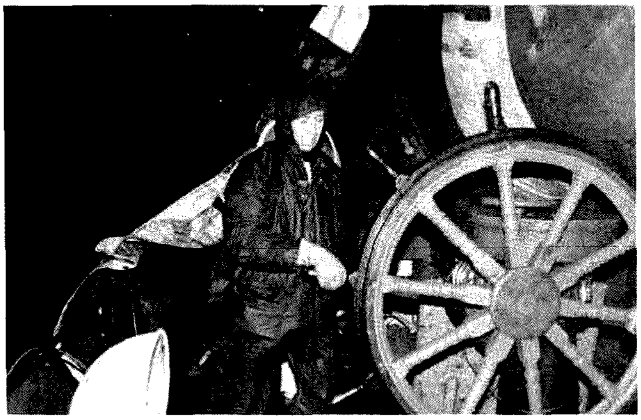
We were now joined by Walter OE1LO, who had been helping the mountaineers get started on their climb up Big Ben on a new route from Mechanics Bay. With the poor band conditions, we were more than enough operators, and some of us actually just sat idle most of the day. SoJo was in charge of all RTTY and SSTV gear and made the first QSO ever from Heard Island on these two modes. He also made the first satellite QSO from Heard Island. So, by making use of every little opening, the number of QSOs crept up. VKØJS made about 12,400 QSOs, with VKØNL making about 2000. This was not a bad score in poor conditions.

The *Anaconda II* operators were also active. This meant that only one of our stations could operate on whatever band happened to be open. If VKØCW was on 20 meters CW, then we could only be on 20 meters SSB instead of having one station on CW and one on SSB. This, of course, applied to the other group as well.

Bob took charge of the generators. He kept them going, serviced them, refueled, and did some repairs. None of us got a tremendous lot of sleep. The shack was noisy, cold, and cramped. But the days passed quickly. We were more or less self-contained in our hut, being able to do the basic cooking there and not having to leave the bands to turn up for meals in the other hut. Not very sociable, but time did not allow for socializing. In fact, when the other three ladies of the expedition were invited aboard the *Anaconda II* for dinner one evening, I was not even asked. At least I like to think that this was because everyone knew the hams were too busy to socialize! (It could have been those shapeless oilskins combined with my advanced years, of course.)

So we worked. The scientists took samples from penguins, counted them, measured temperatures on rocks and under rocks, collected samples of this and that, and generally had a very successful time on the island. The mountaineers climbed their new route towards the summit of Big Ben, keeping in touch by VHF skeds twice daily. The film crew filmed everyone and everything and will have an excellent documentary of the whole fantastic voyage and stay on the island, to be released on Australian TV in June/July, 1983. It is expected that this film will also be released overseas in due course.

We had hoped to extend our stay a few more days, but due to the precarious fuel situation on the *Cheynes II*, this could not be. So we were due to depart February 15 at 1600. In preparation for this, we started to carry some things to the beach, intending to keep one rig on the air till the bitter end. However, the wind was quite strong, and by lunchtime, a full storm blew up. This was the Heard Island we had feared. Atlas Cove boiled; sea spray was blown far inland. Ashore, the black volcanic sand whipped and blasted. The *Anaconda II* operators lost their beam; the mast just buckled effortlessly. It became clear that departure was impossible and we made our way down to the beach to make sure the gear already there was secure. Here, we found that the seas were rising and everything had to be moved further up—an enormous task in that wind. Gusts were measured up to 80 knots and some of us were literally blown off our feet. At one stage, I was sent flying and ended up underneath the tarpaulin which we used to cover the goods. The *Cheynes II* had to get up steam to keep from drifting



In oilskins and mittens, doing the dogwatch while under sail.

onto the rocks, and the skipper told me later that he had never before seen the wind actually blowing big holes in the sea the way it did that day.

Things could have been worse. The storm could have lasted until the *Cheynes II* was out of fuel for that matter. As it was, she burned up a considerable amount that day and the next, but the wind did abate and we were finally able to get on board on the 16th at lunchtime.

It was a hurried, cold, and blustery departure. The island looked extra miserable with sleet and snow settling on the black hills. The ride out to the ship was bumpy and frightening for those who cared. I did not; I was exhausted and retired to my bunk and refused to come out for the remainder of the day!

Heard Island is a unique island, black and white with a bit of moss covering some of the rocks. There are no insects to speak of, just a wingless fly and a wingless moth. Seals and penguins are the permanent residents, and there are many birds. We found time to go for short walks and see the sights. One day when the weather was very mild with sun breaking through, the island looked beautiful in its own stark way. But the climate is miserable. As I had it explained to me: It is not that it gets so cold, it is just that it does not get warm enough for things to grow. There is very little sun—mostly rain and mist. With a summer temperature around +5° C, only 8 vascular plants and some mosses and lichen represent the growth of millions of years.

I would not mind going back some day, but on a guaranteed vessel—guaranteed not to run out of fuel and to be unsinkable. The *Cheynes II* is probably very close to unsinkable. She proved that she could perform some amazing feats—standing up on her hind legs and laying over on her side, all in one quick motion. But . . . there was the fuel/water problem. I was dimly aware of talk of sails and so forth but had been too busy to think about it. Now it had to be faced. After two days steaming, the engines were shut down and sails were hoisted on the foremast. The "sails" were actually our tarpaulins which were made fast to yardarms welded together on board from bits and pieces. With no engine, we had no electricity, so the emergency steering gear on the open afterdeck came into use. The wheel itself was enormous; it took two people to turn it before the grease worked its way through. A compass was laid to rest on a lifebelt inside a drawer which was tied in front of the wheel. A small wind sock above indicated how the wind was in relation to the sails (which we could not see), and appropriate chalk marks on the tiller flat showed how much helm we had. Thus, 400 tons and 160 feet of iron steamship became a square-rigged sailing vessel!

We were still far south since this was where the prevailing wind and current could be used to our advantage. Sometimes the speed was less than 1.5 knots, but at other times, we reached a stunning 4.5 knots. The albatrosses settled down to paddling in our wake, and we kept studying the foam alongside to try to guess if we were moving or not. It was very uncomfortable, cold, and dark, with watchkeeping done on the afterdeck more frequently now since two of us had to be on duty each period.

Incredibly, we inched our way ahead. I think the worst of it all was the bitter, cold wind and the dark. The diesel generator would run for 3-4 hours each evening to charge the batteries on the bridge. This was the highlight of the day when I would rush to our cabin and switch on the bed lamp in the hope that the warmth from the globe would perhaps yield a bit of warmth to the pillow before bedtime.

After 13 days of this, the boilers were fired up and the engine restarted, since we expected to meet the owner with the promised fuel and water in a couple of days time. However, after two days steaming, we learned that the refueling ship had been delayed. This was a great disappointment. Another 3 days of sailing, and at last, after 855 nautical miles under sail, we made the rendezvous. Another pie in the sky; there was no refueling—we were to be towed home. A 1000-foot line was attached, and we continued our cold and dark existence for yet another 7 days although we did not have to stand watch on the open deck.

For reasons best known to himself, the owner now instructed the skipper to forbid amateur radio on *Cheynes II*. He "did not want any talk about what was going on" was the comment we heard. No other reason was given. I am not sure exactly what it was he did not want us to talk about, but it seemed pretty silly, since anyone could make a Radcom call and talk his mouth off to anyone. And the news media were interested. They even hired a plane to come out and see for themselves, a couple of hundred miles off the coast.

We had started to run out of some foods. The variation in meals was not great in the end, but we were not in any immediate danger of starving. It was a matter of look-

The Saxon Onward *takes us in tow.*

ing at the bright side. For instance, without butter, margarine, or cooking oil, washing up in seawater became mere child's play since we had no greasy dishes. And with not much to cook, the cooking chore became fairly simple. As the trip was supposed to have lasted a maximum of 42 days, and we had eaten well for 72 days, I would say that in this important area at least calculations had been liberal. Even when we finally berthed in Albany, West Australia, there were baked beans, tinned tomatoes, and packet soup left over. We could in fact have spent a few more days at sea but were certainly happy not to be obliged to do so.

During all our trials the group stayed together. The mood in the mess room remained lighthearted and cheerful, and no one allowed him/herself to show any short-tempered ill feelings which so easily could have jeopardized the easy-going comradeship which reigned. In any case, any short temper would have been caused by minor irritations and would not have been worth showing off. We were literally "all in the same boat" and knew it.


Nearly home and relaxing in the sun: Jim VK9NS, Kirsti VK9NL, Walter OE1LO, SoJo VK0SJ, and Bob WA8MOA.

The whole expedition had been an uphill battle with problems arising one after another for months before we even left Hobart. To top it off, we found that evil tongues had been wagging on the amateur bands while we were battling our way home. "They have lost the logs" was the cry. Was there no end to it all? Jim took the unprecedented step of having the logs sighted by Tom VK6MK, in Albany, as proof that we had not lost them. Tom subsequently advised WIA that the logs were intact. How can anyone stoop so low as to start such rumors? Especially someone sitting snug and comfortable in his safe home thousands of miles away from Heard Island or *Cheynes II*? How do they explain their "knowledge"? The only explanation I can think of is that someone is determined to discredit HIDXA at any cost—even at the cost of their own honor and credibility. Why? What are they afraid of? Is amateur radio a hobby or has it become big business?

The Heard Island and *Cheynes II* experience was no picnic. We did it because we wanted to activate Heard Island and had said we would do so. And as my granny used to say: "What does not kill you will make you stronger!" ■

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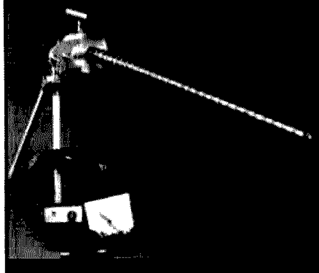

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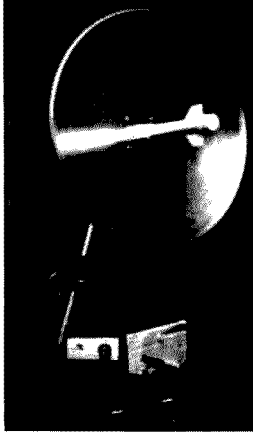

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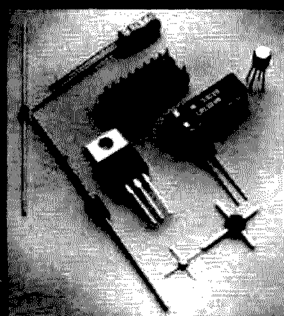

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Of course, there are various means to overcome these problems. Temperature-controlled ovens as an option for your frequency counter, for example, are readily available. They will give the crystal in your frequency counter a short-term frequency stability on the order of 0.1 ppm. However, they lead to an increasing uncertainty about the actual accuracy due to the aging process in the crystal—and they cost 50 dollars or more.

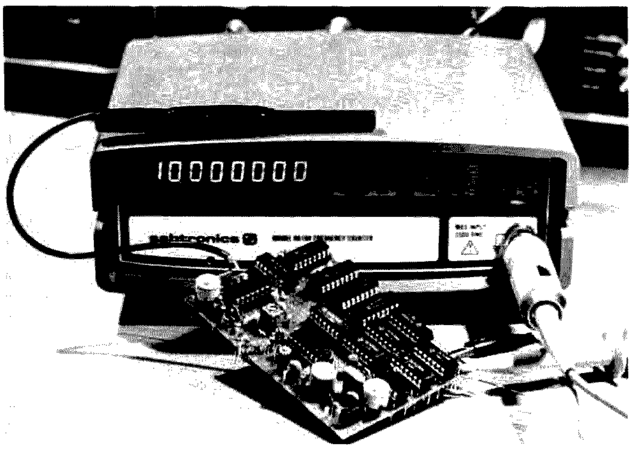
On the other hand, precise frequency reference signals are delivered more or less free of charge to our shacks by the National Bureau of Standards or by means of TV signals synchronized with a cesium standard.

It is not to everyone's taste, however, to deal with fading signals from a distant standard-frequency transmitter or to hook up a TV set to a frequency counter. So there must be another way to take advantage of precise reference signals generated elsewhere but which are already easily available in the ham shack.

The Basic Idea

In almost every populated area of the country, at least one AM-broadcast station in the 450-1800-kHz band is available which is strong enough to be heard even in the basement of a building or in the concrete jungle of city centers. All the care necessary to maintain a stable transmitting frequency has been taken at the radio station already, so there is no need to start all over again.

Usually, the radio stations maintain a stable frequency



The circuit in actual operation, with the ferrite antenna on top of the counter. Output frequency is 10 MHz, phase-locked to a selectable AM-broadcast station.

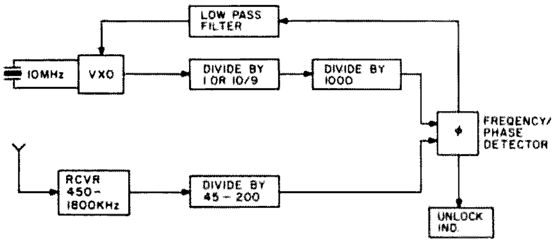


Fig. 1. Basic concept.

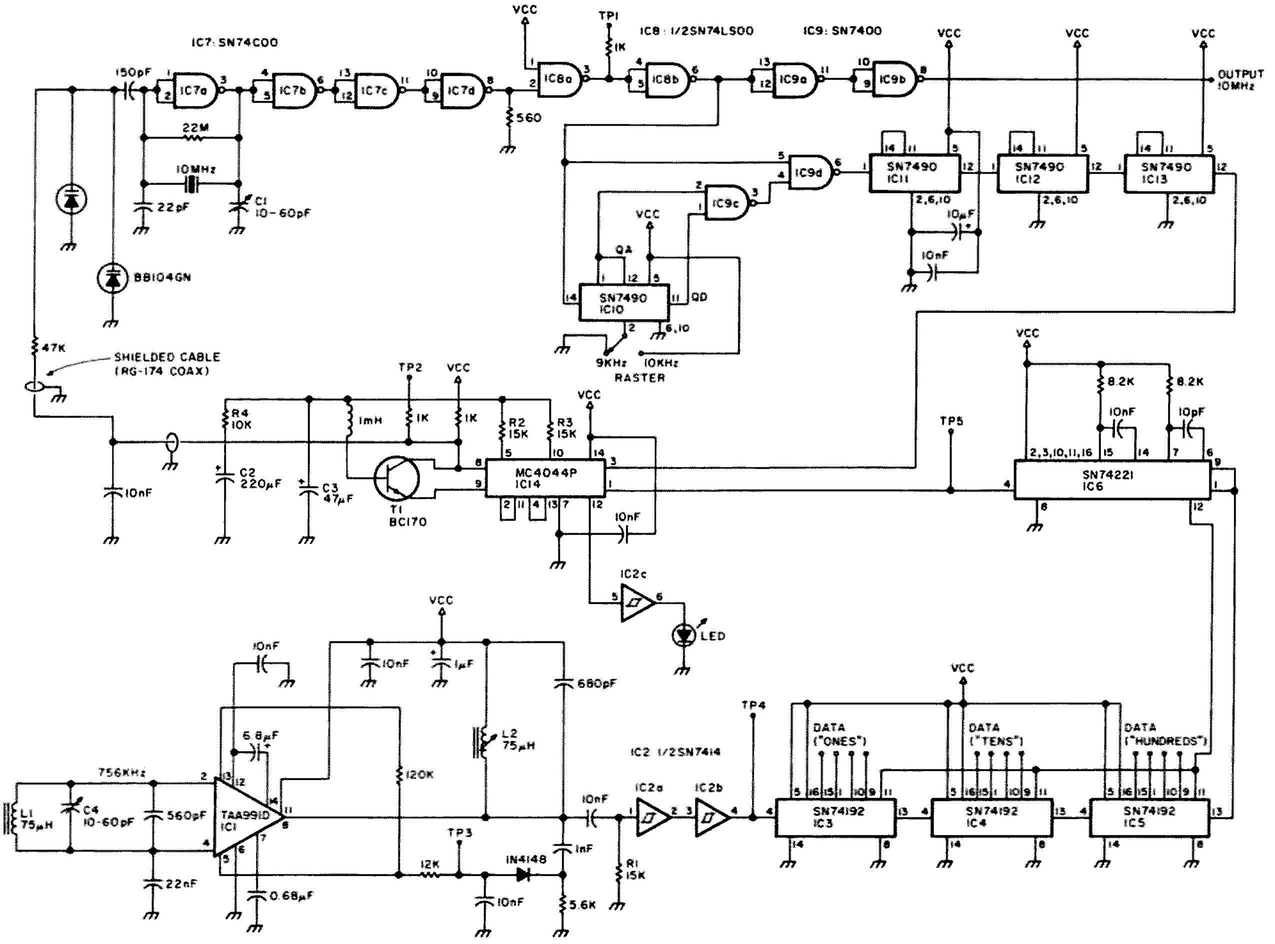


Fig. 2. Schematic diagram.

by means of a crystal oscillator whose frequency is regularly checked against and aligned with a reference frequency from the National Bureau of Standards or a secondary source of a reference frequency of similar accuracy. Even better, the ultimate step has already been taken by phase-locking the radio transmitter frequency to a reference frequency of the National Bureau of Standards.

The transmitting frequency of the Deutschlandfunk (DLF), phase-locked to a frequency standard generated by the PTB, the German National Bureau of Standards (Physikalisch-Technische Bundesanstalt), is one example. The PTB transmission on 77.5 kHz has a frequency stability of better than 10^{-6} ppm per day (10^{-12}).

Due to variations of propagation, the frequency of the signal received 300 km away from the transmitter still is accurate to better than 0.01 ppm (10^{-8}) or 0.001 ppm (10^{-9}) for measuring periods of 1 and 10 seconds, respectively.[1] But while a short-term stability of station DLF on the order of 0.0001 ppm (10^{-10}) is achieved by a well-regulated crystal oscillator, the small variations of the received reference frequency are filtered out by a very slow response of the frequency-control circuit resulting in a long-term stability in the same order of the broadcast-transmission frequency.

Most frequency counters and secondary frequency standards use a 10-MHz crystal oscillator as a master clock from which other time signals or frequencies are derived. And many frequency counters and signal generators already have a provision for synchronization or triggering by an external frequency standard.

My basic idea, therefore, was to build a 10-MHz crystal oscillator, phase-lock it to an AM-broadcast transmitter of high frequency stability, and use it as a virtually drift-free frequency/time signal generator of high accuracy for frequency counters, calibrations, etc. Some of the design specifications were:

- The unit should be programmable to accommodate the AM-broadcast frequencies of interest.
- It should be small enough to fit into existing equipment without employing large external antennas, thus maintaining portability of the equipment.
- It should generate a 10-MHz TTL signal with an accuracy similar to the accuracy of the AM-broadcast transmitter employed, i.e., with a short-term stability of at least 0.01 ppm (ten times better than an oven-stabilized crystal oscillator) and an even higher long-term stability.
- It should be programmable for the 10-kHz raster of AM-broadcast transmission frequencies employed in the US and for the 9-kHz raster already in existence in Europe.

The basic concept is shown in Fig. 1. A simple receiver picks up a signal of an AM-broadcast transmitter in the 450-1800-kHz range. The carrier frequency is isolated from the modulation and fed to a frequency divider with a programmable division ratio of 1:45 to 1:200.

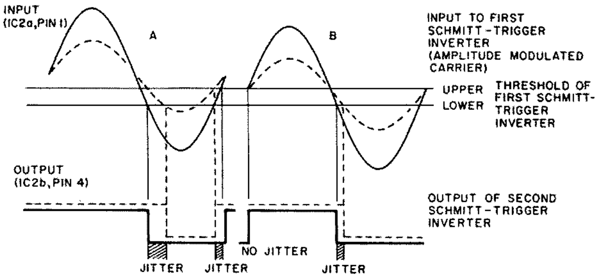


Fig. 3. Operation of the two Schmitt-trigger inverters. (a) Without a pull-down resistor, the input signal resides on the high input level of the first Schmitt trigger. Both edges of the output pulse of the second Schmitt trigger are jittering due to the amplitude modulation of the input signal. (b) The high input level of the first Schmitt trigger is pulled down by a resistor. Triggering occurs at the zero-crossing point of the rising edge of the input signal resulting in a jitter-free rising edge of the output pulse of the second Schmitt trigger.

For the 10-kHz raster of AM-broadcast frequencies employed in the US, a range of division ratios from 45 to 180 is selected to yield a 10-kHz signal at the output of the divider. For example, for station WJR in Detroit on 750 kHz, the division ratio would be set to 75, and so on. For the European raster, a range of division ratios from 50 to 200 is selected to yield a 9-kHz output signal. A ratio of 84, for example, divides the carrier frequency of station DLF on 756 kHz to 9 kHz. The 10- or 9-kHz output signal is fed to a frequency/phase detector as the reference frequency.

The desired 10-MHz signal is generated by a variable crystal oscillator (vxo) whose output signal is frequency-divided in a pre-divider by 1 (US) or by 1.111 · · · (Europe) and then divided again, by the main divider chain, by 1000 to yield an output signal with a frequency of 10 kHz (US) or 9 kHz (Europe). This variable frequency is fed to the frequency/phase detector, too, which produces a corresponding error signal if variable frequency and reference frequency do not coincide regarding frequency and/or phase.

The error signal is passed through a low-pass filter in order to remove the 10-kHz (9-kHz) components. The dc component of the error signal is applied to a varactor diode in the vxo to pull its frequency up or down as required. This dynamic process comes to a rest when both frequency and phase of the variable frequency from the vxo and the (constant) reference frequency coincide on the 10(9)-kHz level, which in turn produces a steady control voltage for the varactor diode in the vxo.

Any tendency to leave this steady state due, for example, to a change of ambient temperature and its impact on the vxo frequency is immediately balanced by an appropriate change of the amplitude of the error signal, thereby keeping the vxo on phase and frequency with respect to the reference frequency (phase-locked loop). An "unlock" indicator signals if phase-lock has not been achieved.

The Circuit

The complete schematic diagram of the circuit is presented in Fig. 2. The simple AM-broadcast receiver consists of the integrated circuit (IC1) designed for the front end of AM/FM receivers. Various types of applicable ICs are on the market. The TAA991D chosen here operates from a 4.5-11-volt supply; it has a voltage gain of 90 dB and an agc range of 60 dB.[2] The TAA991D amplifies the signal of the AM-broadcast station received by the ferrite antenna, L1, to about 4 V_{SS} at its output.

The very efficient gain control accommodates a wide range of input-signal amplitudes and can cope even with very strong signals of nearby broadcast stations. Furthermore, the time constant of the gain control is kept so short that it also compensates carrier-amplitude variations due to the modulation. Measurements showed that an amplitude modulation of the carrier frequency of more than 90% is reduced to less than 5% by the circuit, resulting in an almost steady carrier signal at its output.

Most AM stations modulate far less than 90%, however. The output signal of the gain-controlled amplifier is ac-coupled to a Schmitt-trigger inverter, IC2, which is pulled down at its input by resistor R1 to a level of about 1.3 volts.[3] The value of R1 should be adjusted so that the rising edge of the sinusoidal carrier signal triggers the Schmitt trigger at or near its zero-crossing point (see Fig. 3). Thereby, the modulation of the carrier is removed almost completely, resulting in a jitter-free falling edge of the Schmitt-trigger output signal. At the output of the second Schmitt trigger, IC2B, a jitter-free rising edge is obtained which triggers the programmable divider which follows.

The programmable divider is a chain of three binary-coded decimal (BCD) up/down counters, IC3-IC5.[3] Generally, the incoming carrier frequency can be divided by any integral number from 001 to 999. However, as mentioned earlier, only the range from 045 to 200 is needed. The "ones" of this number are represented by the first counter (IC3), the "tens" by the second counter (IC4), and the "hundreds" by the third counter (IC5). Pins 15, 1, 10, and 9 of each counter accept the respective digit number in BCD form. If these pins are in logic state 1 (i.e., connected to V_{CC}), their contribution to the digit number is 1, 2, 4, and 8 respectively. If they are in logic state 0, they do not contribute at all.

For example, if the carrier frequency of station WJR on 750 kHz is to be divided down to 10 kHz, the number to be programmed is 075. In this case, the logic states of pins 15, 1, 10, and 9 are 0, 0, 0, 0 for IC5, 1, 1, 1, 0 for IC4, and 1, 0, 1, 0 for IC3, in that order ($0\times1+0\times2+0\times4+0\times8=0$, $1\times1+1\times2+1\times4+0\times8=7$, and $1\times1+0\times2+1\times4+0\times8=5$ all together corresponding to 075). As the three counters are wired as down-counters, the number 075 loaded this way is reduced by 1 for each cycle of the incoming carrier signal.

If number 000 has been reached, an output pulse at the output of the counter chain (pin 13 of IC5) is generated which is used to reset the counters to the state programmed initially (075 in the example). The very short output pulse is stretched to approximately 50 nanoseconds by one of the monostable multivibrators of IC6 and applied to reset pin 11 of each counter.[3]

Because only one output pulse is generated for 75 input pulses, a division of the carrier frequency by 75 is achieved. The other monostable multivibrator of IC6 which follows stretches the length of the 10-kHz output pulse to about 50 μs for further processing. For the European raster of AM-broadcast stations, the same considerations apply. The carrier frequencies are multiples of 9, however, and a reference frequency of 9 kHz is obtained by division of the carrier frequencies by integral numbers from 50 to 200 in order to utilize AM stations in the range from 450 to 1800 kHz for the same purpose.

The vxo consists of a low-cost microprocessor crystal and one CMOS gate (IC7, same pinout as IC8[3]) as the active device. The double-varactor diode, BB104 green, has a capacity swing from 35 pF at 3 volts to 14 pF at 30 volts of reverse bias. Any other varactor diode of similar characteristics is applicable. For a voltage swing from 1.5 to 5.0 volts at TP2, a frequency deviation of approximately +60/−95 Hz from the nominal frequency of 10 MHz was measured. Initially, trimmer capacitor C1 is adjusted so that an error voltage of about 3 volts is measured at TP2 for a vxo output frequency of 10,000,000.0 MHz.

Several inexpensive crystals were tried out with appropriate readjustment of C1, and they gave similar good results. The CMOS level of the vxo signal is converted to TTL level by the combination of one low-power Schottky gate (IC8A) and a 560-Ohm pull-down resistor at its input.[3] Another gate (IC8B) is used for buffering the 10-MHz signal. It is further buffered by TTL gates IC9A and IC9B and passed to the 10-MHz output terminal.

As the 10-MHz signal is going to be checked against a reference frequency of 10 (US) or 9 (Europe) kHz, it must first be divided by 1 or 1.111 · · · giving a frequency of 10 or 9 MHz. The chain of three decade counters (IC11-IC13[3]) which follows divides that frequency down to 10 or 9 kHz and this signal is passed to the frequency/phase detector as the variable frequency together with the 10- or 9-kHz reference frequency from the AM-broadcast receiving branch of the circuit.

The alternative division by 1 or 1.111 · · ·, respectively, is achieved by the combination of decade counter IC10 and gates IC9C and IC9D.[3] If pin 2 of the decade counter is high, i.e., at V_{CC} level, the counter is disabled and its output terminal (pin 11) is in a low state. Consequently, the output of gate IC9C remains high constantly, enabling gate IC9D which passes the pulses from the output of gate IC8B directly to the input of the chain of decade counters. No frequency division takes place in this case (division by 1). However, when pin 2 of the decade counter is in a low state (grounded), the counter is operative. Its action is explained in Fig. 4.

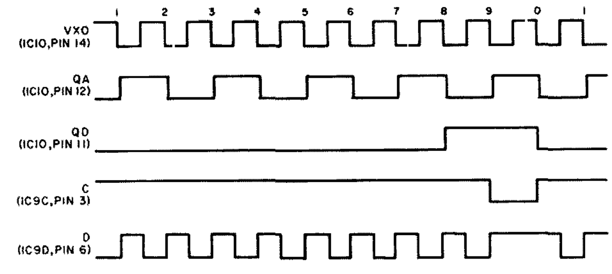


Fig. 4. Operation of the divide-by-1.111 · · · module as explained in the text.

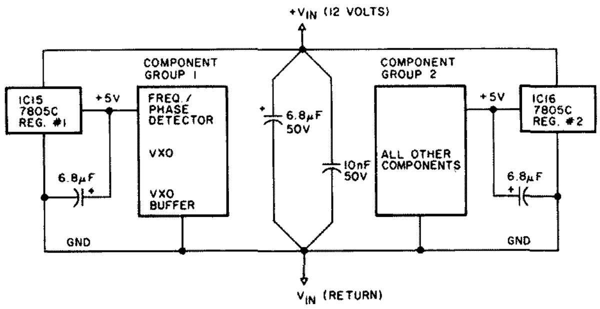


Fig. 5. Power supply.

The counter contains a chain of four flip-flops with designations Q_A for the output of the first and Q_D for the output of the last flip-flop. For the arrangement shown in the schematic, the first flip-flop is triggered by each negative transition of the vxo pulse sequence. Q_D assumes a high state after 8 input pulses and is reset to a low state after 10 pulses. This constitutes one complete cycle of the decade counter. The logic combination of outputs Q_A and Q_D by gate IC9C produces signal C at its output. And the logic combination of signal C and the signal of the vxo by gate IC9D generates a sequence of pulses (D) similar to the signal of the vxo with the exception that for every 10 pulses of the vxo one pulse is missing. Therefore, 9 pulses are generated at the output of gate IC9D for 10 pulses of the vxo, constituting a division by 10/9 = 1.111 · · ·.

The frequency/phase detector, IC14,[4] checks the frequency/phase difference between the reference frequency and the variable frequency, i.e., the AM-station carrier frequency and the vxo frequency, respectively, both divided down to 10 (US) or 9 (Europe) kHz. 10(9)-kHz pulses appear on pins 5 and/or 10 with a duty cycle corresponding to the difference. These pulses are filtered by a low-pass filter (R2, R3, R4, C2, C3, 1-mH choke) and buffered by transistor T1.

Any small signal transistor is applicable here provided it has a gain high enough to meet the following specifications: no frequency/phase difference generates a voltage of about 3 volts at TP2; a higher frequency or a leading phase of the variable frequency (vxo) with respect to the reference frequency generates voltages of down to 1.5 volts or up to 5 volts in the contrary case.

This error voltage is applied to the varactor diode of the vxo which pulls the crystal frequency to achieve zero frequency difference and a very small but constant phase difference. At pin 12 of IC14, negative-going pulses are generated whose duration is proportional to the phase difference of variable and reference frequency. They trigger the Schmitt-trigger inverter, IC2C, which turns on an LED in case of a wide pulse width indicating that a no-lock condition exists.

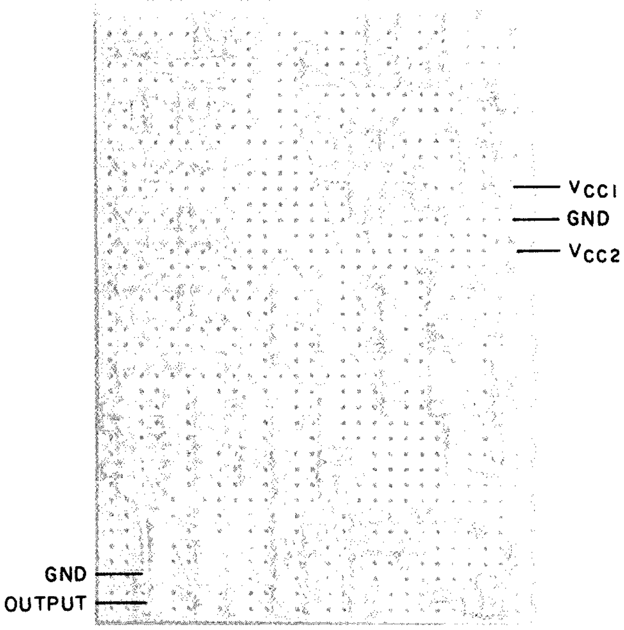
The Power Supply

In the power supply, two regulators are used. One serves the most critical component group, i.e., the frequency/phase detector, the vxo, and the vxo buffer, IC8A/B. The other serves a group containing the remaining components. All ground-return leads in each one of the two groups are returned to their common ground—and a heavy wire is recommended here. Fig. 5 presents the general arrangement of the power supply. Regulator #2 needs a bit of heat-sinking. At V_{in} = +12 volts, regulator #1 has to deliver approximately 50 mA to component group 1 while regulator #2 delivers approximately 330 mA to component group 2. Total power consumption is 4.6 Watts (12 volts at 380 mA).

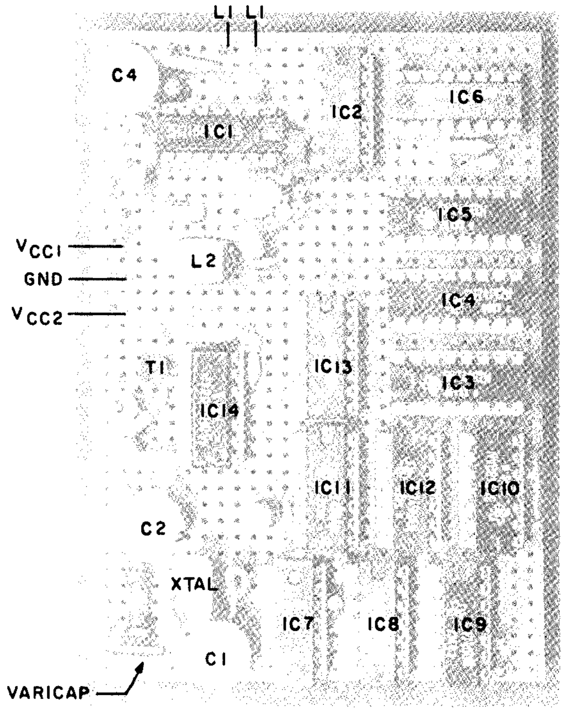
Construction

The whole circuit was mounted on a perforated board of 68 × 100 mm (2-5/8″ × 3-7/8″) size with solder eyes and 0.1-inch spacing. The discrete components were soldered directly on the board in an arrangement which minimized the number of additional interconnecting wires. For the integrated circuits, wire-wrap sockets were used, and this part of the circuit was wire-wrapped.

Miniature binding posts



Bottom side of board.



Top side of board.

were inserted in the perforated board where needed. The whole circuit board may be mounted in a miniature cabinet 71 mm long × 102 mm wide × 28 mm high (2-3/4" × 4" × 1-1/8"). In this case, both regulators are mounted directly on the inner surface of the cabinet. However, the board may be installed directly into existing equipment. In case of a metal cabinet, the ferrite antenna must be mounted externally.

Alignment

The test instruments used for alignment were a VOM with an internal resistance of 20k Ohms/volt, a Sabtronics model 8610A frequency counter with an HP 10006 A 10:1 test probe (14 pF/10 megohms), and a small pocket receiver to check whether the broadcast station to be utilized is on the air.

First, the receiver is aligned by measuring its agc voltage at TP3 and tuning the input and output circuit of the receiver for maximum agc voltage. The negative agc voltage should be at least 0.6 volts and may run as high as several volts depending on the strength of the AM station received. The component values shown in the schematic diagram were chosen to receive a station on 756 kHz.

With the frequency counter at TP4, one should obtain a stable indication of the carrier frequency of the AM-broadcast station selected. If the display is not stable within one bit of the last digit of the frequency counter, make sure that the counter is not disturbed by residual modulation of the carrier, line noise, or other signals.

Next, program the appropriate number into the three count-down counters (IC3-IC5) which follow to obtain a 10(9)-kHz reading on the frequency counter at TP5.

Now connect the frequency counter to TP1 and the VOM to TP2 and adjust C1 so that the frequency counter displays 10-20 Hz more than 10 MHz (if the VOM indicates more than 3 volts) or 10-20 Hz less than 10 MHz (if the VOM indicates less than 3 volts initially). Allow the frequency/phase detector up to 30 seconds to recover from saturation and observe the VOM. The error voltage measured at TP2 should stabilize at about 3 volts within 60 seconds with the unlock indicator turned off and the frequency counter displaying 10,000,000 Hz, 9,999,999.9 Hz, or an overflow to (1)0,000,000.0 Hz depending on its accuracy. If the error voltage stabilizes elsewhere, adjust C'1 of the vxo to achieve an indication of 3 volts.

Finally, adjust C1 so that an error voltage of 3.2 volts is indicated. This finishes the alignment of the circuit.

Performance

The performance measurements were made with the same test equipment already used for the alignment of the circuit. First, the frequency counter together with the 10:1 test probe was checked. An undesirable sensitivity of its internal clock generator to TTL signals at its input could not be found. However, it was sensitive to heavy line noise, so a 12-volt car battery was used to power the frequency counter.

The frequency counter had an internal voltage regulator for 5 volts, but no drop of battery voltage occurred during the time of measurement. After warm-up, the counter was connected to TP1 of the circuit and its internal clock aligned for a display of 10,000,000 Hz for a measuring period of 1 second. Then it was aligned for an overflow to (1)0,000,000.0 Hz (representing 10,000,000.0 Hz) using a measuring period of 10 seconds. Using this test setup and applying a VOM to TP2, the following performance measurements were made:

1) The frequency counter displayed no other values than (1)0,000,000.0 (overflow) or 9,999,999.9 during more than one hour of measurement and for consecutive measuring intervals of 10 seconds at room temperature.

2) No other values than (1)0,000,000.0 (overflow) or 9,999,999.9 were displayed for intermittent shorts of the 10-MHz output terminal to ground. Also, the error voltage of 3.2 volts at TP2 remained constant in this case.

3) No other values than (1)0,000,000.0 (overflow) or

9,999,999.9 were displayed for ambient temperatures of 3° C (refrigerator) or 50° C (stove). No significant change of the error voltage at TP2 was noticed. (The measurements were made quickly after the 1-hour cooling/heating procedure outside the refrigerator/stove since their metal cabinets prevented the circuit from receiving the AM-broadcast station.)

4) No other values than (1)0,000,000.0 (overflow) or 9,999,999.9 were displayed for a change of V_{in} in steps of 10 volts in the range of 7-27 volts.

5) If the circuit is operated employing the European raster of AM-broadcast frequencies, phase modulation of the 10-MHz signal may be expected due to the quasi-periodic/aperiodic operation of the divide-by-1.111··· module. However, due to the long time constant of the low-pass filter following the output of the frequency/phase detector, ac components of the error voltage are filtered out to a large degree and a low phase modulation of less than 4% peak-to-peak was measured with an oscilloscope.

6) The output frequency settled to a display of (1)0,000,000.0 (overflow) or 9,999,999.9 within 60 seconds after power was applied to the circuit.

7) The circuit is sensitive to heavy line noise which in severe cases requires additional line filtering in front of the power supply. It also is sensitive to major disturbances of the AM signal. For example, during a thunderstorm the frequency of the 10-MHz output signal dropped by some Hz several times but recovered within a few seconds. A complete loss of the AM signal causes a drop of the output frequency to the lower bound of the phase-locked-loop capture range on the order of 100 Hz below 10 MHz.

Parts List

Qty	Item		Price
	Integrated Circuits		
1	MC4044P (Motorola)		$5.00
1	SN74LS221N (Quest Electronics)		1.19
1	SN7414N (Quest Electronics)		.55
1	SN7400N (Quest Electronics)		.19
4	SN7490N (Quest Electronics)		1.40
3	SN74192N (Quest Electronics)		2.37
1	SN74C00 (Quest Electronics)		.35
1	SN74LS00N (Quest Electronics)		.25
1	TAA991D (Siemens-Ref. 2)		2.50
2	7805C regulators (R.F. Electronics)		2.78
	Crystal		
1	10-MHz crystal (Quest Electronics)		3.95
	Semiconductors		
1	LED, red TO-18 (Quest Electronics)		.15
1	Transistor BC170 or equivalent		.20
1	Varactor diode BB104gn or equivalent		.50
1	Diode 1N4148		.10
	IC sockets		
4	Wire-wrap, 16 pin (Quest Electronics)		2.28
10	Wire-wrap, 14 pin (Quest Electronics)		5.50
	Resistors (all 1/10 Watt)		
1	560 Ohm		
3	1k Ohm		
1	5.6k Ohm		
2	8.2k Ohm		
1	10k Ohm		
1	12k Ohm		
3	15k Ohm		
1	47k Ohm		
1	120k Ohm		
1	22 megohm	Total for all	1.20
	Capacitors (15 V except where indicated)		
1	10 pF		.12
1	22 pF		.12
1	160 pF		.12
1	680 pF		.12
1	560 pF		.12
1	1 nF		.15
8	10 nF		1.60
1	10 nF/50 V		.40
1	22 nF		.30
1	.68 uF		.40
1	1 uF, electrolytic		.40
3	6.8 uF, electrolytic		3.00
1	6.8 uF/50 V, electrolytic		1.00
1	10 uF, electrolytic		1.00
1	47 uF, electrolytic		1.00
1	220 uF, elctrolytic		1.00
2	Trimmer capacitors 10-60 pF		1.00
	Other		
1	Ferrite rod 115 × 8 mm (R33-050-400)		1.95*
1	Perforated board		1.80
1	Miniaturized filter (L2) (L-43-1)		1.50*
1	1-mH choke		.50
16	Terminal posts for board		.50
	Wire, solder etc.		1.40
			$49.96

*Amidon Associates, 12033 Otsego St., North Hollywood CA 91607.

Conclusions

As it was considered unlikely that during the performance tests variations of the output frequency of the circuit were counterbalanced by identical errors of different sign of the frequency counter, the following conclusions were drawn:

- The circuit can provide a 10-MHz reference frequency with a short-term stability of at least 0.01 ppm and a much higher long-term stability.
- Its accuracy and stability are directly dependent upon the quality of the AM-broadcast signal used as a reference frequency. Most AM-station frequencies are accurate to this and even to a higher degree.
- In contrast to a vxo in a thermostat, the circuit needs no warm-up period, it has no drift due to aging, it provides at least one order of magnitude better stability, and it does not cost more.
- It also has all the provisions necessary to accommodate a 9-kHz raster of broadcast frequencies if the FCC should go along this way in the future.

Use the circuit as an external reference, install it as the main clock in the existing space of your frequency counter, or use it as a calibration standard for your station. In every case, you are bringing a degree of frequency accuracy and stability to your ham shack which is maintained for you by other people day and night and brought to your home free of charge. Enjoy it! ■

References

1. Hetzel, P., "Empfang der Normalfrequenz des Traegers von DCF77," *Physikalisch Technische Bundesanstalt*, Braunschweig, Fed. Rep. of Germany, March, 1979.
2. Siemens AG, "Lineare Schaltungen," *Datenbuch 1974/75*, Band 2, Order No. B12/1213, Siemens Corp., Components Group, 186 Wood Avenue South, Iselin NJ 08830.
3. Texas Instruments, *The TTL Data Book for Design Engineers*, Second Edition, Marketing and Information Services, PO Box 5012 MS 308, Dallas TX 75222.
4. Motorola, Inc., *Phase-Locked Loop Systems Data Book*, Second Edition, August, 1973, PO Box 20912, Phoenix AZ 85036.

MICROLOG AIR-1

SPECIFICATIONS

INPUTS: Receiver audio, in & out phono jacks for easy speaker connections. Hand key input allows code practice that reads your sending and drives the transmitter keying outputs.

OUTPUTS TO TRANSCEIVER: Positive and negative switching for CW & FSK keying, solid state or tube type transmitters, AFSK tones at microphone compatible levels, T/R(PTT) transmitter control.

PRINTER OUTPUT: Uses standard VIC printer for "Hard-Copy" of both receive and transmit data regardless of on-the-air mode. Also has hi voltage transistor switch on board for driving current-loop type printers.

DISC & TAPE INTERFACE: Uses standard VIC DISC & DATASET for recording off the air and making long "brag tapes." Another handy feature is the ability to save and re-load your "here-is" memories easily. Since this function is also compatible with your VIC disc drive, it's especially nice for quick start-up.

VARIABLE MEMORY UTILIZATION: A unique Micrology feature allows you to select the size of your text buffer and 8 "HERE-IS" messages from the available computer RAM. It automatically takes into account any memory expansion cartridges you've added. The unexpanded VIC has about 3000 characters for you to allocate. You could for example choose eight 300 character messages and a 600 character text buffer. If you don't tell it otherwise, the system will default to eight 100 character "HERE-IS" memories and a 2200 character text buffer. The expanded VIC will have different default memory sizes, depending on the amount of added memory. The programmable "HERE-IS" memories can be loaded or inserted into the text buffer for transmission at any time.

TEXT BUFFER: Allows you to type ahead while receiving. Text entered into the buffer is visible above the split-screen line for correction before sending.

AUTO-START: Inhibits the display of non-RTTY data.

TUNING INDICATORS: On screen visual tuning aid and audio (pitch) reference tone for RTTY and CW. (Audio is heard thru your tv or monitor's sound channel, just like any other VIC generated audio.)

W R U (Who Are You?): Automatically responds with your call sign when a user programmable sequence up to 15 characters is received.

SEL-CALS: Two 15 character user programmable sequences. Receipt of selcal #1 enables the printer, disc or tape. Receipt of #2 disables these outputs for unattended message store (mailbox).

FULL SPEED OPERATION: Transmit and receive Morse — 5 to 199 WPM, Baudot — 60, 66, 75, 100, 132 WPM, ASCII — 100 & 300 baud.

MORSE SPEED TRACKING: Automatic and speed lock modes, keyboard selectable.

VIDEO DISPLAY: Color keyed display makes optimum use of the computer's color capability. Uses standard VIC format of 23 lines of 22 characters.

SPLIT-SCREEN: Displays text buffer input above and receive/real-time transmit text below the split line.

TOP LINE DISPLAY: Constant display of Time, Mode, Speed/Code in use, and status indicators.

TEST MESSAGES: Quick brown fox and RYRY's in Baudot, U*U* in ASCII, and VVV in Morse.

SPECIAL SYNC-LOCK MODE: Allows improved ASCII operation and "Paced Output" in Baudot RTTY.

T/R(PTT): Fully automatic control of your XMTR via the Push-to Talk line in both RTTY and Morse.

UN-SHIFT on SPACE: Automatically shifts back to "LETTERS" upon receipt or transmission of a Baudot space. Keyboard command on/off.

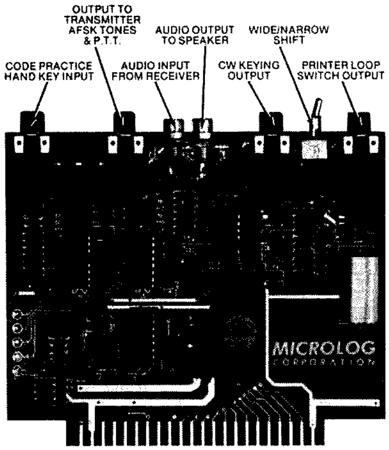
SYNC: Transmits "Blank Fill" in RTTY and BT in Morse when the text buffer is empty and unit is in transmit. Keyboard command on/off.

OUTPUT MODES: CHAR — outputs each character as typed. WORD — outputs full word when spacebar is typed. LINE — outputs full line when carriage return is typed. BUFFER — outputs full buffer, on command.

REAL-TIME CLOCK: Uses the VIC's internal clock for constant on screen display of time which can be inserted into text buffer on keyboard command.

WORD WRAP AROUND: Prevents splitting words at the end of a line. Works in receive as well as transmit.

MORSE TONE DETECTOR: Single tone, 800 Hz center frequency, with effective bandwidth of 300 Hz. Pitch reference regenerated audio tone for easy tuning.



RTTY DEMODULATOR: True dual tone computer enhanced demodulator circuit on standard 2125/2295 Hz tone pair compatible with HF RTTY and VHF FM operation. Switch selected wide and narrow shift.

CODE PRACTICE: Random five character code group generator sends at any speed you set via the keyboard. Hand key input for sending practice and manual morse transmission.

CW ID & NORMAL ID: Two independent 16 character memories for either 2 calls or one normal and one with auto-CW ID for RTTY.

MECHANICAL: Printed circuit board is G-10 epoxy, double sided with plated thru holes. Board is solder masked and silk-screened with parts locations for easy troubleshooting. Size is 5¾" wide by 4½" deep by ¾" high. Fits directly into VIC expansion port and is compatible with popular expander boards in use.

NO EXTERNAL POWER REQUIRED: Unit is completely powered by host computer, eliminating the need for outboard power supply. (Entire system; VIC, Microlog AIR-1, & video monitor can easily run from 12 VDC power for remote or emergency battery operation.)

CONNECTIONS: All inputs/outputs are convenient ¼" 3 circuit phone or RCA phono types. Mating plugs are all provided.

Note: VIC, VIC-20 and DATASET are trademarks of Commodore Electronics, Ltd.

MICROLOG

INNOVATORS IN DIGITAL COMMUNICATION

William B. Jones KD7S
1081 Sierra Avenue
Clovis CA 93612

Build the Billboard Keyboard Keyer

Get perfectly-timed CW without a buffer. Then join the crowd at 60+ wpm.

Amid a flurry of activity to make modern amateur radio equipment extremely sophisticated, there are some indications of a welcome trend in the opposite direction. This is evidenced by the popularity of direct conversion receivers, low-power transmitters, and, in some instances, keyers. Magazine editors are begging for manuscripts describing equipment the average amateur can build without a laboratory full of expensive test gear or an engineering degree in solid-state physics.

One area which has not felt the full impact of this simple design philosophy has been that of the keyboard keyer. Some attempt has been made in this direction, but it has fallen far short of most people's expectations.

One early example of a rather uncomplicated device appeared in CQ a few years ago.[1] Unfortunately, there was a flaw in the design which would have rendered the unit inoperable had the builder not seen a following article describing an add-on memory which was published in a subsequent issue of the same magazine.[2] The same author more recently described a fairly simple keyboard keyer which appears to have whetted the appetite of many home-brew artists, judging from the number of units heard on the air recently.[3] Even so, this most recent design requires some fourteen integrated circuits which would intimidate the less experienced builder in most cases.

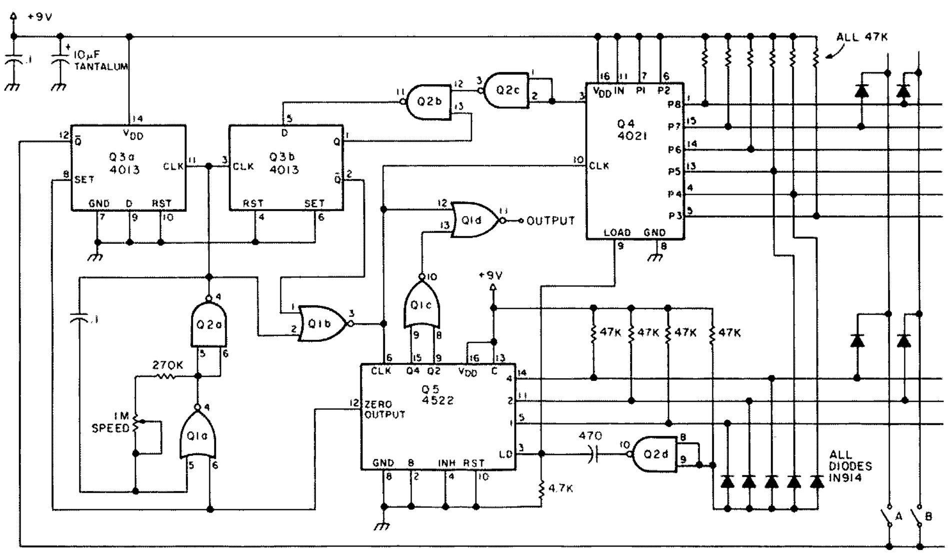


Fig. 1. Schematic of the "Billboard" keyboard keyer. Integrated circuit Q1 is a CD4001B and Q2 is a CD4011B. Although not shown on the schematic, pins 14 of these chips should be connected to +9 volts and pins 7 should be grounded.

Described here is a keyboard keyer which requires only five commonly available CMOS integrated circuits. It is capable of generating all letters, numbers, punctuation, and special characters such as $\overline{AR}$, $\overline{BT}$, $\overline{SK}$, and $\overline{AS}$. The keys are electronically disabled during character generation, which eliminates disrupting that character once it has been initiated. Further-

more, automatic letter spacing has been built into the design so that sending machine-perfect CW is no longer a rich man's game.

The last two features, keyboard lock-out and automatic letter spacing, are extremely important considerations when you give some thought as to how they are used. Take the combination "CQ" as an example. The operator momentarily depresses the "C" key and that character begins. He may then immediately depress the "Q" key and hold it down until the letter "C" and the space following it have been completed. Then and only then will the letter "Q" begin, at which time the operator releases the key and a perfect "CQ" will be generated. With very little practice, this method can be used for all words transmitted, thus reducing or eliminating altogether the need for expensive and complicated buffer memories.

It is my opinion that buffers do nothing more than compensate for poor typing ability in much the same way some operators use linear amplifiers to compensate for poor operating practices. If you are loud enough, somebody will surely answer you. If the operator is willing to practice for a bit with a bufferless keyboard, it is quite easy to fool other keyboarders into believing you actually do have such a buffer installed. Enough said.

Finally, no provisions for automatic word spacing have been included, as it was not felt necessary. Most operators can simulate near-perfect word spacing by ear. Again, this results in a meaningful reduction in cost and complexity.

Design Philosophy

Simplicity by itself is worthless unless consideration to reliability has been given. We have all seen the deceptively simple design which works poorly or not at all. The author was determined that this device not fall into that category. For that reason, schematics and parts lists were circulated to selected amateurs who represented a cross-section of building abilities and experience. Each was encouraged to build his keyboard as he saw fit. In each case, performance was identical to that of the two originals I built. A defective capacitor caused one unit to operate erratically until the culprit was found and relegated to the garbage can. Another builder used integrated circuits of dubious heritage and experienced some problems when operating in high ambient temperatures. Barring this sort of trouble, others building this keyboard keyer should have absolutely no difficulty in getting it to work, perfectly, the first time.

Circuit Operation

A diode matrix is used to encode the keyswitches to information which the electronic circuitry needs to form Morse code characters. Some designers prefer to use toroid transformers for this purpose. It is a moot question as to which method is superior as both have advantages as well as disadvantages. Diodes were chosen here mainly for the high degree of reliability they afford. They are widely available and inexpensive as well.

Integrated circuit Q4 is a parallel in/serial out shift register. Its output (Q8) is used to control Q2C, Q2B, and Q3B which comprise a dash generator. Any time a logic zero is present at pins 1 and 2 of Q2C, a dash will be generated. Otherwise, only dots will be formed. Logic zeros are programmed into the shift register by placing a diode on the appropriate input line and strobing pin 9 (load) high. As the clock input of the shift register (pin 10) is pulsed, any logic zero programmed will eventually work its way to the output and cause a dash to be sent.

Integrated circuit Q5 is a programmable downcounter. It is preloaded to one number higher than dots or dashes in the appropriate Morse character. The purpose of this is to keep the keyed clock (Q1A and Q2A) running for the additional time necessary to complete the automatic letter spacing. The counter is preloaded in identical fashion to the shift register.

Gate Q1C enables the output gate, Q1D, in all cases except when the counter has reached the number one or zero so that the letter space will not appear as a code element.

The other half of the dual-D flip-flop, Q3A, per-

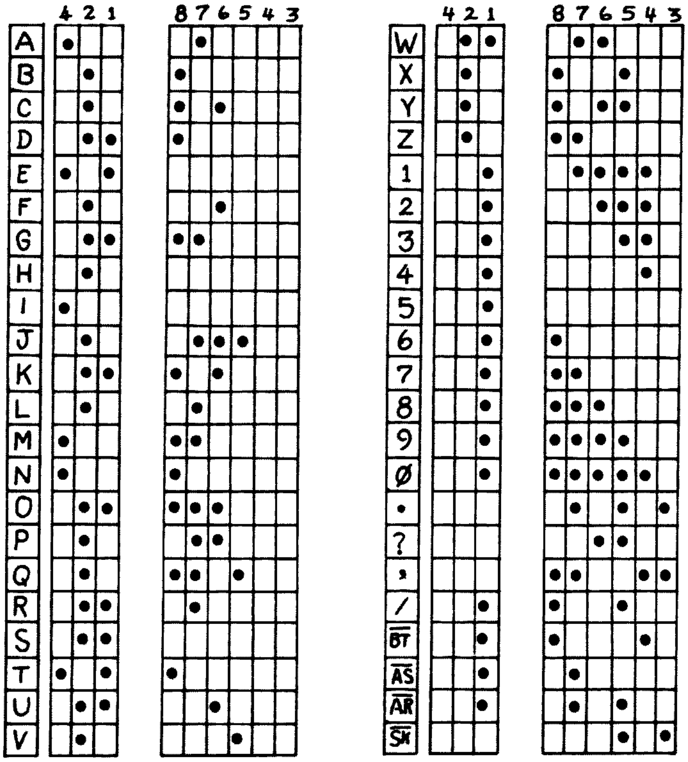


Fig. 2. Placement guide for diodes in the diode matrix. The first column refers to the CD5422 down-counter. The second column is for the CD4021 shift register. A dot indicates that a diode is to be placed in the appropriate line. All diodes are silicon switching types such as 1N914s or 1N4148s. The use of germanium diodes such as 1N34s is not recommended.

forms the keyboard lockout function by presenting a logic one to the common terminal of all keyswitches during character generation. Only after a character and its space are completed will the $\overline{Q}$ output go low, allowing another character to be started.

All this may seem rather complicated at first, but a couple of trips through the logic should bring everything together in short order. Consider each section separately instead of trying to visualize the action simultaneously. There are a lot of things going on at the same time, which may tend to confuse the reader who tries to understand the circuit as a single unit.

It can be seen from the schematic that everything is used. That is, there are no unused gates laying around doing nothing, no flip-flops standing idle. Nothing is wasted, which is one reason this kind of performance can be had with only five active devices.

The addition of a sidetone generator is left up to the individual builder. Most modern transceivers already have them built in. On the other hand, it is useful to have some method of monitoring your progress as you practice sending without the rig being activated. In my latest version, a Radio Shack Piezo Buzzer (part #273-060) was driven by a 2N2222A-type transistor and served the function of a sidetone generator simply and inexpensively. The singular drawback to this device is that the pitch is rather high for this application. Alternately, a 555 timer wired as an audio oscillator could be driven by a transistor in a similar manner to the Radio Shack device. Whatever method you choose, remember, the driving capability of CMOS integrated circuits is limited to extremely high impedance loads. Consult the *CMOS Cookbook* by Lancaster for additional information.

Transmitter keying is best done with a transistor instead of a reed relay to reduce the overall current drain. Since the entire keyer is capable of operating for extended periods of time from a single nine-volt transistor radio battery, it would be a shame to throw this feature away in order to use a relay. My rig is all solid state and requires keying a positive voltage to ground. Again, the 2N2222A was brought into play and performs the task well. For those rigs which require keying a high negative voltage to ground, something similar to the circuit used in the CMOS version of the Accu-Keyer should do well.[4] A recent paragraph in *QST* described a system which is designed to key both kinds of rigs without worrying about switching and could probably be adapted to this keyboard with little effort.[5] In any event, considerations should again be given to the limited current-driving capabilities of CMOS integrated circuits.

Construction

Due to the simplicity of the design, it was decided that no printed circuit board layout was necessary. Instead, the prototype models were constructed on perfboard using point-to-point wiring. This method has proven most satisfactory in this and other projects I have designed. One local builder used wire-wrap, which also worked out well although it was slightly more expensive.

Sockets were used for the integrated circuits to aid the builder should troubleshooting become necessary. The small additional cost is usually well justified, as many years of building experience has borne out.

The diode matrix is easily wired by running "lines" of number eighteen bare copper wire horizontally on one side of the board and vertically on the other. The author terminated the vertical wires with miniature flea clips purchased from the local Radio Shack store. Wires from the individual keyswitches were then soldered to the clips, resulting in a neat and orderly package.

Some number eighteen wire may tend to be springy and difficult to handle as it comes off the spool. By placing one end in a vise and pulling on the other end, the wire may be stretched slightly which will cause it to go limp and perfectly straight. Try this trick and you will be pleased with how well it works.

My unit was housed in a cast-off computer keyboard enclosure garnered at the local surplus emporium for a cost of under five dollars. An earlier version was built into a home-brew box which was not very attractive but quite functional. It is difficult to justify putting a twenty-dollar circuit into a twenty-five-dollar box with my limited budget. If that sort of thing doesn't bother you, there are some very nice commercial enclosures available. Just remember to make it metal for shielding the circuit from strong rf fields.

The actual keyswitches were purchased from Jameco Electronics of Belmont, California. They come as a unit molded into a plastic base thirteen inches long. Because I had need for only forty-four keys instead of the sixty-three supplied, the unit was cut down to ten and one-half inches long prior to wiring. This modification allowed space inside the enclosure for additional circuitry which will be described in a subsequent article.

As with any project, the finished unit is only as good as the parts which go into it. Cutting corners usually results in compromised operation. If a silver mica capacitor is specified, use one. The same applies to tantalum capacitors. They were chosen for a reason. Also, wherever possible, use "B" series integrated circuits as they are more reliable and better suited for this application. The erratic operation in high ambient temperature environments discussed earlier was cured by switching from "A" series to "B" series chips from a reliable vendor. Nine-volt transistor radio batteries are ideal power sources for CMOS designs. However, one should take care to get a quality unit. Don't waste your money on the dimestore cheapies. Don't rob the one out of the kid's handie-talkie. Buy a fresh alkaline cell for best results. It is money well spent.

If there is a keyboard keyer in your future but the family budget won't allow the several hundred dollars a commercial job requires, consider rolling your own. You will be the winner all the way around in dollars saved and pride of using a piece of equipment you built yourself. As an added bonus, most keyboarders find their code speed increasing steadily and rapidly. Perhaps the "Billboard" described here is the key to an Extra class license for you. ■

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1. Helfrick, "An Integrated Circuit Morse Code Keyboard," *CQ*, September, 1973.
2. Helfrick, "A Memory for the Integrated Circuit Morse Keyboard," *CQ*, November, 1973.
3. Helfrick, "An Inexpensive Morse Keyboard," *QST*, January, 1978.
4. Hinkle, "An Accu-Keyer for QRPp Operation," *QST*, January, 1976.
5. Balla, "Automatic Output Polarity for the Accu-Keyer," *QST*, April, 1979.

Construct the Lead-Foot Key

If you like your CW in the fast lane, you'll love this key. And it is guaranteed not to slip—at any speed.

Editor's Note: Melting lead can be dangerous! Not only can you get burned, but the fumes can be toxic, too. Use caution and plenty of ventilation.

J. H. Owens W5JQE
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Pottsboro TX 75076

Have you ever considered building your own keying-paddle, only to be stopped short by lack of a heavy metal base? Me, too. Then, one day after eating some sardines, I was about to throw the can away, when I took a second look and got a great idea. Why not fill the sardine can with melted lead and use it for the base?

Thinking about it for a while, I could find no flaws, so I scrounged some used automobile tire-balancing weights and melted them into the can with my propane torch. The metal clamps floated to the surface where I picked them off with pliers. The sludge also floated to the surface, and I scraped it off with the lid from the can. (A friend of mine used lead pipe and melted it in the can over a kitchen range burner. But, before that, he drilled a hole in each end of the can, and put a sheet metal screw through it, this to hold the lead casting and the can securely together.) So far, so good.

After the lead-filled can cooled down, I washed off the traces of sardine oil with solvent (you can use lantern fuel, paint thinner, acetone, etc.), then roughed the surface with fine sandpaper, and gave it a coat of paint. Not bad. The upside-down can was smooth and nicely contoured. Heavy too... it weighed four pounds.

A little later on, I found that it was also very adaptable for mounting the keying hardware. All I had to do was drill pilot holes through the can and into the lead casting—*very slowly*. If you don't have a hand-drill or variable-speed electric drill, use your regular electric drill, but turn it on and off repeatedly to keep it from running fast. I used a #4 drill, 3/32" in diameter, and kept it oiled. Now I was able to mount the parts with #6 × 1/4" sheet-metal hex-head screws. Neat.

The Paddle Arm

The biggest challenge I found in making the paddle arm was finding the right material. I went through the usual list of leaf switches, hacksaw blades, etc., only to find out that those

The finished model with glass-epoxy paddle arms, which give it a "hard" feel, like the commercial paddles. Phenolic arms are more flexible and give it a "soft" feel. If you like a really soft feel, make the arms an inch longer. Hey! If you don't like sardines, you can get smoked clams or oysters in the same size can!

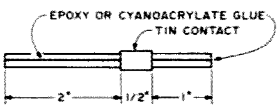

Fig. 1. Paddle construction. Clamp glued ends together until cement has cured. Use same technique for tin-plate ground contact.

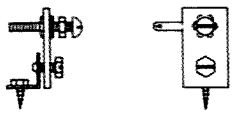

Fig. 2. Keying stanchions. To begin, gap the points at 0.010".

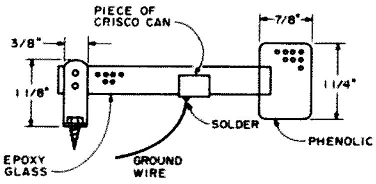

Fig. 3. Details of paddle-arm assembly.

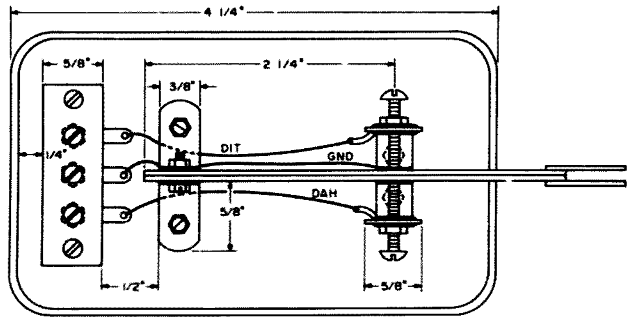

Fig. 4. Top view of the completed key. The dimensions were measured on one of the models, but need not be exact.

springy gadgets have *minds of their* own! They keep on bounding back and forth after you want them to stop, and good electrical contacts they ain't. So, after many trial-and-error experiences, I got down to some basic reasoning.

What I really needed was a lightweight material, having low mechanical Q, or high damping factor, something rigid in one plane and flexible in the other. But what? Then it hit me. How about a strip of perfboard or, better still, *two* pieces? After some experimenting, I ended up with two strips of 3/64" (0.0468) glass-epoxy board, about 5/8" wide and 3½" long, glued together at the last half-inch on each end with epoxy cement. You also can use cyanoacrylate cement. See Fig. 1.

This assembly provided the desired damping factor, and more. Let me explain. When you bend the arm, one of the perfboard pieces is *stretched* and the other one is *compressed*, and the friction between the two absorbs the stored kinetic energy quickly. If you want to test this, clamp one end in a vise, and flick the other end with a finger. Listen closely, and note the time it takes for the vibration to stop. Now try this same test with a hacksaw blade and you will find that the vibrations last *ten* times as long. No minor difference here, but a major improvement. OK?

The Dit-Dah Electrical Contacts

Still another challenge was finding a satisfactory substitute for the precious-metal contacts used on the finer commercial models. No big problem with the stanchion contacts—6-32 nickel-plated brass screws, about one inch long, worked OK. I made the stanchions by cutting a terminal-strip into two pieces, and mounting them to the base with half-inch angle brackets. See Fig. 2.

The common, or ground contact, on the paddle arm was a little trickier. The best thing I could find was shiny tin-plate, such as used for Crisco and other hydrogenated vegetable-oil cans. S-o-o-o, I raided the refrigerator and transferred the cooking grease from its container into a plastic storage box. Then I cut off a piece of the can material about a half inch wide and an inch long, cleaned all the grease off it, bent it around the paddle arm, and glued it in place. See Figs. 3 and 4.

Next, I soldered the flexible ground wire to the bend point. Finally, I sprayed the contact surface for lubrication and corrosion resistance . . . WD-40 or TV tuner spray works well. Voilà! Soft-touch contacts. Not gold, but so much *much* better than blued steel.

The Non-Slip Feet

One thing I hadn't planned on was a 4-pound paddle slipping around on my operating desk, even with rubber feet on it. I talked with some other hams and they told me that they had the same problem with their bugs and paddles. Some glued them to their desks, others drilled holes and screwed them down.

Well, I kept trying different things until one day I hit the jackpot with polyurethane foam. This is the stuff used for cushioning fragile items for mailing. It also is used as weatherstripping tapes. It worked, beautifully. Dime-size pieces, about one-quarter inch thick, glued to the lead base, did the job. The final choice was two strips, about a half inch wide, glued with rubber cement along each underside of the base. This stuff works on the commercial paddles, too. Just slip a little piece under each one of the rubber feet to make contact with the desk surface. I know, because I own one of those commercially-built paddles, a fine piece of precision machinery.

So, why did I go through all of this work to build a paddle? Well, the problem is that the manufactured paddle is *iambic*, and I am *non-iambic*. That's incompatibility. I just couldn't avoid closing both the dit and dah contacts at the same time, too often in the wrong order. Mistakes, mistakes, mistakes. So, I decided that the "squeeze" system, as well as the squeeze paddles, were not for me. Unfortunately, I could find no non-squeeze, non-iambic paddle on the market. So, I built my own. Maybe this article will stimulate some manufacturer to take a step *backward*. Anything to cut down on the keying mistakes on the air would be a blessing.■

Hardware for the key. The contact stanchions were made from a second terminal board (same as the one on the left) cut into two pieces. The angle brackets for the contact stanchions shown had pierced-and-threaded holes, but their base ends had to be cut off to leave only one hole. Ordinary 1/2" × 1/2" angle brackets would serve as well. The sink-faucet washers may be glued to the base to raise it higher if desired. The sheet metal screws for the terminal board have to be 1/2" to 5/8" long to account for the standoff spacers.

Phil Anderson WØXI
3005 W. 19th Street
Lawrence KS 66044

The $2 Infinite-Memory Keyer

Take a break. Your cassette recorder will send any message for you.

If you have a cassette tape recorder and like to operate CW, you can add an infinite memory keyer to your station for about two dollars. The idea is to place your CW messages on cassette tapes and play them back to key your transmitter. The demodulator presented in this article will convert the CW tones from the tape player into keying signals to drive the transmitter.

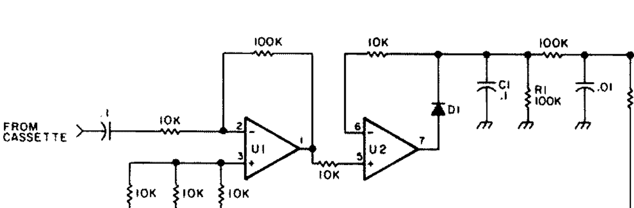

Fig. 1. Cassette memory keyer block diagram.

For repetitive messages such as CQ CQ DE . . ., you can use a continuous cassette tape. These come in 1/2-, 1-, 2-, and 3-minute durations. The tape in the cassette is looped back on itself and thereby forms a continuous tape. For code practice or message broadcasts, the usual C15, C30, or C60 cassettes could be used.

Code can be placed on a cassette by using an audio oscillator or your transmitter sidetone. Best results are obtained if the code is transmitted directly from the oscillator circuit to the mike input of the cassette tape recorder rather than recorded by microphone pickup. Too much background noise results from the latter.

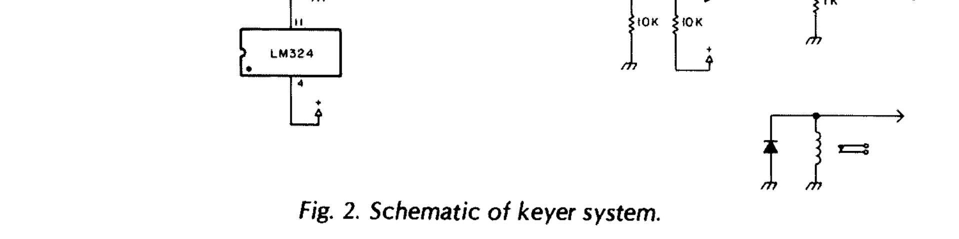

Fig. 2. Schematic of keyer system.

Demodulation

Before presenting the cassette keyer, let's look at the general demodulation process. As shown in Fig. 1, it consists of four steps: limiting, peak detecting, low-pass filtering, and slicing. The limiter is used to amplify the cassette CW tones and to provide sufficient drive for the peak detector. Also, the limiter will smooth out any small variations in the amplitude of the tones. This process is similar to FM detection ex-

cept that the filter or discriminator is discarded.

The peak detector is set to convert the limited tones to positive-going pulses. It acts as a half-wave rectifier but retains the positive peaks for a short duration; hence, the pulses have a slight ripple pattern at their tops. The circuit ignores the negative-going portions of the tones.

The low-pass filter is then added to remove these ripples. The system will work without the filter as long as input tones are clean and strong. It aids operation, however, when tape output is marginal.

The slicer converts the peak-detected pulses into TTL-compatible signals that go from 0 volts in the off state to about 3.5 volts in the on state.

Circuit Schematic

Now, let's examine the circuit schematic, Fig. 2. All of the signal processing is done with a single operational amplifier chip, an LM324, which contains four separate op amps. The circuit can be operated from a 5- or 9-volt dc supply. All resistors are 1k, 10k, or 100k, with the exception of one 470-Ohm resistor.

Circuit Operation

Cassette tones enter at the left and the TTL-compatible output is at bottom right. The circuit can also drive a low-voltage relay if it is substituted in place of the 1k output resistor at pin 14.

The limiter, U1, has a gain of ten and is biased at pin 3 to one-third of the supply voltage. This bias also sets the dc voltage level at pins 1, 5, 6, 10, and 12.

The peak detector, U2, charges capacitor C1 to the peak voltage of the tones that appear at pin 5. When the voltage at pin 5 exceeds the voltage on C1 and hence also at pin 6, U2 forward biases diode D1 and further charges C1. When the voltage at pin 5 drops, U2 turns off and C1 holds its charge until the bleeder resistor, R1, discharges it. C1 and R1 are set so that the ripple at C1 is small but the pulse formed from the code signals follows the code quickly; this is always a compromise.

The ripple is then removed by the RC low-pass filter. It does a sufficient job and frees up the fourth op amp in the LM324 IC to be used as a tuning indicator.

U3 and U4 work as slicers, or comparators, and convert the pulses from the peak detector into TTL-compatible signals. A dc restore circuit could be used here as an alternative. The advantages of the slicer are that it cleans up some ripple that may still remain and generates sharp and clean rise and fall edges for the keying output. The bias for U3 and U4 is set about one volt above the bias for U1 and U2. Therefore, when a pulse is generated at U2, the voltage crosses over the bias voltage of U3 and U4, generating positive pulses at their outputs. That is, when the voltage at pin 12 exceeds the bias voltage at pin 13, pin 14 will have an output nearly equal to the supply voltage.

The output of U3 is used to drive an LED indicator. This makes tuning and circuit verification of proper operation easy. The circuit as a whole could be used for receiver CW demodulation if a CW filter is placed between U1 and U2. You may want to consider that when planning circuit construction. Happy cassette keying! ■

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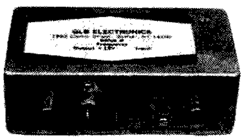

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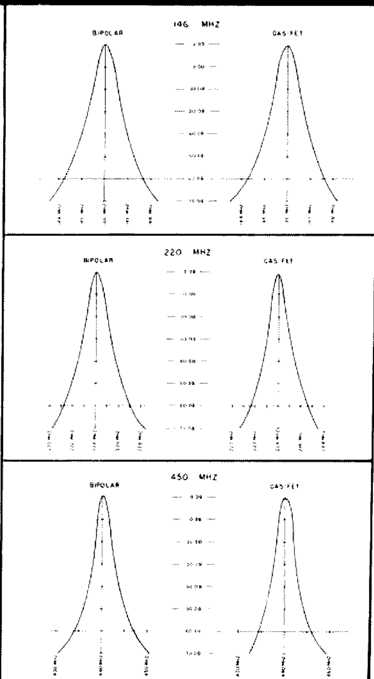

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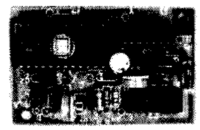
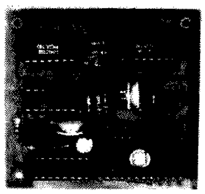


ID-1



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Lines 1000 to 1460 contain the Morse data. The data lines consist of the ASCII value for the character followed by a Morse representation. A 3 signifies a dash, a 1 stands for a dot, and a 0 marks a space. For example, line #1110 says the following:

1110 DATA 65,130

The number 65 is the ASCII code for an uppercase A. The 130 means didah, followed by a short space to keep it from running into the next letter.

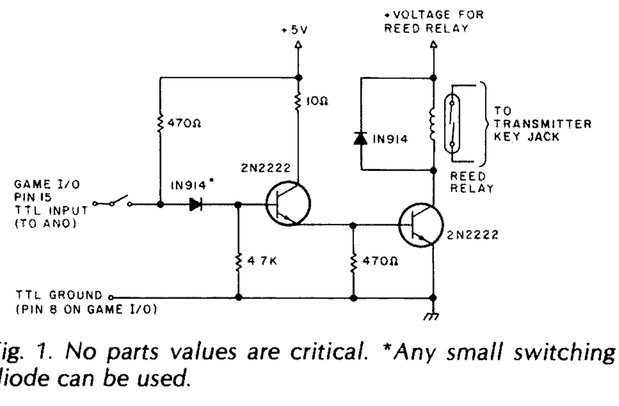

*Fig. 1. No parts values are critical. *Any small switching diode can be used.*

When the program is run, the computer will take the data listed between lines 1000 to 1460 and load it into the string matrix CODE$. The location within CODE$ is the ASCII value of the character; in other words, location 65 in CODE$ contains the data for the Morse letter A. When characters are sent to the computer from the keyboard, the computer changes the letters to their ASCII value (using the BASIC ASC($) command) and looks in CODE$ (<ASCII value of letter>) for the Morse data. The Morse data is then dissected character for character using the BASIC MID$(X$,X,X) command.

Lines 80 to 90 are for the CW sidetone. These lines POKE a machine language subroutine which will enable the Apple to send the CW through the internal speaker. The value POKEd into decimal location 768 on line 70 determines the pitch of the sidetone.

Line 130 gets a single character input from the keyboard. This character is then checked to see if it is a control character used for a special purpose on lines 140 to 160. In this program, the control characters A, B, Y, and Z are used for special functions.

The subroutine at line 200 is what takes the Morse data from the proper location in CODE$ and generates the Morse signal from it. The Morse character can be heard on the Apple speaker. Also, the annunciator TTL output number 0 will be toggled on and off in Morse code. This signal

can be used to drive your transmitter through a suitable driving circuit. The circuit used must take the TTL output and use it to drive a reed relay which, in turn, keys the transmitter. An example of such a circuit is shown in Fig. 1. The lines which turn AN0 on and off are located at line 235 and line 245. Line 240 is a call to the machine language sidetone routine.

Using the program is a simple procedure. When the program is run, the screen will clear and the following will appear:

MESSAGE—>

After this prompt, type in a message for the memory. This message can be played back at any time while in the keyboard mode of operation by simply pressing either CTRL A or CTRL B. The message may be up to 254 characters in length. If the message contains commas, enclose it in quotes.

The next thing to appear on the screen is:

SPEED

Type in a number between 1 and 85. Note that 85 is the *slowest* speed. The fastest usable speed is about 6. At speeds faster than this, the transmitter does not key accurately. When set for a speed of 7, the code speed as measured on a Kantronics Field Day II code reader was in excess of 75 words per minute.

After the above two items are entered in, the program will operate as a CW keyboard. When a letter is typed on the keyboard, it is sent through the speaker and AN0 in Morse code and displayed on the monitor. If you want to play back the pre-programmed message, hit control A or B. To reset the speed, use CTRL Z. If you want to change the message, hit the CTRL Y keys.

I gave the following keys special functions: ESC produces the Morse error code (eight dits), and the colon (:) is the CQ key. To add a special function to any key of your choice, all you must do is determine the ASCII value of the character and put it on a DATA line followed by the Morse representation of what you want sent. For example, if your name were Joe and you wanted the computer to send your name whenever CTRL N was pressed, you would add the following line:

DATA 19, 1333003330010

The line number can be any unused one, as long as it comes before the end of data marker at line 1460.

Because of the structure of this program, it is quite easy to make some useful changes. One thing that would be quite easy to implement would be to have the program output American Morse instead of International Morse. To get the longer dashes used in Continental code, use a 4 or a 5 instead of a 3 for the dash character. This will limit the top speed number that can be entered in to a 51. It also would be necessary to change the *end* of line 50 to read:

IF S * 5>255 THEN 50

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This is needed to accommodate the longer dash character.

I hope you will enjoy using this program. If you own a micro other than an Apple II, you can use the same fundamental program as long as your BASIC contains string manipulation functions. The sidetone and keying of the rig will vary greatly on different types of computers. ■

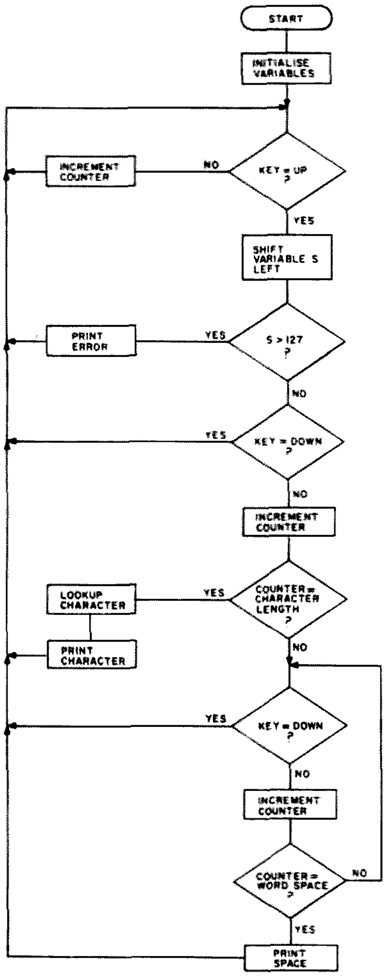
Program Listing.

```
1 Q9 =  PEEK (49240): REM  TURN XMITTER OFF''
5  REM :WRITTEN BY ROBERT SWIRSKY
10  DIM CODE$(128)
20  HOME
30  INPUT "MESSAGE--->";M$
40  IF M$ = "" THEN M$ = " "
50  HOME : INPUT "SPEED";S: IF S * 3 > 255 THEN 50
60  RESTORE
70  POKE 768,50
75  REM :SIDETONE
80  POKE 770,173: POKE 771,48: POKE 772,192: POKE 773,136: POKE 774,208: POKE
     775,5: POKE 776,206: POKE 777,1: POKE 778,3: POKE 779,240: POKE 780,9
     : POKE 781,202
90  POKE 782,208: POKE 783,245: POKE 784,174: POKE 785,0: POKE 786,3: POKE
     787,76: POKE 788,2: POKE 789,3: POKE 790,96: POKE 791,0: POKE 792,0
100  REM
110  GOSUB 310
120  HOME
130  GET R$
140  IF  ASC (R$) < 3 THEN  GOSUB 370
150  IF  ASC (R$) = 26 THEN 50
160  IF  ASC (R$) = 25 THEN 20
170 D =  ASC (R$)
180  GOSUB 200
190  GOTO 130
200  FOR X = 1 TO  LEN (CODE$(D))
210 G$ =  MID$ (CODE$(D),X,1)
220  IF  VAL (G$) = 0 THEN  GOTO 350
230  POKE 769,(S * ( VAL (G$)))
235 X9 =  PEEK (49241)
240  CALL 770
245 X9 =  PEEK (49240)
250  FOR X1 = 1 TO 3: NEXT
260  NEXT
270  PRINT R$;
280  FOR X1 = 1 TO S * 1.3: NEXT X1
290  RETURN
300  END
310  READ F,F$
320  IF F =  - 1 THEN  RETURN
330  LET CODE$(F) = F$
340  GOTO 310
345  REM :SPACE
350  FOR X1 = 1 TO S * 1.7: NEXT
360  GOTO 260
370  FOR H1 = 1 TO  LEN (M$)
380  LET R$ =  MID$ (M$,H1,1)
390 D =  ASC (R$)
400  GOSUB 200
410  NEXT H1
420 R$ = " "
430  RETURN
1000  DATA  49,133330
1010  DATA  50,113330
1020  DATA  51,111330
1030  DATA  52,111130
1040  DATA  53,11111
1050  DATA  54,31111
1060  DATA  55,33111
1070  DATA  56,33311
1080  DATA  57,33331
1090  DATA  48,33333
1100  DATA  32,00
1110  DATA  65,130
1120  DATA  66,31110
1130  DATA  67,31310
1140  DATA  68,3110
1150  DATA  69,10
1160  DATA  70,11310
1170  DATA  71,33100
1180  DATA  72,11110
1185  DATA  47,311310
1190  DATA  73,110
1200  DATA  74,13330
1210  DATA  75,31300
1220  DATA  76,13110
1230  DATA  77,03300
1240  DATA  78,310
1250  DATA  79,03330
1260  DATA  80,13310
1270  DATA  81,33130
1280  DATA  82,1310
1290  DATA  83,11100
1300  DATA  84,00300
1310  DATA  85,11300
1320  DATA  86,11130
1330  DATA  87,13300
1340  DATA  88,31130
1350  DATA  89,31330
1360  DATA  90,33110
1370  DATA  46,131313
1380  DATA  27,11111111
1390  DATA  13,31113
1400  DATA  44,331133
1410  DATA  38,10111
1420  DATA  45,31113
1430  DATA  58,3131003313
1440  DATA  63,113311
1450  DATA  18,13131
1460  DATA  -1,-1
```

See List of Advertisers on page 114

Micro McElroy

Is Pet BASIC fast enough for solid CW copy? You bet—and this program will work miracles with a sloppy fist.



Flowchart.

Mike de la Dette VK3BHM
79 Bedford Road
East Ringwood, Vic. 3135
Australia

Most CW reception programs are written in assembly language to optimize speed and efficiency. This is a good idea, but makes conversion of the program to run on another computer very difficult and time-consuming. Also, while many people are very proficient in high-level languages such as BASIC, not everyone is prepared to devote the time required to program directly in assembly or machine language.

Having written a routine in machine language to decode CW on my Commodore Pet™, it occurred to me to try a direct translation into BASIC. Would it work? Surely BASIC would be too slow and inefficient.

The results were very surprising. The routine is very short (under 500 bytes) and handles speeds of up to about forty words per minute. This limitation on speed is imposed by the BASIC interpreter in the Pet. Higher speeds could be obtained on versions of BASIC which employ a compiler rather than an interpreter. Armed with the BASIC listing and flowchart, anyone reasonably familiar with their machine's assembly-language instruction set should be able to write an equivalent machine-language program, if speeds in excess of 40 wpm are contemplated.

The memory location in my Pet for input/output is at 59471 (decimal). With a key connected between pin L on the user port and ground, the value obtained by PEEKing this location will change from 255 to 127. These values are set in line 5 of the listing. Variables U and D give the values for key UP and key DOWN respectively and variable P contains the input port address. You will need to change these three variables to match your computer's arrangements.

Variables F and T determine the receiving-speed

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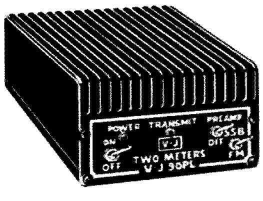

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- PREAMP KEYING independent — separately RF activated relays
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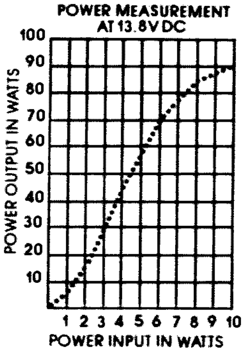

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"window" and are set in line 10. This gives a center speed of approximately 20 wpm on the Pet. As these values will vary according to the execution speed of your computer's BASIC, I have not supplied a conversion constant or table. You will need to experiment with differing values for variable F to obtain a constant which can be divided by the speed required to produce a new value for F. The algorithm used will decode CW over a wide range of speeds without altering these variables, but word spacing will suffer.

If using a hand key or electronic keyer directly into your computer, place a .1-uF capacitor across the key contacts to smooth out the inevitable bounces, especially if using a relay.

After trying things out on local copy, you will need to make up a demodulator to convert your receiver's audio into a signal which switches between ground and +5 volts. A one-IC PLL circuit is a good place to start and will cost very little. If you plan to use a RTTY demodulator, disable the limiter—hard limiting will bring up the background noise to the point at which copy is impossible. Also, you will not be able to use your receiver's CW filter if the demodulator is set up to accept only the standard 2125/2295-Hz RTTY frequencies. This is no great matter, but you will need to set your receiver to a somewhat higher-pitched tone than is usual for CW. Ideally, a separate demodulator with anti-noise circuitry, slow agc, and filtering centered around 1000 Hz should be used.

The algorithm used will cope with odd dot/dash ratios, "swing," and other irregularities. However, like most CW decoding systems, it is easily confused by very poor inter- and intra-character spacing. If the other guy's CQ sounds more like NNMA, then it's time to put your headphones on and switch over to the computer Ted R. McElroy used all those years ago. That's the one with enormous memory, fantastic speed, and incredibly complex I/O; you'll find it right under the headphones! ■

```
1 REM THIS LISTING EXPANDED FOR READABILITY
2 REM DELETE UNNECESSARY SPACES WHEN ENTERING
10 N=0: Q=1: F=2: T=3
20 P=59471: U=127: D=255
30 A$=" ETIANMSURWDKGOHVFILAPJBXCYZQOO54%3FF?2
40 A$=A$+"!.@....16-/...#.7...8.90.....*....U.?
50 S=Q
60 X=N: Z=N
70 IF PEEK (P)=D GOTO 100
80 Z=Z+Q: IF Z=T THEN X=X+Q: Z=N
90 GOTO 70
100 IF X=N GOTO 60
110 S=S*2: IF X<F GOTO 130
120 S=S+Q
130 IF S>127 THEN PRINT ".";: GOTO 200
140 X=N
150 IF PEEK (P) = U GOTO 60
160 Z=Z+Q: IF Z=T THEN X=X+Q: Z=N
170 IF X>F GOTO 190
180 GOTO 150
190 PRINT MID$(A$,S,Q);
200 X=N
210 IF PEEK (P)=U GOTO 50
220 Z=Z+Q: IF Z=T THEN X=X+Q: Z=N
230 IF X> F*2 THEN PRINT " ";: GOTO 200
240 GOTO 210
```

Program listing.

✓See List of Advertisers on page 114

T. K. Davies VE7DHD
Department of Chemistry
University of Victoria
Victoria, British Columbia
Canada V8W 2Y2

QRP Keyer for Misers

Get machine-perfect code with this keyboard. All it costs is 30 mW and a few dollars.

What on Earth is a QRP keyer? A very reasonable question. If you run a kilowatt, your keyer could draw five Watts, but if you run less than two Watts, you start looking for another keyer: a low-power, or QRP, keyer. Any keyer you have should be consistent with the power of transceiver that you are using. In my case, being a convert to the QRP doctrine, the keyer must be in the very low milliwatt range. Specifically, the following design draws 30 milliwatts and has nearly as many features as it has milliwatts.

Well, now that you are reading about QRP keyers, a word about why a low-power keyer was conceived.

The project was initiated for two reasons: one, to have a keyboard for portable and vacation operation, and the other, to have a good electronic keyer to use for the instruction of a Novice class. My experience with teaching code using a computer and seeing the advantages of properly-sent Morse at known speeds and intervals has confirmed me as a keyboard-keyer user. The problem was not that there were no circuits to do most of the above, but that they each had some good features and some undesirable ones.

In reviewing the more recent articles, several are of note. K1GN[1] describes an excellent keyboard unit which incorporates an instructor function that is capable of sending random five-letter groups with variable delay between characters. However, the method of encoding the Morse character with diodes is not appealing. Also, the lack of any type-ahead buffer would make the sending of Morse for extended periods quite trying.

Steber's[2] Morse-a-Keyer has many more desirable features. It has type-ahead, it has a simple encoding scheme, and it was designed with readily available parts. The major drawback is the use of a 1702A PROM to convert the ASCII to Morse. The ASCII keyboard, the PROM, and its associated negative voltage inverter consume 95% of the power required to run the keyer.

K2BLA's[3] unit offers a good solution to the problem of encoding the Morse characters—a scanned keyboard. However, the limited capability for type-ahead of only two characters is hardly in the realm of a unit for "armchair operation."

After this survey of keyboards, several criteria became apparent for a good portable/instructional keyboard:

- it must be low power
- it must have a type-ahead buffer
- it must have an accurate speed indicator
- the buffer must have a useful indicator of "how full"
- it must be small in size and self-contained
- it should have a store feature for preloading the buffer
- it should have an Escape key to quit operation if break is required
- it should have an indicator for battery condition
- it should have switchable sidetone

With this list of "desirable features," the QRP keyer was attempted and the following was the result.

The Keyboard

The keyboard is a surplus unit with all the electronics removed. (Similar units are advertised in the $20-to-$25 range in this magazine and other amateur journals.) The keys, their mounting frame, and the PC are retained; all excess printed-circuit traces are cut away with a hobby knife and pliers, leaving only the keypads on the PC board.

The push-and-lock switches such as the shift lock and

Photos by E. Grambart

Photo A. Complete keyer with lid of case removed.

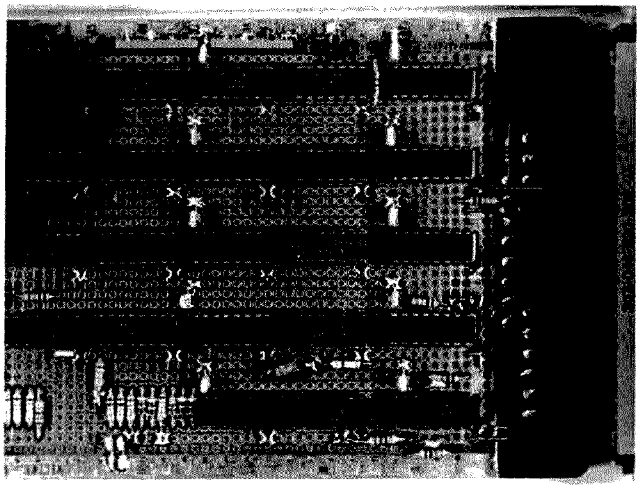

Photo B. Logic card—located in top right of case.

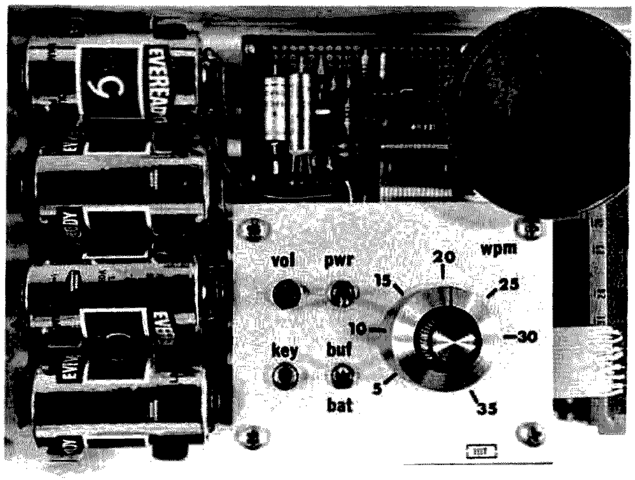

Photo C. Control panel, speaker, batteries, and sidetone/relay board.

similar functions were moved to the back row, as these are useful for analog functions which are described later. After all this carving of the PC board was done, the keyboard was rewired with small-gauge wire as outlined in Table 1.

Fig. 1 gives details and references for the following discussions. The keyboard encoder is a 16-by-8 matrix which allows for all of the common Morse characters to be encoded. Additional wiring is required for special characters and functions that are not encoded by the scanned keyboard but are essential just the same. These include Escape, Space, Tune, Speaker, Meter, and Store. The rewired keyboard is interconnected to the electronics card by a 50-conductor cable. I used a length of surplus telephone switchboard cable. (For a description of the operation of a scanned keyboard, see Reference 4, as this is the probable source of most scanned keyboards.) The QRP keyer's design extends the Lancaster keyboard to a 16-by-8 and also makes it a Morse unit rather than ASCII.

Type-Ahead Buffer

A highly desirable feature in a keyer is the type-ahead buffer, providing the ability to type on the keyboard at high speed and have the keyer send at a slower speed. With this capability, the timing of your letters and spaces is not tied to your uneven hunt-and-peck at the keys. The type-ahead in this keyer differs from previous units in that it has a segmented buffer. The 48-character buffer is in three parts, each of which indicates on a meter. While you are typing, the keyer keeps track of how much space has been used with each keystroke. When you are one-third full, the meter will indicate one-third full scale and multiples of one-third up to a full buffer at which time characters will be lost if you keep on typing. The 16-character type-ahead buffer in Reference 2 does not give meaningful indications as it only lights an LED when the buffer is full; you are left to guess whether it was the last key you pressed or one or several before.

I find that with the 48-character buffer there is little problem with overflow of the buffer. In practice, I type on the keyer until the meter indicates two-thirds full and then I finish my sentence and wait until the keyer empties the buffer to one-third or less and start typing again.

The circuit for indicating the fill of the buffer is straightforward. The data-in ready flag on the 40105 FIFO (first-in, first-out memory) indicates whether the particular 16-character segment is full. If it is full, the flag line goes low and this indication is fed via an inverting buffer to a summing network of all three FIFO segments. The summed voltage point of the three FIFOs is fed to a meter. The meter serves a dual purpose since it indicates the condition of the batteries when the switch is moved to the Bat position.

The Keyer

The heart of the keyer is the PISO section (parallel-in, serial-out). The PISO takes the parallel two 4-bit parts of the Morse word from the buffer and sequentially shifts these bits through a

Photo D. Keytops and meter (black keys have new tops).

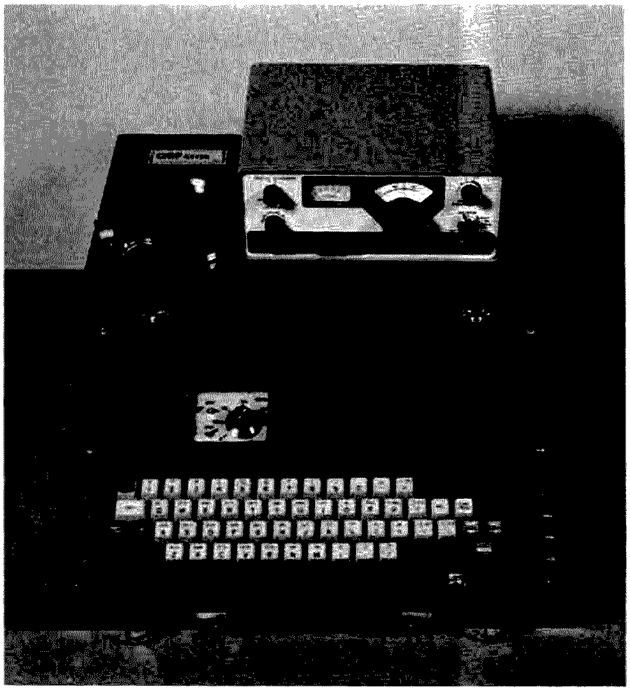

Photo E. QRP station—QRP keyer and HW-8 (the keyer lid was removed to make a base for the transceiver).

	Octal	A	B		Octal	A	B
E	004	10	0	5	100	8	4
T	006	11	0	6	102	9	4
I	010	12	0	AS	104	10	4
				7	106	11	4
SP	011	special		8	116	15	4
N	112	13	0				
A	014	14	0	/	122	9	5
M	016	15	0	AR	124	10	5
S	020	8	1	KN	132	13	5
D	022	9	1	9	136	15	5
R	024	10	1				
G	026	11	1				
U	030	12	1	4	140	8	6
K	032	13	1	Brk	142	9	6
W	034	14	1				
O	036	15	1	3	160	8	7
H	040	8	2	2	170	12	7
B	042	9	2	1	174	14	7
L	044	10	2	0	176	15	7
Z	046	11	2				
F	050	12	2	Error	200	0	0
C	052	13	2	?	230	4	1
P	054	14	2	:	216	7	0
				;	262	5	1
V	060	8	3	SK	320	0	5
X	062	9	3	.	324	2	5
Q	066	11	3				
Y	072	13	3	()	332	5	5
J	074	14	3	,	346	3	6

Table 1. Keyboard rewiring. A = the 16 rows of the keyboard matrix and B = the 8 columns of the matrix. All like numbers of the rows are connected together and likewise all the columns, and then each set is connected to its appropriate 4051 scanner.

set of four dual flip-flops (ICs 10, 15, 19, 23), testing for dots, dashes, spaces, or whether the last element of the word has been sent. The space character is not, of course, a Morse character, but must be represented by some unique 8-bit word that can be stored in memory like any other character. The space is not generated by the scanned part of the keyboard, but is a jammed character. It is encoded by resetting the scan register (IC2) to all lows and, via gates IC11a and 11b, bits 0 and 3 are set high which in effect generates a space word. The space has its own keyboard strobe circuitry also; it is a part of IC6. (It would have been possible to generate the space character if a larger matrix for the scanned keyboard were used, but the additional logic for the jammed character was less and therefore was used.)

The Wpm Clock

The QRP keyer uses a more complicated clock than previous units. Most common wpm clocks are interconnected gates which rely on RC time constants and are predictably nonlinear. The clockwise rotation of a linear potentiometer to control speed has far too much travel on the slow end and is cramped up on the high-speed end. A log control was tried, but the improvement was not sufficient. I am sure you can remember how important it was to you when you were learning the code that your instructor be able to tell you exactly how fast he was sending. Well, to this end I put a better wpm clock in the QRP keyer.

A voltage-controlled oscillator was used for the wpm timer; this type of oscillator produces a linear scale and has nearly constant duty cycle. There is some slight shift in speed as the batteries age, but with good batteries you can say with some confidence that you know the speed to be over 10 or 15 wpm (or whatever) for a least a year.

Calibration of Wpm

The easiest way to calibrate the wpm clock is to prestore the word PARIS five times with spaces between each and time how long the keyer takes to send the set of words. After timing, apply the formula: code speed (wpm) = 300/T (sec). If, for example, the set takes 15 seconds, your code speed is 20 wpm.

Keying Relay and Sidetone

The relay circuit and the sidetone generator are derived from earlier designs, but a couple of features have been added. The sidetone is now switchable. This allows the sidetone to be silenced when the keyer is used with a transceiver which has built-in sidetone. The sidetone oscillator is turned off at its power connection to conserve power, as the audio section of the keyer draws more than the logic section.

Escape and Store Keys

The Escape key allows you to abort sending if you hear a break or if you want to change that which has already been entered into the buffer. The store function allows you to pre-type into the buffer, but not to send its contents. This is useful when you are just finishing your copy of the other station and you can pre-type in your callsigns while your contact is still sending the required identification.

Physical Layout

The keyer was built into an old but somewhat elegant box which held a tool kit for a chemical instrument. I hope you can be as lucky and find something similar. If not, a small attaché case is ideal both from a size and cost standpoint. A baseplate for the keyer was fabricated from 1/16" aluminum sheet, just big enough to fit inside the case. Photo A shows the whole unit with the cover on. As you can see, the keyboard is not enclosed. It is on spacer blocks (¾") which

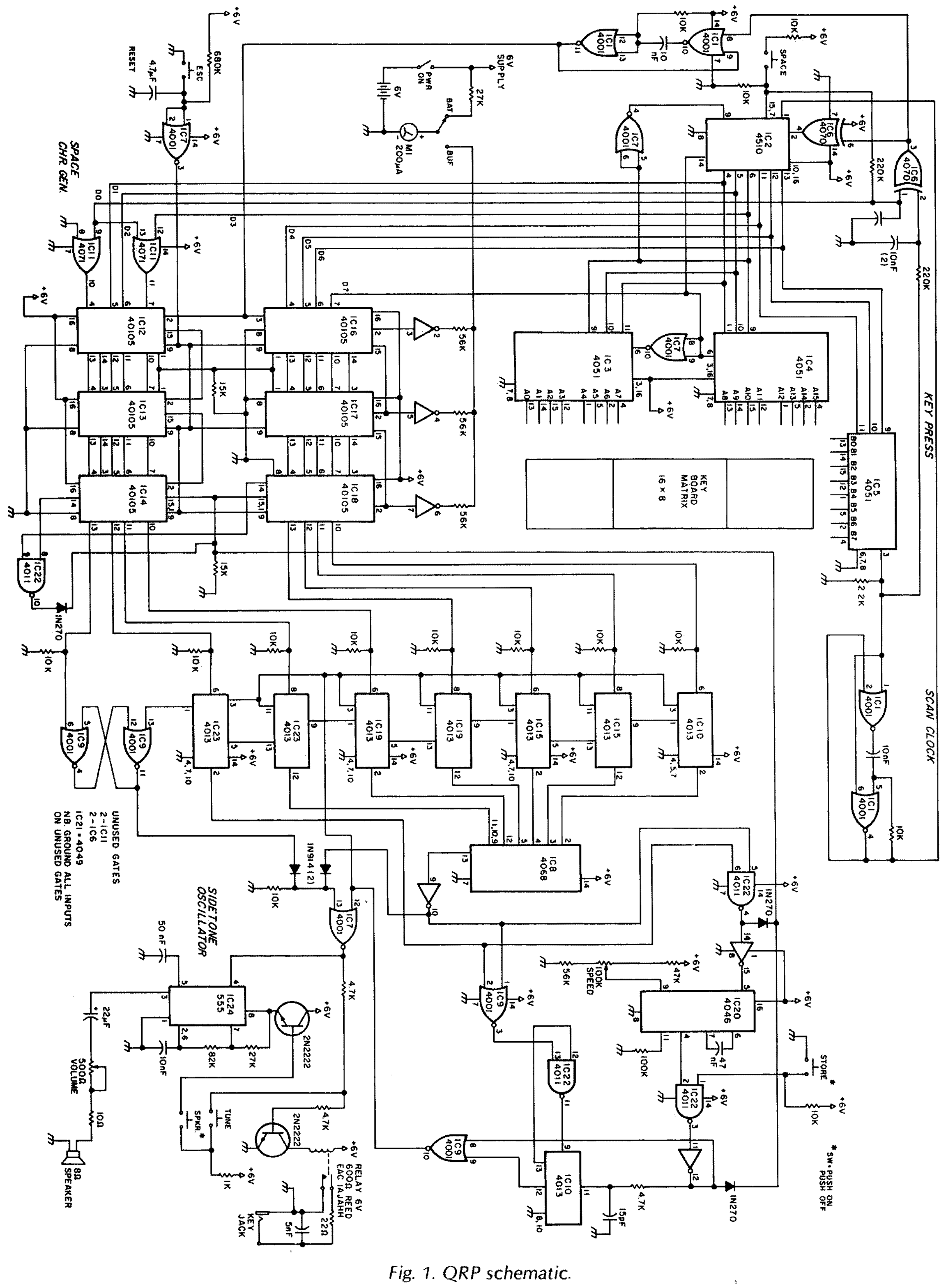

Fig. 1. QRP schematic.

provide sufficient clearance for the PC board on the bottom of the keys and its associated new wiring.

The electronics is in three parts: the main logic board—a 4½" × 6½" 44-pin computer-type card, a small perforated board for the keying relay and sidetone, and the control panel. Photo B shows the logic board and its connections to the keyboard. The small 16-conductor cable which connects together the con-

trol panel, the card, and the sidetone board is on the lower left side of the card. (See Photo C for exact placement.)

Photo C shows the control panel which has the speed control, the power switch, the battery/buffer switch, the volume control, and the miniature key jack. The panel is mounted on small standoffs which allow the speed control to clear the baseplate. As is shown in Photo A, the speed control knob is just level with the top of the panel. (In effect, the panel is in a well cut out of the cover.) Size C batteries were used as space permitted, and annual battery changes are desirable.

Photo D shows the special keytops and the Bat/Buf meter. The meter was mounted on a small plate and fitted to cover the hole for the old keyboard encoder IC which is not now used. The meter's placement is not just cosmetic, but also practical, as you can watch the meter easily while typing, as it is near the space bar.

Keytops

The keytops for the special keys are worth a few words. I have made several other keyboard controllers and was always stuck on how to label the special function keys effectively. I have tried painting the keys and using press-on lettering covered with several coats of lacquer, but this lasts only several months. On this keyer, I tried something which is much better.

The original keys were concave, and after roughing them up with fine sandpaper, a thin "float" of black epoxy was applied. With a little warming with a heat gun (or hair dryer), the epoxy conforms to the shape of a keytop, slightly convex but conforming to the top. After this was completely dry, the keys were labeled with the special functions using white press-on lettering. Next was applied a clear "float" of epoxy on the lettering. After this was set and was lightly sanded to remove any droplets or uneven areas, the tops were polished with a plastic or fine metal polish, and "professional" keytops of specific designations were the result.

As epoxy formulations vary, try the whole procedure on a small scrap of metal to ensure the compatibility of the epoxy and the lettering. I used 5-minute-type epoxy and allowed 24 hours between coats. Another possibility is to use graphite to tint the clear epoxy, but I found that the curing time for the 5-minute type extended to 48 hours due to the inhibiting action of the graphite. If you can wait, you can save some money.

Using the Keyer

When the keyer is first turned on, hit the space bar and then a letter; this initializes the logic. I usually hit an E, as this gives the fastest check that all is well when I hear the dit. If you hit the Escape key to abort sending, repeat the above procedure as this will ensure that you are loading or sending exactly what you intended.

Probably one of the most important things to remember is to send only at a speed you can receive. The temptation will be great to send faster, but just sit back and enjoy the comfort of the keyer sending while you have a sip of coffee. ■

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2. Steber, G., "Build a Morse-A-Keyer," parts I, II, *Popular Electronics*, January, 1981.
3. Helfrick, A. (K2BLA), "An Inexpensive Morse Keyboard," *QST*, January, 1978.
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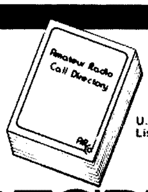
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The Easy FIFO Keyboard

First in, first out means you type as fast as you want to. It will send at the speed you set.

Home-brew keyboard designs are now readily available and construction need be no more costly than a regular keyer. However, some home-brew designs, while effective, are limited to the basics of character generation. The operator must provide the proper timing to maintain a certain conversational speed and rhythm. This task can easily be left to the keyboard itself by the addition of a relatively inexpensive buffer memory.

The Fairchild 3341 first-in, first-out (FIFO) is a serial memory that operates in basically the same manner as a shift register. Data is entered, is shifted to the output, and is removed. However, there is an important difference between the two. The conventional shift register will retain data in its first register position until additional data enters the system and forces the previously entered data to the next register position. In the FIFO, data entering the register is immediately shifted to the first open position at the output end. This feature automatically allows buffering between two systems that operate at different data rates. The 3341 is asynchronous in that data input and output are completely independent. The 3341 can also control system speed.

Fig. 1 is a block diagram of the 3341 control logic.

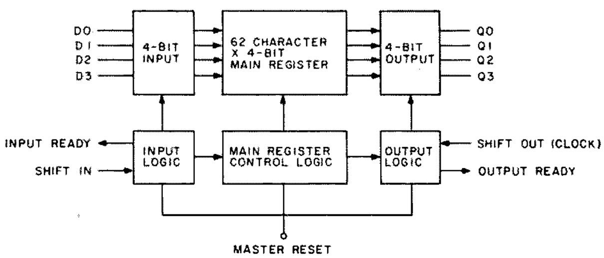

Fig. 1. The Fairchild 3341 MOS FIFO buffer block diagram.

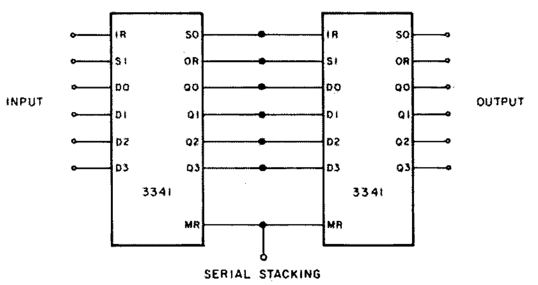

Fig. 2. FIFO serial stacking to expand a buffer memory to 128 or more characters.

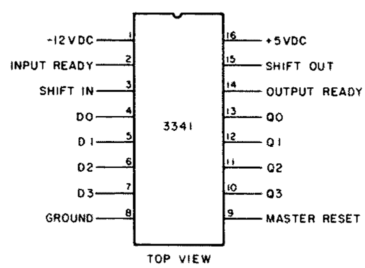

Fig. 3. 3341 connection diagram.

The main register contains sixty-two 4-bit characters, with one 4-bit character contained in each of the input and output registers, for a total of sixty-four character memory positions. Information may enter the input register on the D0 to D3 inputs when both Input Ready (IR) and Shift In (SI) logic is high. When data has entered the input register, IR goes low. Data remains in the input register a preset interval, at which time SI goes low. Data is then shifted into the main register. When the transfer is completed, IR will go high, indicating that the next entry may be accepted. If the main register is full, IR will stay low, blocking further entries. SI will now go high and the next character is accepted into the input register.

Information entering the main register is immediately shifted to the first open data position at the main register output. Transfer of a character from the main register to the output register occurs when both Output Ready (OR) and Shift Out (SO) logic is low. When the transfer has occurred, OR will go high, indicating that information is present at output pins Q0 to Q3. Transfer out of the FIFO takes place when SO logic goes high. OR logic now goes low, followed by a low on SO which again allows a character to enter the output register. SO logic can be controlled by a clock to provide an output speed control.

The 3341 FIFO may be expanded in sixty-four character steps by stacking individual chips. Fig. 2 indicates the serial stacking method. No external logic is required. If character data of more than 4 bits is required, the FIFO may also be expanded in parallel to increase capability in 4-bit steps. In this case, external logic is required to ensure that the input and output logic on each chip is ready before character transfer is attempted.

Refer to Fig. 3 for the 3341 connection diagram. Note that both a +5-V-dc and a −12-V-dc power source is required.

The typical home-brew keyboard probably employs either the diode matrix or the toroid transformer method of character generation. Both methods generate several parallel data pulses, the number depending on the specific CW character, which are fed into a shift register. The shift register converts the parallel data bits into serial data bits. These serial data bits form the CW character.

The FIFO is inserted between the character generator and the parallel-to-serial shift register. System speed is controlled by a clock input to the FIFO to control SO rates. A register content indicator is an option to inform the operator when the FIFO is approaching full memory status.

One keyboard design,[1] recently available as a PC board kit, is an excellent example of FIFO application to the toroid transformer method of character generation. Referring to Fig. 4, note that the character generator is 8 bits wide, requiring that two FIFO chips stacked in parallel be used. The required input logic begins with U1. A high pulse on any one of the eight character bits will cause a low U1 output. This low is inverted to a high at the input of U2A. When the IR in-

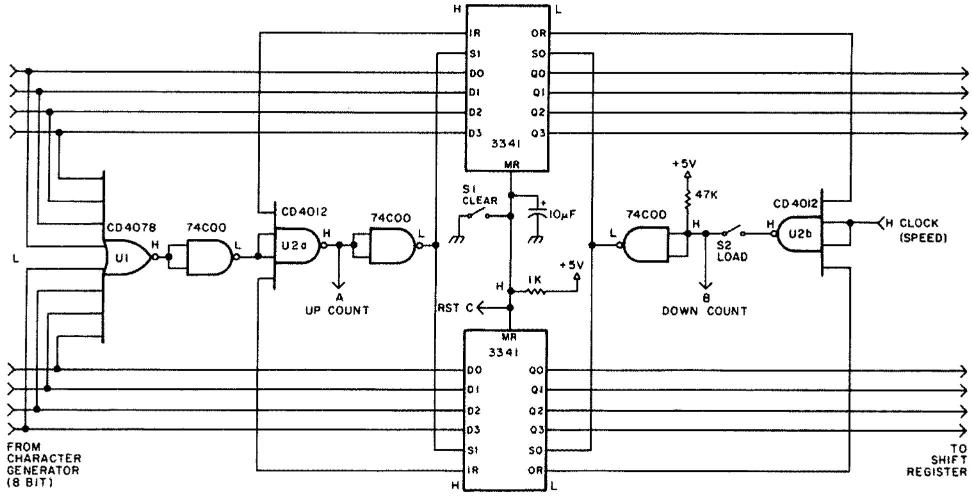

Fig. 4. FIFO parallel stacking to accommodate an 8-bit character. Logic indicated is with circuit at rest.

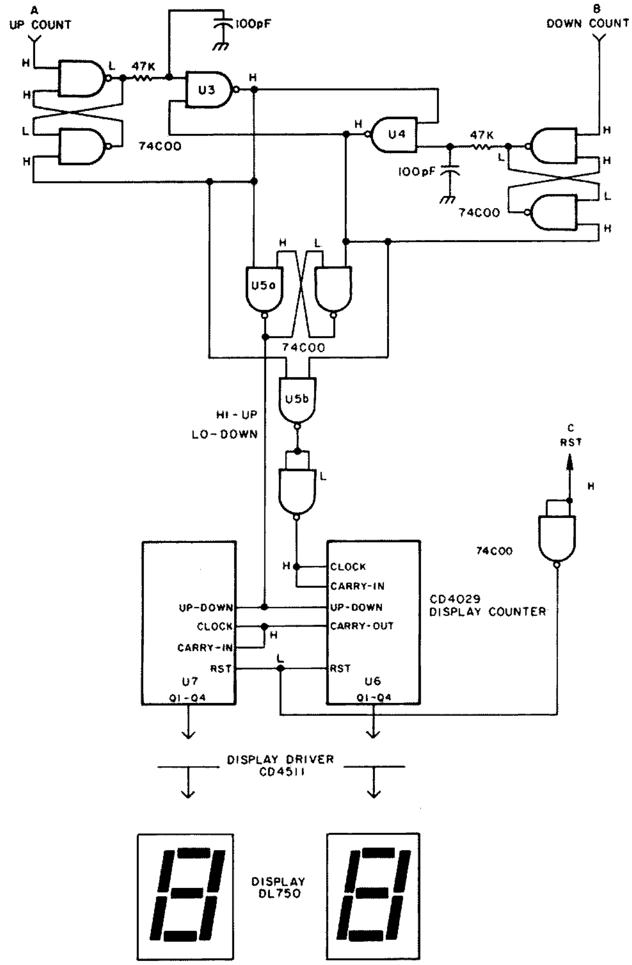

Fig. 5. FIFO register content count. Logic indicated is with circuit at rest.

puts to U2A from each FIFO are high, indicating the FIFO is ready to accept data, the output of U2A goes low. This low is inverted and appears as a high at the SI input at each FIFO, indicating that data may enter the input register. This logic ensures a coordinated flow of data into the FIFO stack.

Characters stacking up at the FIFO output are shifted out according to the speed control setting. When OR goes high on both FIFOs, indicating a character is present in the output register, a low will appear at the output of U2B. This low will occur at clock speed as long as information is flowing into the output register. If S2 is closed, the low is inverted and places a high on the SO pins of both FIFOs, and information may flow into the parallel-to-serial shift register. If S2 is open, the low cannot be inverted and the FIFO will fill to capacity. This feature allows the operator to pre-load a message into the FIFO for later transmission at the flip of a switch. The FIFO can be completely cleared by S1.

A memory content indicator, while not an absolute necessity, is certainly a worthwhile convenience. The previously mentioned design also provides an excellent example of one method of memory count logic. Referring again to Fig. 4, note that up-count, down-count, and reset inputs to the memory counter are obtained at points A, B, and C. Counter logic is displayed in Fig. 5.

U3 receives and inverts an up-count pulse from the input gating. The low output from U3 inhibits a down-count from U4 and drives the output of U5A high. A high appearing at the up/down terminal of the display counter will initiate an up-count, provided clock and carry in logic is low. The low from U3 also appears at the input to U5B, which causes the output to go high. This high is inverted and provides the necessary low at the clock and carry in terminals of the counter. This process is repeated for a down-count except that a low appears at the up/down counter input. When the count in U6 reaches its maximum count, carry out logic will go low. This low appears at the clock and carry in terminals of U7, which initiates a ten count at the next up-count command.

A buffer-equipped keyboard is truly a joy to operate. When sending at speeds below your typing ability, just fill the buffer, then sit back and compose your next sentence. The down-count will tell you when to resume typing. You can easily tell when you are approaching speeds that tax your typing ability. Just keep an eye on the memory count. If you cannot build up a lead, turn down the speed control and give the buffer room to function. Quite often your contact will sign his call after each transmission. This time can be used to fill the buffer and be set to go at first opportunity.

All logic for the example design is readily available through advertisers in this magazine. The buffer section requires one each of the 74C00, CD4012, and CD4078 logic in addition to the two FIFOs. Currently, this will cost about $15. The two each of the CD4511, CD4029, and DL750, and the three 74C00s in the counter section will cost about $10.

If you have a question on this article, an SASE will bring a prompt reply. ■

Reference

[1]*Skipjack*, AJR Electronics, PO Box 5722, Evansville, Indiana 47715.

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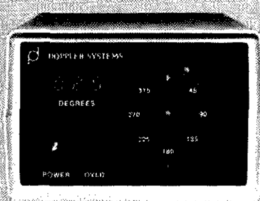

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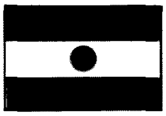
73 INTERNATIONAL

Each month, 73 brings you amateur radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, Pine Street, Peterborough NH 03458, USA, Attn: Avery L. Jenkins WB8JLG.



INDIA

The Bangalore Amateur Radio Club had its club night on Sunday, March 12, 1983. This annual function is specially held to bring ham families together. This year, the function coincided with the 70th birthday of OM Girimaji VU2GX. He was given an autographed memento by all the hams present. (See photos.)

GARDEN CITY CONTEST

This is an annual CW contest jointly organized by the Bangalore Amateur Radio Club (VU2ARC) and Visvesvaraya Industrial and Technical Museum (VU2VTM). This contest is essentially conducted to promote the DX capabilities of VU2 hams. It is held in the third week of December every year between 1200 GMT on Saturday and 1200 GMT on Sunday. The frequencies of operation used are 7 and 14 MHz.

Message Exchange: RST report with a three-digit serial number of contact (599039 = 39th contact).

Eligibility: Contest is open to all licensed amateurs worldwide.

Type of Operation: Single operator.

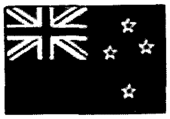
Classes of Entry: Group A for VU2s holding grade I license. Group B for VU2s holding grade II license. For non-VU2 hams, no group classifications.

Scoring: Points earned by VU2s for making complete contact with Asia, including India—1; Europe, Africa, and Australia—2; North and South America—3. DX stations score 1 point for every VU2 contacted.

All entries to the contest must be postmarked not later than 15th January and addressed to: The Convenor, Garden City Contest, Bangalore Amateur Radio Club, PO Box 5053, Bangalore-560 001, India.

There is no entry fee. True copy of a contest log must be submitted with sender's name, call, address, etc.

The three top scorers in each class will be awarded the winning certificates. All contestants submitting valid logs will also receive certificates of participation.



NEW ZEALAND

Des Chapman ZL2VR
459 Kennedy Road
Napier, New Zealand

June in New Zealand is the month when the shortest day occurs (signifying the middle of the the winter season) and also the month when the New Zealand Association of Radio Transmitters (NZART) holds its Annual Conference and Convention. It is the time when the members get together to attend the Annual General Meeting and discuss the policies concerning the running of our Association. Also held are the annual meetings of the various sections of the NZART: WARO, the Women's Amateur Radio Operators, OTC, the Old-Timers Club, AREC, the Amateur Radio Emergency Corps, and forums of the VHF groups, the Novice Radio Training Scheme, and the DX buffs.

The weekend program also includes plenty of social- and radio-oriented activities—trade displays, trading tables for hams and XYLs and YLs, a dinner dance, a fox hunt on 2 meters, a mobile rally on 80 and 2 meters, and, over the past couple of years, several technical seminars and forums as well as the usual rag-chewing that always forms part of any ham get-together.

The venues of the Annual Conferences are set about two years in advance so that the branch responsible for the organization of the Conference has plenty of time for the planning of it. The Conference is held in a different city or town every year; last year it was the turn of my hometown, Napier, because it was the 50th anniversary of the formation of the Amateur Radio Emergency Corps (AREC), our emergency communication network. The AREC was born about 12 months after the devastating earthquake which hit Napier and the surrounding areas in February, 1931, when several amateur radio operators, including three within the devastated areas, maintained emergency communications for several days after the first shocks of the earthquake. As a matter of interest, some of the emergency signals were received in the United States and were the subject of an article in *QST* in 1931 or 1932.

As a result of these emergency operations, the amateurs of New Zealand saw the necessity for some form of emergency group to be available at any time to provide emergency radio communications. Since its inception, the AREC has assisted in hundreds of emergency situations including earthquakes, floods, land subsidences, aircraft crashes, mountain and bush rescues, and shipping disasters. This year's Conference was held over the first weekend in June (which is a long holiday weekend in New Zealand) at Dunedin, the main city in ZL4-land.

Next year's Conference is scheduled for Palmerston North, a university city in the center of the lower half of New Zealand's North Island. The city has some wonderful conference facilities, both in the city itself and at the university, and boasts of pleasant public gardens and recreational facilities. Overseas visitors are always welcome at our Conferences, and we have had visitors from VK, VE, W, and some of the Pacific islands in past years. So, if you are contemplating a ZL holiday, what better time to come to our fair land than at Conference time in June? If you are interested, a letter to NZART or myself will supply you with the necessary information. Even though it's winter time, a very warm welcome awaits you; the winters are reasonably mild in ZL since only the high country areas and the mountains are snow areas.

NZART NATIONAL FIELD DAY

NZART holds an annual Field Day contest each year during February, when

Photo A. (left to right) Back row: VU2IR, 3 SWLs, VU2KVR, VU2AUS, 2 SWLs, VU2RVS, VU2RRN, VU2RO, SWL, VU2GX, SWL, VU2GSM, and VU2YZ. Center row: families and VU2UV. Front row: VU2NRS, VU2USA, VU2KAX, SWL, VU2RXZ, VU2RAH, VU2VNS, and VU2VIZ.

Photo B. VU2GX presenting Pat (XYL of VU2AUS—ex-VK3KHL/NUI) a 6-kg watermelon. Others seen: VU2GSM, Mathu (SWL), VU2RAH, and VU2UV.

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NZART branches go portable in the field. The contest is over two days, Saturday and Sunday, the operating periods being from 1500NZST to 2400NZST, Saturday, and 0600NZST to 1500NZST, Sunday, and the frequencies used are 80 and 40 meters, CW and phone.

Field-Day stations must operate from a portable power supply, in a tent or trailer (caravan), or some other portable location, e.g., a car or mobile home, on antennas erected for the Field Day no earlier than 1200NZST on Saturday.

Our Field-Day contest this year was one of the most successful for some time. In all, over 56 branch stations operated during the two days, out of a possible 80 branches. Contacts are on phone and CW in each hourly period, with points allotted for contacts and multiplier points for the number of branches worked on each band and mode. Some overseas contacts are admissible, with stations in VK and some of the near Pacific islands only.

My local branch station was set up on the banks of the Tutekuri River, about 3 miles from the center of town. The station was set up in a tent and a mobile camper. We used tall poplars about 120 feet high for antenna supports, placing pilot lines over the top of the trees with a surf-casting rod and line. We had 80- and 40-meter dipoles at about 80 feet, a delta loop on 40 meters, and a long-wire about 500 meters long across the river as our other 80-meter antenna.

The team had 1500 contacts, for 181 multipliers, giving us a total of just over 1,000,000 points; we did not think that we were the winners, as there were two or three teams ahead of us! The station was operated from the club's portable motor generator, supplying 230 volts to the four rigs used: a Kenwood TS-930S, a Yaesu FT-101, a Yaesu FT-901, and a FTDX-401—a rig on each of the modes on the two bands used.

I hope to be able to include some of the photographs taken at Field-Day locations in a future column to illustrate the similarity between our Field-Day exercises and yours (wherever you live), as hams around the world have a lot in common concerning our hobby.

BITS 'N' PIECES

June was the diamond jubilee for one of New Zealand's original ham operators, Dan Wilkinson ZL2AB, who was allotted his callsign in June of 1923. His was the third to be granted, and he still holds the same original call today. Who knows, that could be some sort of a record. Incidentally, the first call was issued to Jack Orbell 3AA, and #2 was 4AB, the Otago Radio Society. Another early call issued in 1923 was 1AC to Len Spackman, and he, too, still holds that same callsign and is active on the Old-Timers Club Net, so his diamond jubilee will be due later this year. Dan ZL2AB is also heard regularly on the Old-Timers Net on Sunday mornings on 40 meters.

AREC PHILATELIC COVERS

A small quantity of special commemorative philatelic covers is available. Issued to commemorate the 50th anniversary of the foundation of the Amateur Radio Emergency Corps, the covers were postmarked with a special cachet in June of last year, at the time of the Annual Conference and Convention. They are unaddressed and will be sent under a separate outer cover to avoid damage.

Please send 6 IRCs for one cover by return 2nd class airmail. Send applications to Napier Branch 25, NZART, PO Box 4030, Napier, New Zealand.

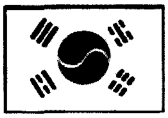
DX NEWS

Chatham Islands. . . Allan ZL2BKM has been operating from the Chatham Islands since April and will continue until August 29, 1983, all bands, CW and phone. Allan is a radio operator in the New Zealand Post Office, and he is doing a tour of duty at the Chatham Island Coast Radio Station run by the NZ Post Office. Allan's rig is a TR-430S. When he leaves the Chathams, he will be traveling to the States with a group of New Zealand hams to attend the Seattle NEZCHEQ get-together over the US Labor Day weekend, September 2-3.

Niue Island. . . Peter ZL2IK has taken the position of Director of Telecommunications, Niue, a two-year tour of duty which started in mid-May. Peter is a 160 buff and will be endeavoring to work DXCC on 60 and, if it is possible, 160 during his stay in Nuie. He also will operate on the other HF bands. His rig is an IC-720; he will be ZK2IK.

Also operating from Nuie at present are two other ZL operators, Bob ZK2RS and John ZK2JS, both telecommunications technicians on tours of duty in the islands. Both of these operators are also active on the HF bands, and when these two are joined by Peter, they probably will make quite an impact on the DX front. So the DX boys will be sure of Nuie being active for some time in the future—at least until 1985 when the present ZLs' tours of duty will finish. But then let's hope more hams from ZL will take their places when they return to New Zealand.

Penrhyn Island. . . Warwick ZL3AFH has been active operating from Penrhyn, in the Northern Cook Islands, as ZK1WL. He will operate until some time around the middle of this year.



KOREA

J. Michael Wengert HL9KT/KH2AC
CPO Box 2961
Seoul, Korea

In the spring, a young ham's fancy turns to operating portable! Koreans are natural outdoorsmen and love to climb rocks and mountains, camp at the seashore, and generally commune with nature. A dream situation for a young Korean ham might be camping in the mountains with his favorite rig and perhaps YL. Realizing that dream, however, has been a difficult thing for Korean hams.

In the past, portable/mobile operation required permission from the MOC (Korean Ministry of Communications) in the form of a special callsign, but such operation was possible. An important restriction was that operation was not permitted in certain areas near the demilitarized zone (DMZ) that separates the hostile states of the Republic of Korea and North Korea, for obvious security reasons. Well, no matter where you go, there is a "wrong-way Charlie," and Korea is no exception. Violation of this taboo by a single ham resulted in cancellation of the privilege for all.

Efforts to regain the portable/mobile privilege are expected to come to fruition sometime this year. VHF handie-talkies are popular here but have been prohibited for use outside the shack. Most 2-meter FM operation is with Japanese mobile-type transceivers, so the changeover to mobile operation would be easy. Along with the question of permitting portable/mobile operation in Korea, the MOC is also considering issuing licenses for repeaters. In Korea's mountainous terrain, repeaters are a necessity for serious mobile work.

When portable/mobile operation is finally a reality, it will have been in no small part because of the efforts of Mr. Lee Hae Soo HL1BO, one of the pioneer hams in Korea and several-times director of the KARL. He has devoted much of his time and energies to regaining those privileges. He was instrumental in setting up the Korean National Red Cross regional club station system for use in time of national disaster and introducing the concept of amateur radio as a public service rather than a self-serving hobby. Much of this work has served to convince the Korean authorities of the value of amateur radio to society and encouraged them to liberalize the rules and regulations applying to amateur operation. A *73* International salute to HL1BO!

Much confusion regarding QSL Bureaus took place when the Korean hams changed over from HM to HL prefixes as a result of the 1973 WARC. Until that time, only US Forces/United Nations Command personnel used the HL prefix. To further complicate things, at about the same time, the USFK/UNC QSL address changed.

Following is the *correct* information: HL9 stations—American Amateur Radio Club of Korea, c/o Dependent Mail Section, APO San Francisco CA 96301; all other HL stations (1,2,3,4,5,8,0)—Korean Amateur Radio League, CPO Box 162, Seoul, Korea.

One final note. . . when signing with a Korean station, if you really want that QSL card, *never say Sayonara!* Koreans are completely different people from the Japanese. The correct farewell would be *Ahn-young!*

Well then, Ahn-young and 73 from the Land of the Morning Calm.

CANADA

(Reprinted from the CARF News Service Radio News No. 7/83 *by permission of the Canadian Amateur Radio Federation, Inc.)*

As the old saying goes, you win some, you lose some, and here's some proof. The same Privy Council Office which held up proposed license increases so long that they could not be implemented this year has been sitting on proposed revisions to the amateur regs since last May. The proposed changes which surfaced a couple of weeks ago were some of those which resulted from recommendations made to DOC (Department of Communications) by amateurs at the 1981 CARF Symposium. Included were revisions which would lift power restrictions on 160 meters, permit repeaters on 10 meters, allow European amateurs to use all of the two-meter band while operating in Canada under a reciprocal operating agreement, and redefine permitted bandwidths for AM, FM, FSK, and ATV. DOC hopes that now that these drafts which it had submitted to the Privy Council have been found, they will be approved fairly soon.

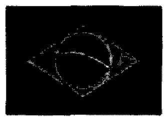
British Columbia amateurs were involved in a novel way in the recent Royal Tour activities in Vancouver. During the ceremonies connected with the upcoming 1984 World Exposition, held in the new BC Place, the Queen's speech on March 9 was relayed by a 450-MHz link to Vancouver repeater VE7RPT and retransmitted on 20 and 40 meters. To mark the event, BC amateurs were allowed to use the prefix XO. A special QSL card is available to listeners who report hearing the broadcast. VE7 stations who used the XO prefix can obtain a special QSL card free from the BC government.

TOWERS COLLAPSE

The worst ice storm in Manitoba's history hit in early March and put Brandon and Baldy Mountain repeaters out of business when the broadcast towers holding their antennas collapsed. Many amateurs lost their antennas and some had the tough luck to lose their towers as well, according to VE4MG.

CORDLESS TELEPHONES

The cordless telephone, like CB radio, is rapidly becoming a fad, and like CB radio, it already poses problems for amateurs. QRM from these devices is already showing up from their harmonics in the 40- and 80-meter bands and some of them are, according to a US source, being crystalled in the 160-meter band. DOC is currently working on some regulations concerning them. Just to complicate the scene, there is apparently a 25-Watt amplifier now on the market. The phones themselves operate duplex, using 49 meters and 1.6 to 1.8 MHz, although the latter slot is going to the broadcast-band expansion in a couple of years. These things work well, but the Consumers' Association of Canada points out that with some models which have dial-out facilities, it is possible to access another telephone line and rack up toll-line charges on it.



BRAZIL

Carlos Vianna Carneiro PY1CC
Rua Afonso Pena 49, Apt. 701
20270 Rio de Janeiro, RJ
Brazil

YL FROM BRAZIL

Need a "sure QSL" from Brazil? Looking for a YL contact for your YL award? Well, all you have to do is come to 14.248 kHz every Wednesday from 1900 to 2100 UTC and join the BRYLA (Brazilian YL) net. The net has existed since March, 1976, and is directed by Inge PY2JY. The net attracts YLs from all of the Brazilian states on both SSB and CW.

Inge has held her license only since 1970, but she fell so in love with amateur radio that she now has 290 countries and holds this BRYLA net to stimulate DX operations with Brazilian YLs and to spread the BRYLA Award to all places and continents. 159 of these awards have been sent to 35 countries of the 105 countries filed by the net.

Listen to PY1YL, PY1AIP, PY1LMS, PY1MF, PY1DVQ, PT2ML, PT2SV, PT2LS, PT2TF, PT2DCR, PY2ATL, PY2DLZ, PY2FL, PY2JY, PY4AKL, PY4ML, PY4DY, PY4RA, PY2ACR, PY5BZN, PY7AVN, PY7VBG, PY8SSB/7, PS8YL, and many others on the BRYLA net, and most of the requirements for the BRYLA Award will be fulfilled.

The BRYLA Award was created by Therezinha PT2TF, and it is great! DX stations must prove a two-way QSO with 12 YLs from different countries on three continents, plus 8 YL stations from Brazil—on any band, any mode, and all QSOs from 1975 on are valid.

The log must be certified by a radio association and must include the station, date, time, mode, report, and band. SWLs also may qualify. Send QSLs for files and

10 IRCs to BRYLA, c/o Ziza PT2LS, PO Box 07/0004, 70000 Brasilia, DF, Brazil, South America.

On the BRYLA net, you can find Eva PY2PE, DXCC Honor Roll member, Tessy PS8YL and Marilia PY4AKL, who both have more than 300 countries, Inge PY2JY with 290 countries, and PY2ADI with 172 countries. Ziza is BRYLA Award Manager with hundreds of first-class awards including 5 BRYLA Awards which were endorsed all CW.

When propagation is fine, Japan, Hawaii, New Zealand, Australia, and many other first-class DX stations are available.

A general CQ is called aiming the beam to South Africa, Asia, or Europe, and traffic is passed just like other international nets. Each YL is listed and one by one they QSO the other participants. No "chats" are allowed during these two hours so all calls can be answered. Only a call and report will be given by each YL.

Another very funny award was created by Inge, the WBYL (Worked Brazilian YL) Award, and it has been offered since the first day of 1981, with the first request coming from South Africa. Just contact 8 Brazilian YL stations and form the words "BRASIL YL" using any one letter from each suffix. One of the YL stations must be a PY2. Any band, any mode. The standard log is required, including station worked, date, time, mode, report, and band. SWL entries are also accepted. Send QSLs with 10 IRCs for return postage to Inge Tobias de Aguiar PY2JY, Rua Texas 448, 04557 Brooklin Novo, Sao Paulo, Brazil, South America.

Inge is so enthusiastic for radio, she was the first YL to operate VHF from a hot-air balloon flying over Sao Paulo, on August 18, 1974. She was with her husband Jose PY2JO and Vitorio Truffi, balloonist and proprietor.

She also participated in two DXpeditions to Arvoredo Island in 1975 and 1980. This island is the most beautiful small island in the world and is located at 46° 10' W and 23° 58' S, 176 miles from Rio de Janeiro. It was developed and maintained by Fernando Edward Lee.

There are hundreds of birds and fishes which come from distant places to the island. The island also has the largest wind alternator in the world, a lighthouse, solar water heating, a rainwater reservoir with a 1-million-liter capacity, and coconut trees which give 12,000 liters of coconut milk each year. There is also a 70-ton crane which can easily lift a 3-ton yacht into a specially-designed tank. Paradise on Earth, says Inge.

A new net is being planned and studied for 14288 kHz on Wednesdays at 2330 UTC. It will be beaming toward the USA and Canada.

LIBERIA

Brother Donard, Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of Holy Cross
St. Patrick High School
PO Box 1005
Monrovia, Republic of Liberia

Liberia is on the westernmost point of the great continent of Africa. Most of the country is nearly at sea level, although there are parts of the interior that rise to somewhat over a thousand feet. For whatever reason, the amateurs in this country enjoy excellent communications conditions with the United States, all of Europe, and in the direction of Russia during the greater part of the year. It seems to be well situated geographically and it is in the GMT time zone.

The amateurs in the country number less than a hundred and most are not natives. The reason for this situation is simply that Africans have had little opportunity to learn amateur radio and, for the most part, they do not have the money to purchase and operate radio equipment. Very few of the cities have electrical power and those that do have it for only a part of the day.

The Liberian Amateur Radio Association (LARA), under the direction of Mr. Benjamin Walcott, is doing everything in its power to reverse those statistics. Radio classes are being run in increasing numbers and the response is very gratifying. In Monrovia, a course is being taught currently at St. Patrick High School, and the turnout is over a hundred persons of all ages and includes both men and women. These classes operate under great difficulty since textbooks are not available and things like code oscillators are rare. The students must rely on class notes and on duplicated pages which are prepared and handed out by the instructor. Many of the people have tape recorders, which are a great help.

When the students are licensed, there is the problem of equipment for them to use. The association plans to gradually set up club stations in strategic areas so that those who do not have their own equipment may have access to a club station. At the present time, there is one such club station in operation. The equipment for these club stations will have to come from amateur friends in other parts of the world. The station which is presently operational was donated by a radio club in Barberton, Ohio.

The Telecommunications Ministry here in Monrovia has neither the personnel nor the funds to test and evaluate applicants for amateur licenses. The government relies on the LARA to do this job for them. The LARA instructs persons interested in amateur radio, tests them, and when they have met the requirements, recommends them to the Ministry for licensing. This system is working remarkably well and the cost to the government is minimal.

Amateur radio in Liberia is proud of its record of performance in times of emergency and disaster. It measures up to the high standards of amateur radio around the world, and it is the aim of the LARA to expand the numbers of operators, increase amateur activity, and at the same time maintain the high standards at which it now functions.

(Brother Donard is Secretary of the Liberian Amateur Radio Association.—Ed.)

GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire, England

The continuing growth of interest in amateur radio in the United Kingdom was evidenced recently when the Radio Society of Great Britain (RSGB) held a National Amateur Radio Convention at the National Exhibition Center near Birmingham. The NEC is a prestige exhibition and conference center with its own airport, railway station, and hotel complex situated more or less in the center of England and well served by motorways (freeways).

I had previously visited NEC for trade shows such as Communications 83 and the International Business Show and had found parking easy and queues minimal. Not so with the RSGB, who, although using a hall of adequate size, had arranged for only two ticket counters to be open. This meant a wait of some twenty minutes in a fresh breeze which at least sharpened our minds for the coming fray.

The majority of major importers were exhibiting the latest in Japanese microprocessor-controlled black boxes. I tried, unsuccessfully, to find a new rig that performed better than my FT-101 rather than just outdid it in numbers of knobs. There are no longer any indigenous manufacturers of HF gear in the UK. However, we do have some able representatives in the specialist scene including Microwave Modules and Wood & Douglas. MM displayed its range of transverters for 2 meters and 70 centimeters, together with linear amplifiers for these and higher bands. Perhaps their most innovative product (and one that always attracts attention) is the Morse Talker. This microprocessor-controlled device sends random Morse at a user-selected rate and then speaks the letters sent for the pupil to check his copying. As an option, the model two will interpret (but not comment upon!) pupil-sent Morse.

Wood & Douglas exhibited a range of 70 cm, 2-, 4-, and 8-meter kits, and modules for the construction-minded operator. As well as traders, the exhibition hall included the various support groups such as the RSGB (showing its extensive range of books), AMSAT-UK, selling the newly-published *Technical Handbook*, Navy and Air Force Amateur Radio Societies, the Radio Amateur Invalid and Bedfast Club, and BARTG (the British Amateur Radio Teleprinter Group).

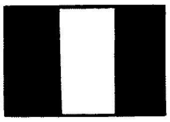
With most of the stands 5 deep in excited people clutching for leaflets, it was something of a relief to take a break for lunch. This is an area in which we have a little to learn from the US. The choice at NEC was to queue for half an hour for a very soggy beefburger or (as we did) walk over to the attached Metropole Hotel and pay over the odds for an average meal.

Many believe that the intense interest in amateur radio is a spin-off from the recently legalized CB service (27 MHz, FM, 4 Watts) which many are finding frustrating and uninteresting (surprise, surprise!). Lots of ex-CBers are furiously studying for the radio amateurs' examination, which twice yearly opens the doors to those answering the questions correctly.

Some early problems with CBers spreading into the 10m band have now largely disappeared. My own local cowboy was discouraged from using 28.1 for SSB by some 200-Watt RTTY tests I ran! There is, however, some worry over here about the 10m band and its lack of use during quiet sunspot periods. Moves are afoot to encourage FM around 29.6 for mobile-to-mobile working (many 2m repeaters are very busy indeed).

Cheap CB rigs ($25.00 to $50.00) are being snapped up and converted from 27 to 29 MHz quite easily. Although low in price, some of these are from well-known names such as Icom and offer a range of facilities including 40 channels.

The RSGB is encouraging 10m usage by promoting a new 28-MHz Counties Award. This requires confirmed contacts on 10m (any mode) with 40 UK counties/Scottish regions from the total of 77. Contacts must be made after April 1, 1983. The award is free to RSGB members and $3.00 to others.



FRANCE

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11 Rue Emile Labiche
28100 Dreux, France

2M FM REPEATERS

About 25 FM repeaters are located in France. Placed on 15 channels in 25-kHz steps, they can be found between 144.725 and 145.175 MHz, with a +600-kHz offset. ERP is between 20 W and 200 W. Some are very busy.

70-CM FM REPEATERS

France has about 10 of these repeaters. Present channels of the machines will be moved, but all have a −1600-MHz offset.

AWARD: DIPLOME VILLE DE PARIS

HF bands: Class 1—contact 20 arrondissements, Class 2—contact 15 arrondissements, Class 3—contact 10 arrondissements. All contacts after January 1, 1946. A log book certified by an officer of the national organization is required. Fee: 30 FF (IRC).

For YL: 10 arrondissements, or 20 for "diplome d'honneur."

Diplome manager: Bernard Louis F5BL, 15 Place d'Aligre, 75012 Paris, France.

WORLD COMMUNICATIONS YEAR

For this event, French stations are authorized to use a TO prefix.

SATELLITE ACTIVITY

RACE (Radio Amateur Club de l'Espace) is supporting ARSENE (Ariane Radio Amateur Satellite Enseignement Espace). This satellite is scheduled to be launched by Ariane IV by the end of 1985. Two modes are planned: B and F (2.4 GHz and 435 MHz). The orbit will be an equatorial ellipse. The president of RACE is F8ZS and the vice president is F8YY.

SWITZERLAND

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CH-5401 Baden
Switzerland

As in most other Western countries, repeaters are an important aspect of amateur radio in Switzerland. However, in the last couple of years, many amateurs in this country have grown increasingly skeptical about what some call "garbage-in-garbage-out machines." They charge, for example—not entirely unfounded—that repeaters tend to promote bad operating practices and that the difference between what you hear on 27 MHz and on 145 MHz has become rather marginal. Monitoring a 2-meter repeater like HB9AN near Zurich, the biggest Swiss city, for a day can indeed be a frustrating experience: QSOs abound with CB-type lingo and their content is only too often in violation of the rules. (Remember, for example, that third-party traffic of any kind is an absolute no-no in almost all of Europe!)

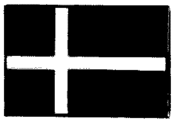
So far, repeater jammers in Switzerland haven't had to fear much in terms of getting caught. Some repeaters, like HB9F on top of Mount Schilthorn (known to James Bond 007 movie addicts as "Piz Gloria") in

the Bernese Oberland or HB9RW on top of the Parpaner Rothorn in the southeastern part of the country, are situated well above 9000 feet. They cover a great part of Switzerland and considerable portions of neighboring countries, thus making it a rather difficult task to locate and track down a jammer. On top of that, the radio surveillance people of the Swiss PTT can't provide as much help as the amateurs sometimes expect. They are facing enough problems already in coping with the messy 27-MHz situation in this country.

For the officials of the Swiss national society, repeaters are a constant item on the agenda. It's the business of repeater coordinating that sometimes gives them headaches. If you thought repeater coordinating was difficult in the US, imagine just how it is to coordinate repeater frequencies when societies and authorities of some five countries are involved!

The 2-meter band plan of the International Amateur Radio Union Region 1 (Europe, the Soviet Union, and Africa) provides only for ten repeater channels designated RØ to R9 with inputs located between 145.000 MHz and 145.225 MHz and outputs 600 kHz higher. You don't need to be a repeater-coverage expert to see that it is close to impossible to cater to all wishes with only ten channels available. Therefore, repeater problems are an everyday fare for the VHF managers of Europe's national societies.

A few years ago, one could even witness a "repeater war" in Central Europe. The French national society unilaterally decided to put into operation a couple of repeaters on frequency pairs well apart from the internationally-agreed-on channels and with inputs right in the middle of the 2-meter-beacon band. The Austrians closely followed suit. Through a lot of negotiating across country borders and shuffling around of channels, the problem is now in the process of being resolved. However, when you're experimenting with HB9W, the flea-power (36 mW!) S-meter calibrating beacon on Zurich's Mount Uto, you still stand a good chance that your test is rendered useless because of constant interference. The input of an Austrian repeater on Mount Valluga just across the border is on exactly the same frequency.



DENMARK

Hanne Nielsen OZ1CID
Hvidovrevej 468
2650 Hvidovre
Denmark

In Denmark we are 8000 radio amateurs strong, and about 7000 are members of EDR (Experimenterende Danske Radioamatører). Under EDR we have 60 local divisions of varying size.

The Copenhagen Division, or as we call it, club, is the biggest, with 300 members. We have our own house bought in 1974. The club was founded in 1932 and we have just celebrated our 50th jubilee.

During the week, we have many activities. Monday evenings we have a common meeting with lectures upon different technical sides of our hobby and afterwards comfortable talks over a cup of coffee and some eatables. Of course, the club station is on the air with the call OZ5EDR.

The EDR Copenhagen Division QTH.

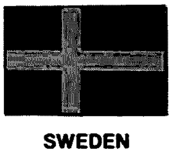
Tuesday we have laboratory evening, where members can receive technical assistance for their problems with stations or construction projects or, as a group, we start some new projects. Four to five days every week, except in the summer time, we have technical courses and CW courses for those who want to have a license or upgrade their present license.

In the clubhouse, we have a laboratory, library, VHF/UHF shack, HF shack, instruction room, office, dining room, three apartments for leasing to members, a workshop, material rooms, and a newly established museum for radio amateurs. Outside the house, we have an antenna mast with HF/VHF/UHF beams.

Many weekends we join into the different national and international contests on both CW and SSB. Joining in Field Days and the Jamboree on the Air are also some of our activities. We also do a lot in award hunting. That special side of our hobby hasn't been going on for more than 4 years, but through many QSOs and a fine award manager, we now have got 104 different awards decorating our walls, many from *73* magazine. We have also founded 2 awards: The Copenhagen Award founded many years ago, and the OZ Prefix Award founded on the occasion of the 1982 jubilee.

The house we own is very old. Every weekend some members work on it as there is always something to do and we are not able to pay workers from outside.

It's very nice, as a chairman, to see that our hobby, amateur radio, is flowering, not only in the Copenhagen Division of EDR, but everywhere. If any radio amateur in the USA should visit Copenhagen, you would be very welcome to visit our club.



SWEDEN

Rune Wande SMØCOP
Frejavagen 10
S-155 00 Nykvarn
Sweden

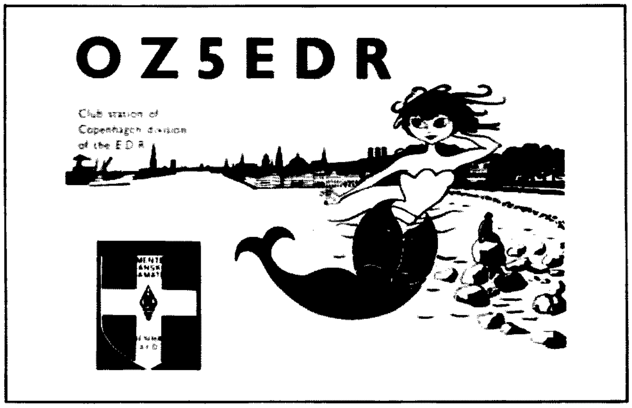
SCANDINAVIAN HORIZON

"Do you always carry your radio with you whenever you travel?" the customs lady asked me at Logan Airport in Boston, Massachusetts, when I unloaded the two 40-pound boxes with ham gear in addition to our 5-person family luggage. "Yes, I always do," I replied, and she let us pass through.

Most of us hams like to have our radios with us when we travel. It sure is fun to experience how the bands sound at a distant location from home. A 2-meter FM handheld can give you lots of opportunities to meet local hams during a vacation in a foreign country. Many of you Americans have been fortunate enough to be able to use ham radio far away from home while in the service overseas. However, only some twenty years ago or less, a citizenship in the licensing country was required. Luckily, this has changed in recent years. Many countries now have formal reciprocal agreements for temporary licenses for foreign visitors.

A DREAM COMES TRUE

You are planning your trip to some foreign country and you would like to operate ham radio while staying there. Start your



planning well in advance. If you have no information on licensing in the country concerned, write to their telecommunications authority or the amateur radio organization in that country for information. Addresses can be found in ham magazines and in the *Callbook*. The easiest way, though, is to write to your own national amateur radio organization for reciprocal licensing information.

Generally speaking, the following things are common in most European countries:

- A reciprocal licensing agreement between the two countries
- Application required
- Processing time, one to three months
- License issued for a period of maximum three months each calendar year
- Operating privileges in accordance with the class of license in the country you visit which is closest to your own license
- You have to follow the regulations in the country you visit which can differ a lot from what you are used to back home, especially maximum power limits and frequencies used

There are some important differences from country to country. The following is currently valid for each of the Scandinavian (Nordic) countries.

Denmark. An application with the following data should be sent to Radiotekniske Tjenste, Tilladelsessektionen, Islands Brygge 83 C, DK-2300 Kobenhavn S, Denmark: Name and address of applicant, date of birth and town, citizenship, callsign and class of license, time period for the stay in Denmark, address in Denmark, any remarks, and date and signature.

A photocopy of your license, certified by two persons, should be attached to your application. This procedure is accepted for applicants from the USA, Canada, Brazil, Australia, Portugal, Switzerland, France, Spain, Luxembourg, Belgium, West Germany, Great Britain, Holland, Iceland, Sweden, Norway, and Finland. Amateurs from other countries have to supply documents stating the requirements for a ham license in their country in addition to the license document.

The fee, 20 Danish kroner (around \$2.50), shall be paid when arriving in Denmark. A special money order form sent with the license should be used. The same procedure applies for the Faroe Islands, prefix OY.

Finland. The Finnish amateur radio organization, SRAL, has a somewhat different status than what is common in other countries. It is mandatory to be a member of the SRAL when being a ham in Finland. Your application sent to the SRAL will be handled faster than if sent directly to the licensing authority. The address is Suomen Radioamatooriliitto r.y., Postilokero 306, SF-00101 Helsinki 10, Finland.

The application shall state your complete name and address, citizenship, fixed station address in Finland, time period for the stay in Finland, any remarks, and date and signature.

A photocopy of your license and personal identification (photocopy of passport or similar document) is required. Finland requires reciprocal agreements. Non-Finnish citizens are prohibited from working mobile ham radio.

The fee is 38 Finnish Markka (around \$8.50) and the license is sent COD.

Norway. Norway also requires a reciprocal agreement, and application shall be mailed to Norwegian Telecommunications Administration, Radio Inspection Office, PO Box 6701 St. Olavs Plass, N-Oslo 1, Norway.

Preferably, you should send for their ap-

plication form which includes about the same data to be filled out as for the other countries. If you intend to operate mobile, the registration number of your vehicle shall be stated. If you intend to rent a car, you can state that. One important difference is that you have to enclose a Certificate of Good Conduct issued by your local police authority.

If you are a foreign citizen but a resident in Norway, you can apply for a license one year at a time. The prefix then is LAØ. Operations from the Norwegian territories JWØ, JXØ, and 3YØ are under separate regulations.

The fee is 50 Norwegian kroner (around $8.00), and shall be included with the application.

Sweden. Together with Denmark, Sweden is one of a few countries that does not require reciprocal agreements. We have agreements, however, due to the reason that otherwise we would not be able to operate in countries where they require such formal agreements. The application form includes the regular data and shall be sent to The Swedish Telecommunications Radio Department, Licensing Section, S-123 86 Farsta, Sweden. The application can be written in Swedish, Danish, Norwegian, English, French, or German. A copy of your valid license and a Certificate of Good Conduct (impunity) issued by the police authorities in your native country must be included. In certain countries, such a certificate cannot be obtained. A certificate issued by the applicant's amateur radio organization must then be included.

The fee is 80 Swedish kroner (around $13.50), and shall be sent after you have received your temporary permit. They prefer not to receive payments in advance.

Any foreign national with permanent residence in Sweden for a considerable time (currently 3 years) can get a permanent Swedish license. If holding a foreign license, the equivalent Swedish license will be issued without any further exams. However, one obstacle to getting the highest class of license, class A, is the code proficiency requirements. Most countries have 12 wpm as their highest code speed. A code exam at 16 wpm will solve that problem.

In both Finland and Sweden, you use your call followed by /OH or /SM and a number stating the district where the radio transmitter is used temporarily.

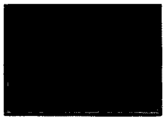
LG5LG and SJ9WL. These two callsigns belong to the same station located on the border of Norway and Sweden, not very far from Oslo, the capital city of Norway. The place is called Morokulien, a name combined of the word "fun" in those two languages. It is not a separate DXCC country, but you can operate this amateur station without any reciprocal agreements. The only requirement is that you show your valid ham license when visiting the station. You can rent the house with the station if you would like to spend a few vacation days there. However, if you want to rent, you are advised to make reservations.

COMPARISON WITH THE US

As a comparison, the reciprocal licensing for visiting hams in the US is very favorable. There is no fee, the license is issued for up to one year at a time and is renewable, and the processing time is short (usually sent by return mail), although the application form states 60 days. However, if your country does not have a reciprocal license agreement with the US and you want to operate from there, you can take the exams at an FCC (Federal Communications Commission) office. US citizenship is not required, and you can go through all exams at the same time if agreed upon by the local FCC office. You start with (e.g.) the 20-wpm code and then take the combined Technician/General class 70-question exam. If you pass, you can continue with the Advanced written exam and finish with the Extra. Then you just wait for the mail.

CONCLUSION

If you plan to visit a foreign country, apply for a license and you get a chance to meet the people. That is much more rewarding than all the tourist attractions in the world.



WEST GERMANY

Hans J. Schalk DJ8BT
Hammarskjold-Ring 174
D 6000 Frankfurt 50
West Germany

FROM AMSAT/DL

The ESA (European Space Agency) fixed—as of this writing—the launching date for the ARIANE flight as June 3, 1983. Expected for this flight was the carrying of the European communication satellite ECS 1 as well as the AMSAT Phase-IIIB satellite. Further ARIANE starts are scheduled for August and November, 1983, as well as January, 1984.

See box for contest results.

ANTARCTIC EXPEDITION

Presently on a visit to the Antarctic is Loy Y44YK. He is scheduled to be QRV as Y83ANT in the near future. His equipment: two transceivers with 150-W input, Type

RESULTS OF THE 15TH EUROPEAN DX CONTEST WAEDC 1982 RTTY

Single Operator

Call	QSO	QTC	Multi	Score
1. Y39XO	298	561	222	190698
2. I1TXD	253	467	195	140400
3. DK8NG	245	328	245	140385
4. IT9ZWS	265	461	174	126324
5. SM6ASD	243	441	184	125856
6. W3FV	198	324	209	108680
7. IC8POF	229	417	152	98192
8. OH1IJ	248	418	147	97902
9. DJ2YA	160	386	172	93912
10. 4Z4KB	176	150	191	62266
11. I8JRA	139	280	124	51956
12. KB2VO	173	109	131	36942
13. YO3AC	123	265	94	36472
14. OE2SNL	123	174	117	34749
15. DJ6OT/CT3	106	89	171	33345
16. Y79XN	143	254	78	30966
17. 4N7NS	111	230	76	25916
18. HC5EA	137	61	122	24156
19. ON7KK	154	0	154	23716
20. UV3FD	168	140	77	23716
21. EA3BLQ	107	244	65	22815
22. EA3OL	247	0	82	20254
23. YV1GU	126	0	138	17388
24. DL8QP	73	168	69	16629
25. EA1AEB	154	0	101	15554
26. DJ9IR	79	152	54	12474
27. DJ1XT	78	136	56	11984
28. EA8ZZ	73	84	75	11775
29. K1LPS	73	27	94	9400
30. KJ2N	67	88	60	9300
31. OK2BJT	74	127	46	9246
32. DF1LX	61	113	52	9048
33. OK2SPS	83	147	35	8050
34. K6WZ	60	54	65	7410
35. DF6AI	66	98	41	6724
36. DJ2YE	90	0	70	6300
37. DF6ZY	52	123	35	6125
38. F6DBY	71	0	82	5822
39. Y23VB	76	50	46	5796
40. KP4BJD	66	0	77	5082
41. EA5CVR	73	0	67	4691
42. SM6BUV	51	77	34	4352
43. WB4UBD	34	53	46	4002
44. EA9JZ	67	0	57	3819
45. W3AQH	75	0	50	3750
46. LU3DSU	51	0	73	3723
47. EA7BBK	74	0	42	3108
48. SM5BRG	40	101	18	2538
49. EA3DMP	49	0	45	2205
50. DL8CX	44	0	46	2024
51. VK2BQS	20	41	30	1830
52. DK5KJ	30	25	26	1430
53. Y33UO	37	11	28	1344
54. YO8FR	48	0	27	1296
55. Y22UL	22	40	18	1116
56. Y33TA	21	39	13	780
57. DK4IS	23	0	12	276
58. VK8BE	13	0	20	260
59. YJ8TT	13	0	18	234
60. JA7KM	4	0	8	32

Multi-Operator

1. LZ1KDP	367	742	196	217364
2. I2DMI	329	576	209	189145
3. OH2AA	327	519	188	159048
4. G3UUP	272	497	188	144572
5. HG5A	257	508	178	136170
6. OH8TA	274	428	160	112320
7. EB1BM	310	10	310	99200
8. YO3KPA	209	306	108	55620
9. UK4LAM	136	169	58	17690
10. YO5KLK	157	0	79	12403
11. DKØOW	49	86	50	6750
12. OK3RJB	79	25	63	6552
13. JA2YKA	34	20	44	2376
14. JA6YDH	05	10	02	30

SWL

Name		QSO	QTC	Multi	Score
1. Stig Kahr	(OZ)	302	469	180	138780
2. Alexander I. Yurchenko	(UB5)	283	440	165	119295
3. Hans Waterstraat	(Y2)	207	226	189	81837
4. Werner Ludwig	(DL)	209	236	174	77430
5. Vaclav Cesak	(OK)	166	148	143	44902
6. Frans van Oostenbrugge	(PA)	111	86	79	15563
7. Jaromir Marisler	(OK)	140	47	71	13277
8. Jindrich Bozek	(OK)	82	76	19	3002
9. V. I. Yermolenko	(UC2)	35	41	24	1824

Trophy winners. Single Operator—Y39XO (Europe), W3FV (North America), 4Z4KB (Asia), DJ6QT/CT3 (Africa), HC5EA (South America), and VK2BQS (Oceania); Multi-operator—LZ1KDP (Europe), and JA2YKA (Asia); SWL—Stig Kahr (Europe).

Checklogs: DE1KWD, DE4TTY, DL1VR, OK3JKF, K8CV, PE1HQR, Y43WK, Y55ZF, YU7AM, and SWL-W8 John Mathews. Contest manager: DF7FB, tnx to DE8BUS.

"Teltow 215." For antennas—dipoles and fixed quads.

The club station of the West German South Pole expedition (DPØAA) is presently not QRV owing to illness of the operator, DF3LK.

GREECE

Anastasios D. Panos SV1IG
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Athens 411
Greece

The Ministry of Communications, which is responsible for issuing licenses for new amateurs, announced that 43 hobbyists passed the tests in March. Exams are held twice a year in Athens, during March and September. Negotiations between radio amateur officials of the Radio Amateur Association of Greece (RAAG) and the Ministry of Communications are being made so that at least once a year exams are held in northern Greece (Thessaloniki). Newcomers to the hobby are issued a C class ticket which allows them to operate with 50 Watts on the HF and 5 Watts on the VHF bands, and this is the only limitation. They are free to operate any frequency in all bands and in any mode.

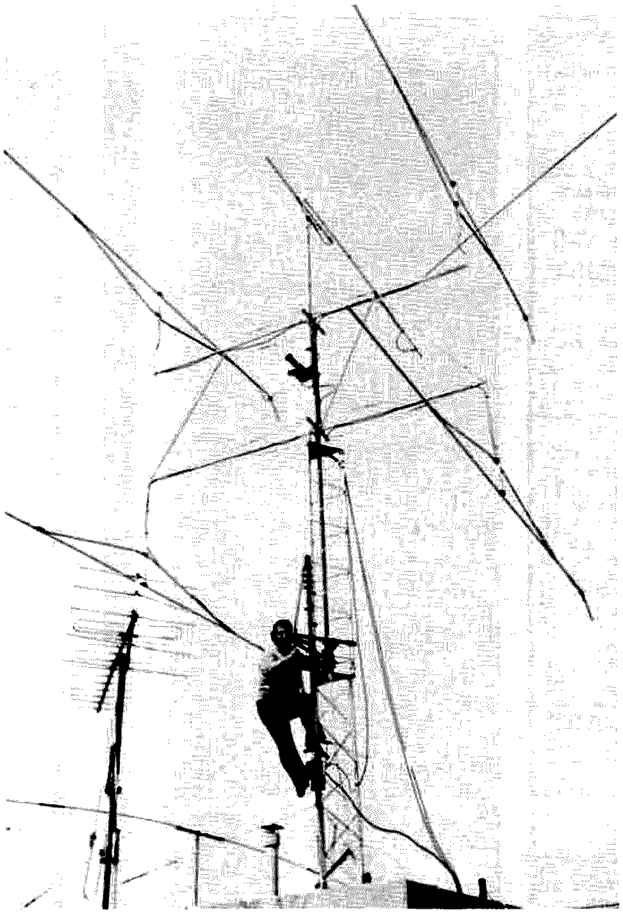
Elections for RAAG's new board of directors were held in February with about 1000 members, but only the 360 licensed members have the right to vote. The new board of directors is as follows: Evangelos Moustakas SV1AN, president; Kostas Fimerelis SV1DH, vice president, Kostas Thanopoulos SV1DC, secretary; Manolis Darkadakis SV1IW, treasurer; Dimitrios Konstantinou SV1GL, member; and Dimitrios Alexandris SV1LL, member.

Elections are held once every two years and candidates for the board of directors must be licensed members for at least 5 years. Members with the right to vote must be licensed and have at least one year in the association.

After a long waiting time, the new repeater R3 (145.075 in, 145.675 out) was placed at Heraklion, Crete Island. There are some problems with the antenna system, but these will be solved soon. Similar problems, plus interference in the input of the R2 repeater in Athens forced it out of operation, and it is in the fine hands of Dimitrios SV1GL. Besides the necessary adjustments and the placement of a duplexer, he is thinking of changing the frequencies from R2 to R7.

Kostas SV1OE, is quite an active radio amateur, one of the few hams who are working RS satellites, and the only one in Greece who makes moonbounce QSOs. His location is close to Hymetus Mountain, about 6 kilometers from the center of Athens. His shack is composed of Kenwood and Yaesu VHF rigs and he uses a Kenwood transceiver for HF. His antennas are a set of four (F9FT) yagis and several dipoles for HF. He is active on the 1296-MHz nets, using the yagi and a parabolic antenna of his own construction. Kostas transmits the A5 mode and his 3-D pictures were really impressive. He is anxious to work the Phase III satellite.

A visit to the Voice of America installation was made by the radio amateurs of Greece. At this visit, a demonstration of high-power transmitters and antennas was given at the transmitter site of Xanthi, Greece. Most of northern Greece's radio amateurs attended, and Bad SVØBK, deputy director of the station, was present at the dinner. He showed them the big complex of antennas used and the transmitters and the voltage generators that keep VOA independent from power lines.



Konstantinos Gioulseren SV1OE.

Attention: Here is required reading for any radio amateurs coming into Greece and bringing their gear. It is against the law to bring a radio into the country if a permit has not been issued by the Ministry of Communications. If caught, you may be charged with illegal possession and/or use of radio, with up to two years imprisonment and/or up to a $2,500 fine as punishment.

ITALY

Mario Ambrosi I2MQP
Via Stradella, 13
20129 Milano, Italy

On April 20, 1983, San Marino amateurs changed their prefix. The new one is T77. You will also have the possibility to work them with a T71 prefix that will be released only during contests and through the club station, T7ØA.

The Yaesu FT-980 has been released for the Italian market; the price should be around $2400. If you are interested in buying something here, some of the most common prices in the market are: TS-930—$2200, TH7DXX—$550, 3-500Z—$145, KLM 34XA—$750, and *Callbooks*—$60. Luckily for us, our salaries are generally lower than the American ones. Otherwise we could end up buying too many rigs!

In Italy, the new WARC bands have not yet been released, though we do hope to get them shortly. Some of us have been authorized to use 160 meters during contests in 1982/83, but now this frequency is again completely off limits. We do not have even 50 and 220 MHz, and as a result, the 2-meter band is incredibly crowded (only two MHz are used, from 144 to 146).

Repeaters are working in the 145.500/145.800 segment, with a 600-kHz split. The 432-MHz frequency is starting to become quite common, and repeaters are starting to be installed in the main cities.

We have two classes of licenses, a VHF one that does not require any code proficiency test and allows you to use 144 MHz and up with a maximum input power of 10 W, and an HF class with a code proficiency test of 8 wpm which permits use of all frequencies with a maximum input power of 300 W. As a result of the easiness to obtain the first license, there is a lot of activity in the VHF sector. To give you an idea, here are some of the distance records of the local VHFers on 144 MHz: I4EAT, 7788 km, using F2 propagation, IØAKP, 3628 km, using sporadic E, and I4EAT, 2500 km, using meteor scatter.

I4EAT has a personal record of 57 countries worked, and 22 other hams have obtained more than 20 countries.

A recent announcement has been made about the discovery of a new elementary particle. It is called the W particle. The discovery has been made in Geneva by a team of 134 European and American scientists headed by an Italian. Many other Italians participated in this W particle project; a major position is held by Giorgio Goggi I2KMG from Pavia, a city close to Milano. I2KMG has just been credited with his country 342/318, thanks to the BY1PK card that was his last missing one, and that places him in the first position on the DXCC Honor Roll.

It's amazing to discover that I2KMG has been able to perform such an impressive achievement on the air and in the lab considering also that his QRL is more than 200 miles from his QTH and that he can devote time to DX only during the weekends.

Of the new particles, it has been said that it is not yet 100% proven they really are Ws, but that they "walk like Ws and talk like Ws"; let's hope they will not make too much QRM during pileups!

A new award was introduced in March by the Italian Amateur Association (ARI), the Italian Islands Award. To obtain the award, you must reach 10 points contacting different islands (or the same one on different bands). Full details on this award and others will be made available to you in the future in this column. If you have a particular interest in Italian awards, write to: Award Manager, ARI, Via Scarlatti 31, 20124 Milano, Italy.

During the first quarter of 1983, most of the interest of active hams in this country was devoted to the various contests—in particular, the 73 40- and 80-meter contest, the ARRL DX contest, and the WPX. Big guns participate in them, fighting for the first positions, and small fishes take advantage of the situation to hunt for new states or for new prefixes.

This year, propagation has not been too good on the higher bands, but good openings have been found on 40 and 80; W6s and W7s have been worked easily without too much power or big antennas. Good scores have been claimed and some records surely will be broken.

Other records are: on 432 MHz, IØMNI with 1520 km; on 1296 MHz, IØSVS with 1520 km; on 2304 MHz, I1PE with 267 km; on 5670 MHz, I1RIP with 183 km; on 10 GHz, IØSNY with 1166 km; and on 24 GHz, I3SOY with 73 km.

ANTARCTICA SP 90 THE WORLD'S LAST FRONTIER

ANTARCTICA

Harry A. Mills W4FD
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Huntsville AL 35803

Brian Combs KA3JXR/KC4 contacted us in mid-October, 1982, seeking a high-performance, low-angle antenna suitable for long-haul amateur communications at the South Pole. Happily, the Controlled-Current Distribution antenna, (see Refs. 1,2,3), which has been in continual development by W4FD since 1959, amply fills these requirements.

Excitement ran rampant among the three of us, because Brian would have an outstanding antenna, and our CCD would be in the spotlight for the world to see what it can do.

Since Brian's scheduled departure time was October 25, W4FD immediately began the assembly of three CCD dipoles, for 7, 14, and 21 MHz. Each was of very rugged construction, necessary to endure the load of the incessant west wind, massive snowstorms, and temperatures which plunge to 100° F below zero.

Siple Station is located at the base of

the Antarctic Peninsula at 75°55' S, 83°W on ice and over 4000 feet above sea level. Since the ice is salt-free, it provides a really tall antenna-supporting insulator.

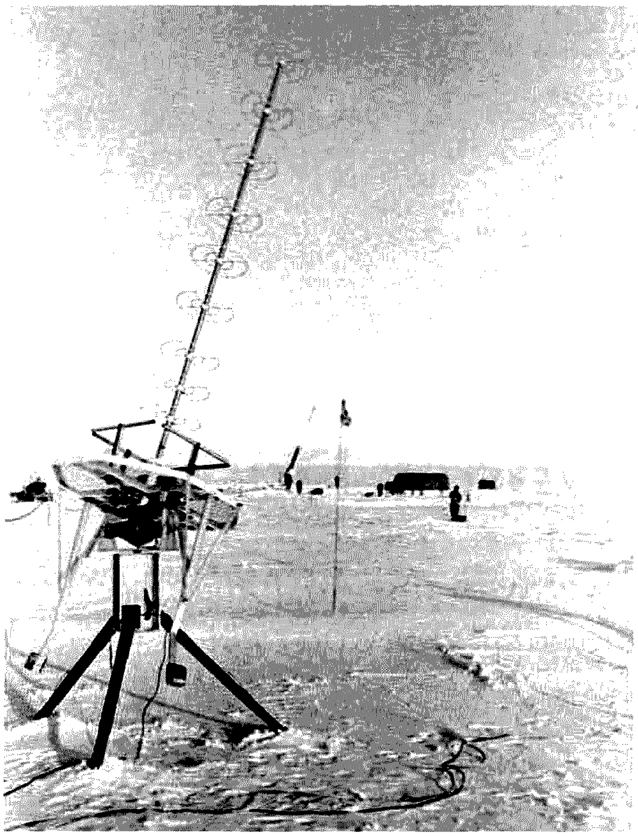
Here, the National Science Foundation will continue to investigate the response of the Earth's magnetosphere to the injection of coherent ultra-low-frequency (ULF) waves in the 2-3-kilohertz range. This response includes wave growth, spectral broadening, development of sidebands, triggering of ULF emissions, wave coupling, and particle scattering. The existing doublet for injecting the ULF waves lies on top of the accumulated snow and is 13 miles (21.4 kilometers) long. During the present Austral summer, the enormous antenna will be raised above the surface and its length doubled.

During 1983, transmissions will be made to such satellites as the Dynamics Explorer-1, the ISIS-1, and the ISIS-2 and to support the SEEP (Stimulated Emission of Energetic Particles) experiment. This is an extremely brief glimpse of the Antarctic investigations under the direction of scientists at Stanford University, the University of Minnesota, the University of New Hampshire, Bell Telephone Laboratories, and Utah State University, in cooperation with the British Antarctic Survey.

Brian KA3JXR/KC4 is age 32, married, and the son of a minister. He has a great interest in QRP operating, the outdoors, and boating. On October 26, he departed California for New Zealand, for fitting of winter clothing. He then went to McMurdo Base to await weather suitable for a safe landing at Siple Station.

Until about the end of January, mail service is through FPO, San Francisco, New Zealand, and McMurdo Base. From there it is distributed to Siple and South Pole Stations by C-130 aircraft.

Brian writes (Nov. 30): "We have now gone over a week without mail or any planes. However, life here is not hard. We are warm and comfortable, with plenty of food, which is all that anyone could ask. During the Austral summer months, we may have as many as 40 people at the station, doing various construction projects, the major one being to extend the ULF dipole to 26 miles. By the end of January, only eight of us who are staying for the winter will be left, to keep the station running on our own without outside help.



The P-Band antenna at Siple Station, Antarctica, is used to receive data from Nike-Tomahawk rockets launched into the magnetosphere (US Navy photograph).

"I am looking forward to using the three CCD antennas. I expect to be on the bands regularly; also, other members of the station will be using the equipment, so the overall use should be quite high, because there will be no mail until November, 1983. The CCD antennas also sound just right for my QRP operations on CW around 21.170 MHz, beginning around the end of December.

"We have plenty of coax and fittings of all sizes that we will likely need.

"During the present heavy work schedule, several plans for amateur construction are being considered. The problem is that the conduit carrying the coaxial transmission lines to the tower is under 40 feet of snow. The major idea at present is to utilize the aurora hut for a shack, where we would install a Collins KWM-2 and the HW-8. This plan gives a reasonable overground run to the tower. A patch board would be constructed, to mix and match equipment.

"Due to commercial schedules, we are not able to meet the Sunday and Wednesday schedules originally planned for amateur operating. We do come up a couple of times per week, after 2000 hours our time, on the Maritime Mobile net on 14.313 MHz SSB (catch us there for any traffic). All our linears are one kilowatt. I had not heard that 10 MHz had opened up. We will try to find a crystal for that band.

"We did not expect the 7-MHz CCD antenna which you provided; it should make life very interesting, indeed. Forty meters doesn't really open up for us until sunset begins. This 24 hours of daylight is quite hard on communications. Twenty meters is our best band by far. It is the only one that we can count on. Several hams have asked me on the air about the CCD antenna; they all want to learn more about it. It should be an interesting year!

"I have had my first experience with a pileup! For a newly-licensed ham who is still trying to master the basics (like moving from a net and finding the other station), a pileup is quite something. When it happened, I had to shut down before giving every station a QSO. Patience seems to be the key to keeping everything reasonably under control (perhaps some Valium wouldn't be a bad idea, either). Perhaps I could work more stations if I only gave RST reports. But I don't think that is fair, so I spend some time with every QSO.

"I expect to use off-duty time for studying to fill the gaps in my knowledge, so that I can take the commercial examination for radio telegraphy and maritime endorsements and the exam for the amateur Extra.

"The weather so far has been remarkably good. We have gone 9 days with clear sunny skies. But very soon we will be getting 5-6-day snows and winds. That is the "whiteout" that you have heard of, when you often can't see more than a few feet in front of you; still, there is work out there to be done. The Antarctic is easily one of the most beautiful places that I have been. The work is hard and often long, but we are getting a lot done."

The zero humidity in Antarctica results in violent lightning and atmospheric disturbances, as well as auroral effects, which subject antennas to many-thousand-volt stresses. For this reason, drain resistors were installed across the capacitors in the largest (7-MHz) CCD dipole. The heavy wind loading is a major structural consideration which was met by assembling each antenna on a length of 500-pound-test monofilament fishing line as a supporting messenger. Two 300-pound-test monofilament lines were then spiralled around the entire length of the antenna, in opposite directions, with frequent ties. Survival of the antennas now depends upon the monofilament lines remaining flexible and not crystalizing in the extreme sub-zero temperatures. Ends of the 500-pound-test messenger lines extend beyond the antenna ends to serve as insulators and also to provide a means for anchoring.

Ideally, the CCD dipole is fed by 300- or 450-Ohm transmission line through a 1:4 balun located directly at the transmitter output. This provides the best current balance and bandwidth, and band-changing is then only a matter of turning the transmitter bandswitch. No matching network or tuner is needed. However, at Siple, the violent winds dictated the use of coaxial line, which has a better chance for survival than even the heavy commercial-size twinlead-line types. Also, the antenna tower being over 100 feet away, a considerable run of line is exposed to possible damage by nature's elements.

The call KC3AAD will be used by another staff member at Siple Station. Phone patches to families and friends will be made on 14 and 21 MHz and have first priority. Brian asks only that callers wait until these are cleared, then general contacts on SSB and CW are welcomed. The most reliable band in the Antarctic has been 14 MHz, so more activity is expected there. All contacts will be confirmed by Brian's QSL upon his arrival home following the 15-month tour.

A CCD antenna net was recently formed by a group of enthusiastic users in the Oklahoma area. Anyone interested in a better antenna is invited to join N6ATS and the group on 7.203 MHz (3.843 MHz, alternate) at 0100 UTC daily.

For construction data for the improved CCD, send an SASE to either of the authors.

References

1. Harry A. Mills W4FD and Gene Brizendine W4ATE, "Antenna Design, something New," *73*, October, 1978, page 282.
2. Harry A. Mills W4FD and Gene Brizendine W4ATE, "The CCD Antenna—Another Look," *73*, July, 1981, page 50.
3. Harry Longerich W4ANL, "The CCD Antenna Revisited," *73*, May, 1982, page 40.

HAM HELP

I would like to get in touch with any hams knowledgeable in using the Timex/Sinclair 1000 computer for Morse, RTTY, and other applications.

Martin E. McCoy WB8TCZ/7
1365 N. 9th
Laramie WY 82070

If anyone can supply me with the manual and schematic for a Lafayette HE-89 vfo, I will pay for the copying and postage.

Greg Dickerson N4OBS
12453 Northwood Rd.
Savannah GA 31406

I am compiling a list of access codes for repeaters, and I need input from *73*'s readers. Access codes for open autopatches will be listed with permission; access codes for closed (member-only) autopatches will not, but information about how to join will be included. Also, please indicate repeater power, antenna height, coverage, and autopatch exchange. Lists will be sent to all who contribute, and others may receive it for an SASE and copying costs. I would also like to hear from others in the EMS and forensic medicine fields (I am a CEMT and Deputy Coroner).

Jeff Howell WB9PFZ
PO Box 187
Milton KY 40045

I need someone to design and build a frequency converter to convert frequencies in the male voice range to the female voice range. I need to be my own secretary.

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PO Box 812
Shawnee OK 74801

Neville C. Harleck
Monitor Instruments
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Sydney, 2018
NSW Australia

Colin Dawson
Electronics Australia
PO Box 163
Chippendale, 2008
NSW Australia

Down-Under Depth Sounder

Get your feet wet with this Australian construction project. We promise that you won't get in over your head.

Reprinted with permission from the November, 1982, issue of *Electronics Australia*, PO Box 163, Chippendale, 2008, NSW Australia.

Depth sounders on pleasure craft are primarily used for simply measuring water depth, although some more elaborate (and expensive) models can locate fish or even produce a scan of the sea bottom so that reefs and other sunken objects can be located. The unit described here falls into the former category and, as such, is designed to be easy to construct and to operate.

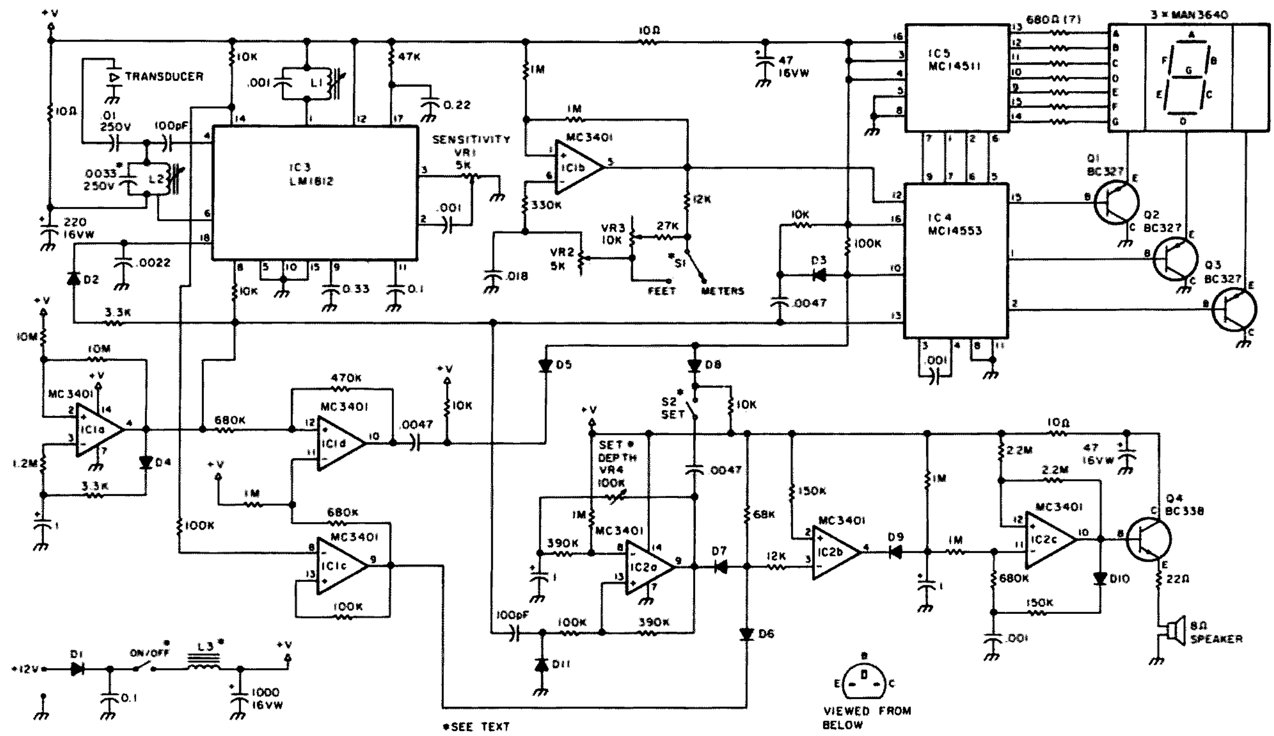
After all, what could be easier than reading a few numbers off a digital display?

The circuit was developed by Sydney engineer Neville Harleck whose company, Monitor Instruments, can supply complete kits for the project. We at *Electronics Australia* simply assembled the unit depicted here and prepared the constructional details.

Once assembled, the kit certainly looks the part. Two printed circuit boards—a display board and a main board—accommodate virtually all the electronics, and these are housed in a white molded plastic case. Overall case dimensions are a compact 125 mm W × 140 mm D × 58 mm H.

While the case is not watertight, it is reasonably weatherproof and should stand up well to the rigors of the marine environment. Its compact size also means that you should have no difficulty in finding a suitable mounting position for the device regardless of the type of boat you own.

Photo A. The digital depth sounder.



Circuit diagram for the digital depth sounder.

Other features include a bright 3-digit LED display, a sensitivity control, an alarm-depth-set control, and a feet/meters switch mounted on the rear panel. A U-shaped mounting bracket allows the case to be tilted to provide a convenient viewing angle.

The audible alarm function is a particularly useful feature. When selected, it sounds whenever the water depth decreases below a preset level, thus eliminating the need for continuous visual monitoring. The danger of running aground is never greater than when the fish are biting, or you are otherwise preoccupied!

Basic Principle

The principle on which a depth sounder operates is quite straightforward. An ultrasonic sound pulse is directed into the water and the time taken for the signal to be reflected from the bottom is measured. Since the speed of sound in water is reasonably constant, the distance the sound pulse has traveled, and hence the water depth, can be easily calculated. Fig. 1 shows the essential elements of a depth-sounder system.

First, the transmitter generates a short pulse of 200-kHz energy and, at the same time, starts the clock. The receiver subsequently detects the reflected signal and produces a pulse that stops the clock. If the clock is counting at the correct rate, then the display will indicate the water depth directly in the appropriate units (meters or feet).

Most of the important functions of the transmitter and receiver circuits are incorporated into a single IC made by National Semiconductor. This IC, designated the LM1812, has been around for some years now and greatly simplifies the design task for a practical depth sounder. Fig. 2 shows the block diagram of the complete unit and should be studied in conjunction with the circuit diagram in order to understand how the instrument operates.

Circuit Description

Our circuit description starts with IC1a, which functions as the timebase clock. This generates a 1-ms pulse approximately every 800 ms. This pulse activates the transmitter and resets the display and alarm functions.

IC1a, part of an MC3401 quad op amp, is wired as an astable multivibrator which

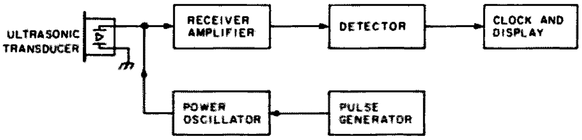


Fig. 1. Basic scheme for an ultrasonic depth-sounder circuit.

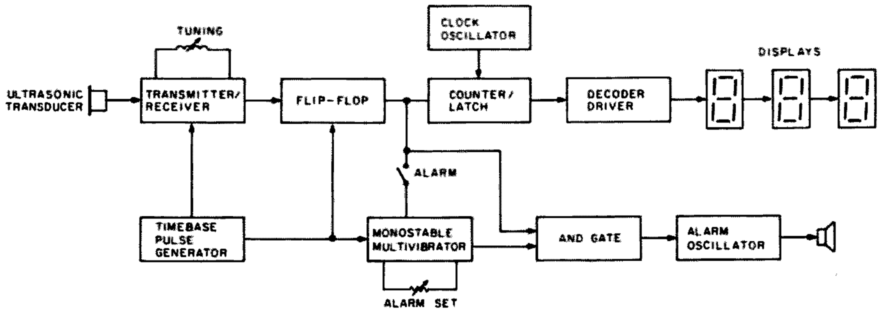


Fig. 2. Block diagram of the complete depth-sounder circuit. The transmitter/receiver is based on a single IC.

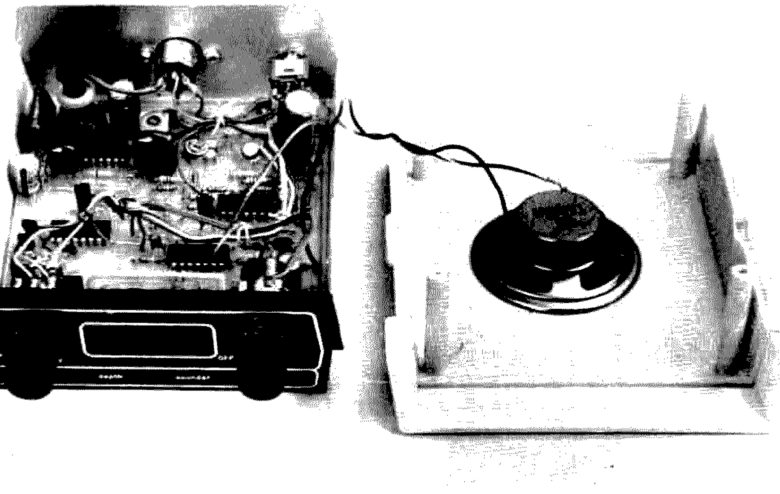


Photo B. Virtually all the circuitry is accommodated on two PC boards.

functions as follows: At switch-on, both the non-inverting input (pin 2) and the output (pin 4) are high. The 1-μF timing capacitor now charges via diode D4 and its series 3.3k-Ω resistor. When the voltage across the capacitor (and hence on pin 3 of IC1a) reaches a critical level, the output of IC1a goes low.

Since diode D4 is now reverse biased, the timing capacitor discharges via the 1.2-megohm resistor into pin 3 of IC1a. When the voltage on pin 3 goes low enough, pin 4 switches high again and the whole cycle is repeated. The 10-megohm resistor between pins 2 and 4 provides positive feedback to speed up the switching transitions.

The output of IC1a thus consists of a train of short positive-going pulses. These pulses are coupled to ultrasonic transceiver IC3, counter IC4, and to the non-inverting input of IC2a which controls the alarm function.

IC3 is the LM1812 transceiver chip referred to earlier. Both the transmitter and receiver sections share a common tuned circuit, consisting of L1 and the .001-μF capacitor, which makes for easy tuning. Readers are referred to the *National Semiconductor Linear Databook* for a detailed description of this IC, as only a general description of its operation will be given here.

The timebase pulse from IC1a is applied to pin 8 of IC3 via a 10k-Ω resistor. This causes the transmitter to "fire" at a frequency determined by the tuned circuit, the output signal appearing at pin 6. This is coupled to the transducer via L2, a parallel 3300-pF capacitor, and a .01-μF blocking capacitor. The signal appearing across the transducer thus consists of a 1-ms burst of 200-kHz energy of about 150-200 V peak-to-peak. At the end of the 1-ms clock pulse, IC3 reverts to the receive mode.

Signals picked up by the transducer are coupled into the first receiver stage at pin 4 via a 100-pF capacitor. Following amplification, the signal appears at pin 3 and is coupled into the next amplifier stage via VR1, the sensitivity control. It is this stage that is tuned by the LC network on pin 1.

As far as the user is concerned, the signal is not seen again until it appears at pin 14, and by this time it has been amplified, detected, shaped, clamped, and clipped so that we get a nice clean negative-going pulse from the supply voltage to ground.

The functions of a few other pins on IC3 should also be considered before moving on to the next section. It will be noticed that the timebase pulse is also fed into pin 18 via a 3.3k-Ω resistor and series diode D2. This is done to inhibit the detector during the transmit time and thus prevent a false output signal appearing at pin 14. The 47k-Ω resistor and 0.22-μF capacitor connected to pin 17 provide a measure of impulse noise rejection.

The 0.33-μF capacitor on pin 9 is charged during the transmit period and serves to inhibit the second stage of the receiver. As the

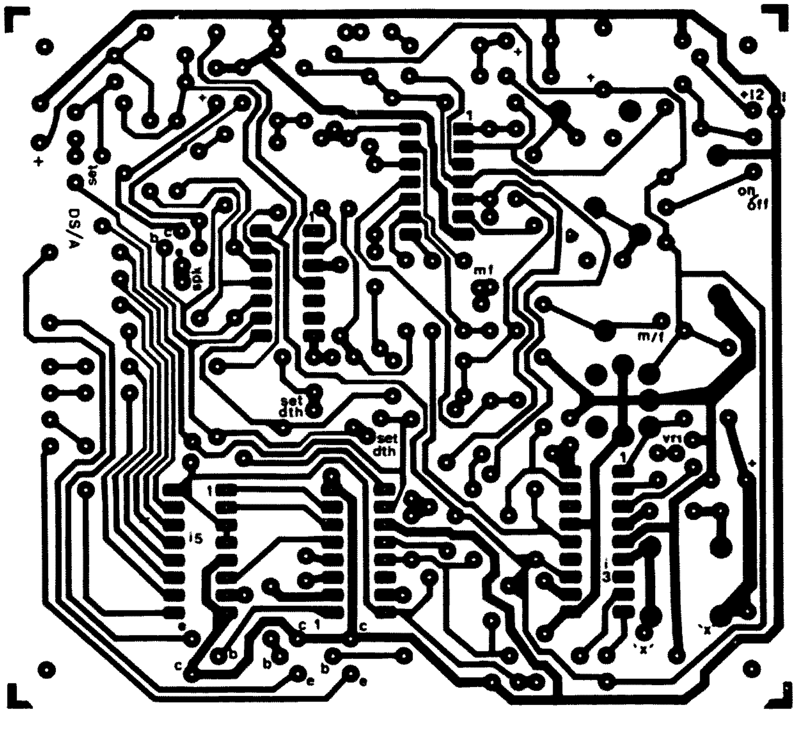


Fig. 3. PC board for the depth sounder.

voltage across the capacitor falls (at the end of the transmit period), the gain of the second stage increases. This has the effect of filtering out signals received during the first few milliseconds after the transmit pulse. Without this effect, echoes from the boat's keel or rudder could falsely trigger the display circuitry and cause an incorrect reading.

The output signal appearing at pin 14 is coupled to IC1c which functions simply as an inverter. The inverted signal is then fed to IC1d which is connected as a monostable and functions as follows.

Pins 9 and 4 of IC1 are normally low and, because of its 470k-Ω feedback resistor, IC1d will be latched either high or low. When a timebase pulse occurs, pins 12 and 10 are forced high, and the feedback resistor latches the device in this state. When an echo is subsequently received, it produces a positive pulse at pin 9 which is coupled to the inverting input of IC1d and hence forces pin 10 to go low.

Thus, the time that pin 10 stays high is the time from transmit pulse to received echo. Note that pin 10 stays low until the next transmit pulse, which means that any echoes occurring after the first have no further effect on IC1d. Multiple echoes are thus ignored.

The signal at pin 10 of IC1d is differentiated and the negative-going pulse coupled via diode D5 to the latch-enable input (pin 10) of counter IC4.

IC4 is an MC14553 3-digit BCD counter with multiplexed outputs. The counter is reset to zero by the timebase pulse on pin 13 and the trailing edge of this pulse is used to enable the latches in the chip (thus displaying 000); i.e., the timebase pulse is differentiated by a .0047-µF capacitor and a 10k-Ω resistor and the resultant negative-going pulse coupled to the latch-enable input of IC4 via D3.

As soon as the reset pulse has finished, the counter starts counting clock pulses from IC1b. When an echo is received, a negative-going pulse is coupled through to pin 10 via diode D5 as above, and the counter data is transferred to the latches for decoding and display. The next transmit pulse again resets the counter and displays to zero and the cycle is repeated.

Note that if no echo is received, the displays will remain on zero. This is because a latch-enable pulse must occur before data can be transferred to the latches.

IC5 is a BCD-to-7-segment decoder/driver chip which decodes the binary data from IC4 to drive common cathode 7-segment LED displays. Since the displays are multiplexed, the corresponding anodes are wired in parallel and connected to the outputs of IC5 via 680-Ohm current-limiting resistors. Each display cathode is connected to the emitter of a BC327 PNP transistor (Q1, Q2, and Q3), and these transistors are turned on and off by signals from the multiplexer in IC4.

If you like, you can regard the counter, decoder, and display circuitry as a "black box" controlled solely by the timebase pulse, the latch-enable pulses, and the clock pulses on pins 13, 10, and 12 of IC4 respectively.

Clock pulses for IC4 are derived from IC1b which is connected as a multivibrator and runs continuously. Its frequency is controlled by the .018-µF capacitor in company with VR2, VR3, and the 27k-Ω and 12k-Ω feedback resistors. Switch S1 shorts out VR3 and the 27k-Ω resistor, thus changing the oscillator frequency so that the display can read directly in either feet or meters.

The clock frequencies for IC1b are derived as follows: The speed of sound in water is approximately 1500 m/s and is fairly constant over

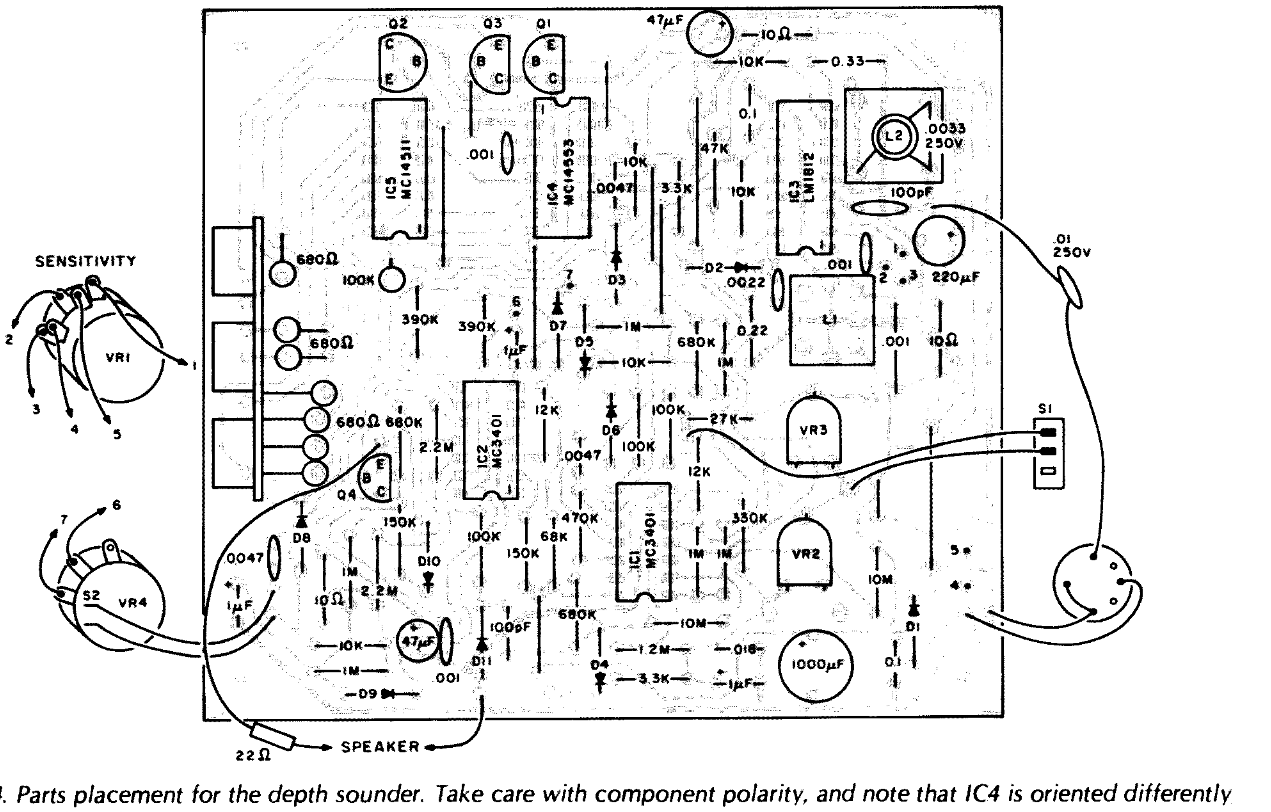


Fig. 4. Parts placement for the depth sounder. Take care with component polarity, and note that IC4 is oriented differently than the other ICs.

quite a wide range of temperature and salinity. It will therefore take 1 second to receive an echo in 750 meters of water, since the sound pulse has to go down and up. Thus, if the clock is set to 750 pulses per second, the counter will count up to 750 and the water depth will be displayed directly in meters.

If we want the display to read in feet, then the oscillator frequency can be found simply by multiplying 750 by 3.28 (the conversion factor from meters to feet), which gives 2460 Hz. Thus, the clock must run at 2460 Hz for feet and 750 Hz for meters. A fathoms display could be achieved with a clock of 2460/6 = 410 Hz.

Finally, we come to the alarm function. The depth at which the alarm sounds is set using front-panel alarm-set control VR4. First, the alarm-set control is pulled out to display the alarm setting. The control is then rotated until the display reads the required alarm depth and then pushed in again. The display immediately reverts to the water depth and, if this is less than the alarm setting, an audible warning is produced.

All alarm functions are controlled by IC2, an MC3401 quad op amp. IC2a functions as a monostable multivibrator, the period of which is determined by VR4 and the 1-µF timing capacitor. The monostable is triggered by the timebase pulse which is coupled in via a 100-pF capacitor and causes pin 9 to go high, thus reverse biasing diode D7.

If an echo is received while the monostable output is high, then both D6 and D7 will be reverse biased for the duration of the echo pulse (i.e., for as long as pin 9 of IC1c remains high). This causes pin 3 of IC2b to go high and the pin 4 output to go low. Since it is now forward biased, the anode of diode D9 also goes low, enabling oscillator IC2c to start up.

IC2c is a voltage-controlled oscillator whose frequency depends on the voltage at the anode of D9, i.e., the charge on the 1-µF capacitor. Initially, the 1-µF capacitor is discharged and the oscillator starts at a high frequency. When the echo pulse ends, D9 is reverse biased again and the 1-µF capacitor charges towards the positive supply rail via a 1-megohm resistor. As the voltage across this capacitor rises, the discharge current from the .001-µF capacitor slows and the output frequency drops lower and lower until eventually the oscillator stops.

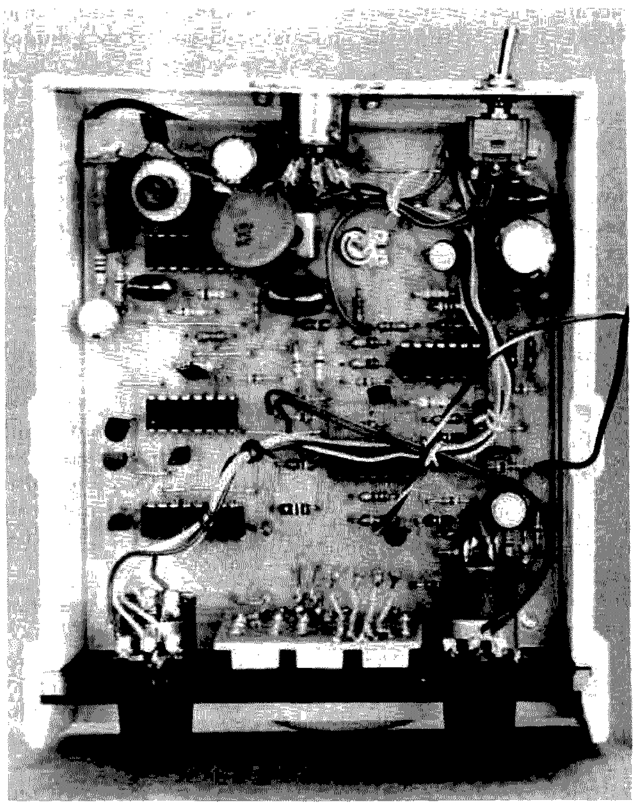


Photo C. Close-up view of the completed PCB assembly. Note that the seven 680-Ohm resistors adjacent to the display board are mounted end on.

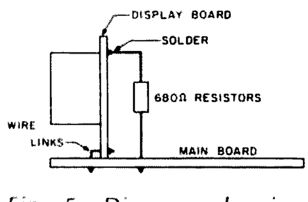


Fig. 5. Diagram showing how four of the 680-Ohm resistors are mounted.

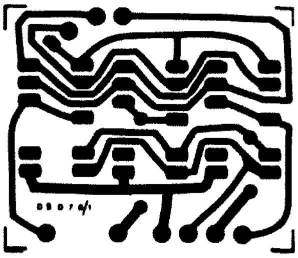


Fig. 6. PC board for the display.

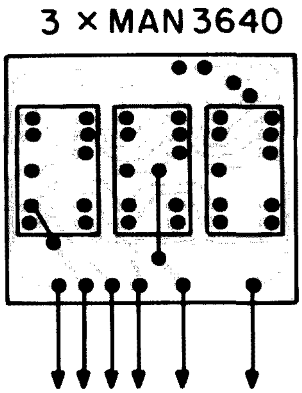


Fig. 7. Parts placement for the display PCB.

NPN transistor Q4 simply functions as a buffer and drives a small loudspeaker in its emitter circuit via a 22-Ohm resistor. The result is a siren-like note pulsed at the timebase frequency.

The alarm can sound only if an echo pulse is received while the output of monostable IC2a is high. Thus, it is the monostable pulse width that determines the alarm depth and this is displayed by using the trailing edge of the pulse to trigger the latch enable (pin 10) of counter IC4.

First, however, the echo pulse must be disabled, and this is done by setting the sensitivity control (VR1) to minimum. The output of monostable IC2a is differentiated by the .0047-µF capacitor and the negative-going pulse produced at the trailing edge coupled via switch S2 (on the back of VR4) and diode D8 to the latch enable of IC4. Since the timebase simultaneously resets IC4 and enables IC2a, the display will now show the alarm depth in the appropriate units.

Power for the circuit is derived from a 12-V battery (normally fitted to the boat). Diode D1 provides protection against reversed supply polarity, while 0.1-µF and 1000-µF capacitors provide supply decoupling and filtering. Choke L3 is not supplied as part of the kit and is not fitted unless problems are encountered with ignition interference (see Construction).

Construction

Construction can begin with the assembly of the main PCB according to the overlay diagram. Insert the wire links first, followed by the resistors, capacitors, coils, diodes, and transistors. Take care to ensure that all polarized components are mounted the right way round.

The ICs should be inserted last. Note that IC4 and IC5 are CMOS devices and

should be treated accordingly. When soldering these devices, ground the barrel of your soldering iron to the ground track on the PCB (use a small clip lead) and solder the supply pins (8 and 16) last.

The display PCB should be assembled next. Watch the orientation of the displays and note that the links must go in first. The display board is mounted on the main board using six tinned copper-wire links along the bottom edge. In addition, four of the 680-Ohm current-limiting resistors are mounted between the main PCB and the display PCB and, if these are bent as shown in Fig. 3, will provide additional support.

The front-panel controls can now be mounted in position and the red perspex window cemented in place using epoxy adhesive. This done, wire the controls to the main PCB and fit the DIN socket and feet/meters switch to the rear panel.

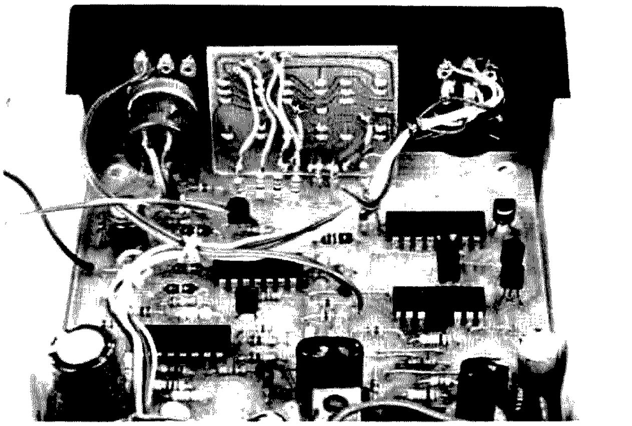


Photo D. Front panel and display PCB details. Note that the spare switch pole on the alarm-set control can be used to automatically disable the echo pulse (see text).

Complete the wiring according to the main wiring diagram and Fig. 3.

Although not part of the original design, the circuit can be easily modified so that the echo signal is automatically disabled whenever S2 is closed. As supplied, there is a spare switch pole on the back of VR4, and this may be used to disable the echo signal by connecting it between pin 2 of IC3 and ground. With this simple modification, you won't have to fiddle with the sensitivity control each time you wish to display the alarm depth.

The loudspeaker is fitted to the top half of the case (over the slots) by gluing it in place with contact adhesive. A piece of cloth is provided to cover the slots. Connect up the speaker, fit the transducer DIN plug with a couple of flying leads for the power connections, and you are ready for the smoke test!

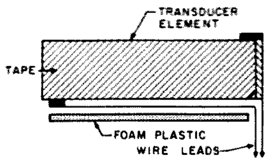
Apply power (12 V) and switch on. All being well, you should be greeted by a chirp from the speaker and the display should read 000 or 001. Make sure that the alarm-set control is pushed in and fully anticlockwise (i.e., alarm off).

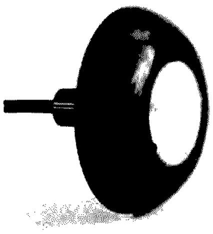
Now set the sensitivity control to minimum (to disable the echo pulse) and pull out the alarm-set control. Slowly rotate the alarm-set control clockwise and check that the display shows progressively higher numbers. If this check is OK, operate the feet/meters switch and check that the display changes by a 3:1 ratio. With the alarm-set control fully clockwise, the display should read a maximum of approximately 30

TRANSDUCER ASSEMBLY

Begin the transducer assembly by gluing together the two plastic pieces forming the element housing. These are molded in ABS, so use a suitable styrene adhesive. Apply adhesive sparingly to the top edges of the "fried-egg"-shaped piece and then press the two parts together, ensuring that the mounting holes are correctly aligned. Allow sufficient time for the adhesive to dry.

The barium titanate element must be prepared next. Carefully tin a small spot close to the edge of the element on each side and solder a short length of hookup wire to each spot. Be very careful with this operation, as too much heat will burn the silver off the surface of the element. Wrap the circumference of the element in plastic tape, using the tape to hold one of the wires against the edge.





The surface where the two wires emerge is now the rear face of the transducer. Now lay the wire from the rear surface against the transducer and place the plastic foam disc in position. Use more tape to secure it in place. The two wires should now emerge from one side as shown and should be reasonably well supported by the tape. Leave about 25 mm of wire free and strip and tin 3 mm at the end of each wire.

Force one end of the coaxial cable through the hole in the stem of the housing and strip and tin the ends of the braid and the center conductor. Carefully solder the coax to the wires coming out of the transducer assembly and insulate the joints with more plastic tape.

The transducer assembly must now be pushed into the housing, carefully pulling the coax down to avoid building up a loop of cable behind the transducer.

Push the transducer down in the housing so that its front surface is about 3 mm below the lip of the housing cavity. Check the cable at the other end for shorts; if all is well, put your meter on a low ac voltage range and tap the transducer with a screwdriver handle. You should see the meter give a kick, indicating that the transducer is functioning correctly. If not, check your connections carefully.

Support the transducer assembly face up, where it can be left overnight, and you are ready for the epoxy resin encapsulation. Do not use 5-minute epoxy. You must obtain some epoxy resin with a 6–12-hour setting time and carefully mix up enough to fill the transducer housing. After mixing, allow it to stand for about 20 minutes to allow the air bubbles to escape, then pour it into the transducer housing.

Fill the housing right to the top so that the transducer element is completely immersed and keep an eye on it for an hour or so, topping it as it runs down behind the element. Use a pin to prick any air bubbles that emerge. Take care here, as any air bubbles can drastically degrade transducer performance.

On no account should you use polyester resin—you must use epoxy. Epiglass 40 resin is quite satisfactory.

Finally, fit the DIN plug to the end of the cable, and fit the red and black supply leads.

meters (VR2 and VR3 roughly midrange).

Now turn the alarm off and the display should go back to zero. Turn the sensitivity control fully clockwise and lightly tap the face of the transducer with a screwdriver handle. The display should flicker and momentarily read some random numbers. If the alarm is now set to maximum depth, it may be possible to trigger it by tapping the transducer face as above. (It will trigger only if you "hit" upon an echo reading of less than the alarm setting.)

Calibration

If all the above tests work, your depth sounder is functioning and will give readings if taken out in a boat. However, it has to be tuned and calibrated if we are to obtain maximum sensitivity and if the readings are to be accurate. If you have access to the appropriate test gear, this can be done easily on the bench; if you don't have test gear, the only way is to take the instrument out on the water.

Assuming that you don't have test gear, the procedure is as follows:

● *Tuning.* Advance the sensitivity control until an echo is obtained, then back it off until the echo is just lost. Now tune L1 carefully until the echo reappears (display reading). Reduce the sensitivity again and continue the process until the optimum setting is found for L1. L2 can be tuned in the same way, but as this has a low Q, its setting is not so critical. Most units will tune with the slug of L2 about flush with the top of the former.

● *Calibration.* Once the tuning is done, the calibration can be set if you have a chart. The problem is to find a known depth of water and set VR2 and VR3 to the known depth. Do not forget to allow for the fact that the transducer may not be at the surface if it is mounted on the bottom of the boat; i.e., the instrument reads depth beneath the transducer.

It may even be possible to resort to the good old lead line to get an accurate depth measurement.

First, set switch S1 to the feet position and adjust trimpot VR2 until the display shows the correct depth. This done, set S1 to meters and adjust trimpot VR3. Note that VR2 must be set first as it affects the setting of VR3.

If you have access to an oscilloscope, a signal generator, and a frequency meter, the procedure is somewhat different:

● *Tuning.* Connect the oscilloscope probe to pin 1 of IC3 and couple in a 200-kHz signal to L2 via the .01-µF capacitor. Now adjust L1 and L2 for maximum signal strength.

If no signal generator is available, then it is possible to get a signal echo in air. Clamp the transducer to the underside of the workbench and check that the unit is over a hard floor (carpet will not reflect ultrasound). Once an echo is being received, simply tune L1 and L2 for maximum signal strength. (Note: Because of the much lower velocity of sound in air than in water, the display will read about four and a half times the actual distance.)

● *Calibration.* A frequency meter connected to pin 5 of IC1b will allow precise setting of VR2 and VR3 to 2460 Hz and 750 Hz respectively. Alternately, you can use a CRO or a frequency meter to set the periods to 406 µs and 1.333 ms respectively.

Once the unit is tuned and calibrated, it may be mounted in the case. To do this, lay the top half of the case (the half with the speaker in it) upside down on the bench and sit the circuit board on the four mounting pillars. Fit the front and back panels into the slots provided and fit the large brass nuts into the cavities in the sides. Ensure that the board holes line up with the mounting pillar holes and fit the bottom half of the case.

The two halves will fit together closely and the four 12 mm × no. 4 self-tapping screws may be fitted through the bottom holes and screwed into the mounting pillars. The U-shaped mounting bracket may now be attached with the large plastic knob-headed screws. Fit the front-panel control knobs, and your instrument is ready for use.

Operation

The transducer is the key to satisfactory operation of

Parts List

1	printed circuit board, 111 x 100 mm
1	printed circuit board, 41 x 35 mm
1	SPST toggle switch
1	5-pin DIN socket and plug
1	plastic case, 125 x 140 x 58 mm
1	front panel to suit
1	8-Ω loudspeaker
2	knobs
1	U-shaped mounting bracket
2	mounting knobs for bracket
1	ultrasonic transducer kit
2	slug-tuned coils, L1 & L2
Semiconductors	
2	LM3900, MC3401 quad op amps
1	LM1812 ultrasonic transceiver
1	MC14553 3-digit BCD counter
1	MC14511 BCD-to-7-segment decoder
3	2N5819 PNP transistors
1	2N5818 NPN transistor
11	1N4001 silicon diodes
3	MAN3640 7-segment LED displays
Capacitors	
1	1000 µF/16VW PC electrolytic
1	220 µF/16VW PC electrolytic
2	47 µF/16VW PC electrolytic
3	1 µF/16VW tantalum
1	0.33 µF mylar™
1	0.22 µF mylar
2	0.1 µF mylar
1	.018 µF mylar
1	.01 µF/250 V disc ceramic
3	.0047 µF mylar
1	.0033 µF/250 V disc ceramic
1	.0022 µF mylar
4	.001 µF mylar
2	100 pF disc ceramic
Potentiometers	
1	100k linear potentiometer with DPST pull-on switch
1	10k mini-trimpot, horizontal mounting
1	5k mini-trimpot, horizontal mounting
1	5k linear potentiometer with SPST rotary switch

Resistors (¼ W, 5% unless specified)

2	10 megohm	1	68k
2	2.2 megohm	1	47k
1	1.2 megohm	1	27k
6	1 megohm	2	12k
3	680k	5	10k
1	470k	2	3.3k
2	390k	7	680 Ohms
1	330k	1	22 Ohms
2	150k	3	10 Ohms
4	100k		

Miscellaneous

Rainbow cable, tinned copper wire, solder, styrene adhesive, epoxy resin

any depth sounder, and a few tips on mounting may not go astray. Many people have mounted transducers inside the hull in a "water-box" and it is possible to get satisfactory results with this method. However, some sound attenuation will occur and this will reduce the range of the instrument. In the worst case, it may not work at all.

The best mounting method is on the outside of the hull, roughly in the middle third of the boat and as close to the center line as possible. It must be clear of any fittings and in an area of clear water flow. Turbulence and bubbles under the transducer will reduce its performance. In yachts, hull-heeling under sail will cause the transducer to fire its sound beam out at an angle and this will reduce sensitivity; if the boat heels far enough, the echo may be lost altogether. Mind you, when this happens, the crew is usually too busy to be looking at echo sounders!

Installation of the unit should be straightforward, but keep the transducer and all leads as far away from the engine as possible to avoid ignition interference. If ignition interference does prove a problem (i.e., the display reading fluctuates randomly), choke L3 will have to be fitted in place of the appropriate link on the PCB. This should be a power supply choke of around 10 mH in value.

Because this choke is not available from Monitor Instruments, it will have to be purchased separately, if required.

The maximum depth range attainable with this instrument will vary considerably and depends on a number of factors including tuning accuracy, transducer mounting, water turbulence, and bottom reflectivity. Bottom reflectivity will be high with a flat sandy bottom and may be nil with heavy weed growing over soft mud.

A typical unit should give a depth range of from 80-120 meters without any difficulty and possibly more with careful tuning and installation.

Note that apparently strange readings can occur with this type of instrument because the display is triggered by the first echo received. For example, echoes may be received from cold layers in the water, undersea currents, propeller wash from other boats, and even fish. The usual effect of this is a steady bottom reading of 30 meters, say, with occasional readings of much less, e.g., a fish at 20 meters or a salinity or cold water layer at 15 meters, etc. ■

KITS AND PARTS AVAILABLE

The sole supplier of the PCB, a proprietary design, is Monitor Instruments, PO Box 116, Rosebery, Sydney, 2018, NSW Australia. Any of the following ordered, when orders are received with payment, will be shipped within 5 days. Amounts are in US dollars.

Fully assembled and tested Depth Sounder—$180.00[1]
Complete kit (add $12.00 for postage)—$138.00
Transducer kit (add $7.00 for postage)—$40.00
Molded plastic case/mounting (add $5.00)—$25.00[2]
Set of circuit boards (add $5.00)—$20.00
Set of coils (add $5.00)—$12.50
Set of semiconductors, complete (add $5.00)—$25.00[3]

[1]Postpaid.
[2]Includes front and back panels, control knobs, and gimbal mounting bracket/knobs.
[3]Does not include the displays.

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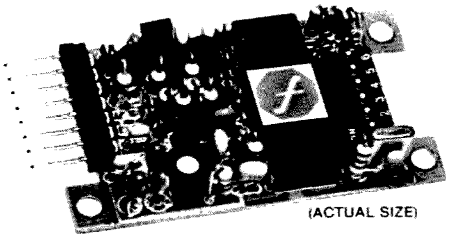
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The ROM-less, RAM-less CQ Sender

Automatic CW can be yours for the price of a few diodes. And you can reprogram without spending a dime.

Morse code can be generated automatically by various methods using memory chips like RAMs, PROMs, and EPROMs. If RAMs (Random Access Memory) are used in the design, the memory is temporary. That means if the unit is switched off, all the memory contents will be blanked unless there is a standby battery connected permanently. Providing a standby battery is not economical, at least for hams.

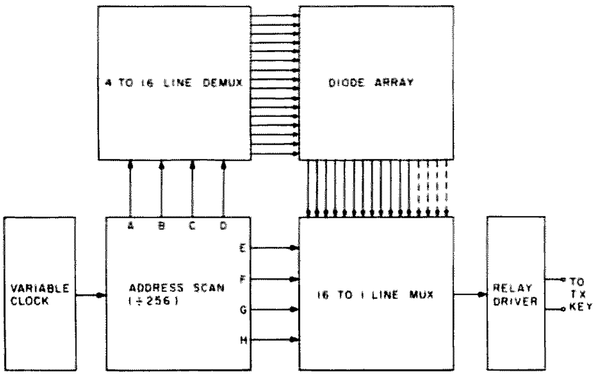
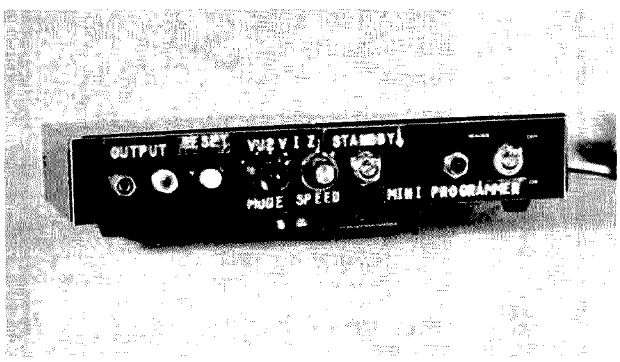


Fig. 1. Block diagram of CQ Sender.



The reprogrammable automatic CQ Sender.

ROMs (Read Only Memory) are programmed by the manufacturer according to the consumer's requirement and cannot be altered once programmed. But the programming is permanent, hence does not require a standby battery.

PROMs (Programmable ROMs) are identical to ROMs except that they can be programmed by the user. The big disadvantage is that the programming cannot be altered once programmed. Hence it will become useless if the callsign of the user is changed. Moreover, PROMs require a complicated setup to program. The IC becomes useless if greatest care is not taken while programming.

One is able to program EPROMs (Erasable PROMs) any number of times. They do not require standby power to retain their memory. The contents can be erased by exposing the IC to UV lights (UVEPROMs) or by electrical energy (EEPROMs). However, for each programming, a complicated separate circuitry with different voltage supplies and UV light to erase the contents are required. Many builders do not have and cannot afford to have what is required for this. Also, the EPROMs themselves are very costly.

Keeping all this in my mind, I have designed a "CQ Sender" which is equivalent to EPROM design in operation yet uses no EPROMs, PROMs, ROMs, or RAMs. My design has got all the facilities you can get using EPROMs, yet it does not require any separate programming circuitry or the UV light for erasing the contents! At first you may think that it is not possible, but I did it!

The block diagram of "CQ Sender" is shown in Fig. 1 and the schematic diagram in Fig. 2. It consists of the following:

- Clock-pulse generator, 7400 IC
- Address scan (÷256 counter), 2×7493
- 4-line-to-16-line 74154 demultiplexer
- Diode matrix—all 1N914 diodes

●16-line-to-1-line 74150 multiplexer
●Switching transistor SL100 and relay

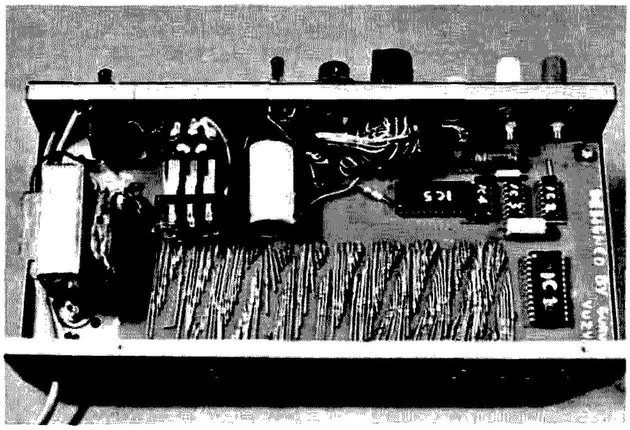
The *clock-pulse generator* is constructed using 2 inverters (a NAND is used as an inverter). The clock frequency is variable, enabling us to set the CW speed at any desired level.

The *address scan* is constructed using two cascaded 7493 chips (each ÷16 mode). An address scan is nothing but a ÷256 counter. It counts from 0 to 255 (256 states) and resets to 0 and starts counting once again. The clock output is fed to this counter's clock input. This means for every one clock pulse (falling edge) the counter advances by one count. The counter has 8-bit output lines (to represent 255 in binary form we need 8 bits), and out of these 8 lines the first 4 lines (starting from LSB) are applied to the demultiplexer IC and the remaining 4 lines to the multiplexer IC.

The *4-line-to-16-line demultiplexer* accepts a 4-bit binary output address and has 16 output lines. If a 4-bit binary output address like 0110 is applied to it, then the corresponding output line (no. 6) will go to the low level leaving all the remaining 15 output lines at high level. Since 4 output lines of the 7493 IC are fed to the "output address" of this demultiplexer, each of its output lines will go low and remain there for a duration determined by the clock frequency.

The *diode matrix:* While programming, each dot is considered as 1 unit, each dash is considered as 3 units, a character gap is 1 unit, a letter gap is 3 units, and a word gap is 5 units. Whenever a dot is required, the output from the appropriate line of the demultiplexer is taken through a diode. If a dash is required, then the outputs from 3 consecutive lines are taken through individual diodes and these diodes are bunched together. These bunches (columns) of diodes are then connected to the different input lines of the 74150 multiplexer.

Referring to the schematic diagram (Fig. 2), the first diode column consists of 8 diodes and the second column consists of 10 diodes. In the first column, the outputs of lines 2, 3, and 4 are taken to generate a dash and the output of line 5 is not taken (for 1 unit space). Then the output of line 6 is taken for a dot, while line 7 is not used (for a unit space). The outputs of lines 8, 9, and 10 are taken through diodes (for a dash), the output of line 11 is not used (for a unit space), and the output of line 12 is taken for a dot. This arrangement produces the code — · — · which is equivalent to the letter C. As per convention, a 3-unit space is given after the letter C (the outputs of lines 13, 14, and 15 are not used). In the



Interior view of the reprogrammable automatic CQ Sender.

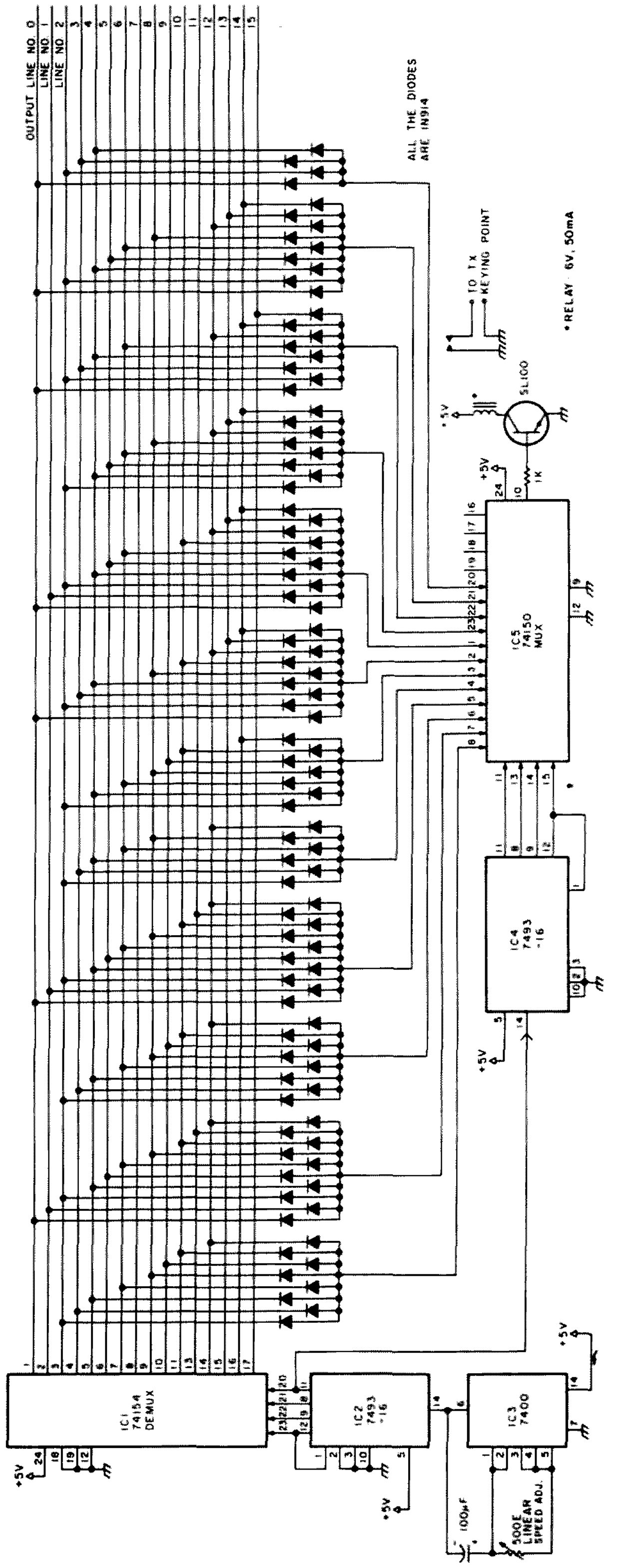


Fig. 2. Schematic diagram of the CQ Sender, programmed to call "CQ CQ DE VU2ARC $\overline{AR}$ K."

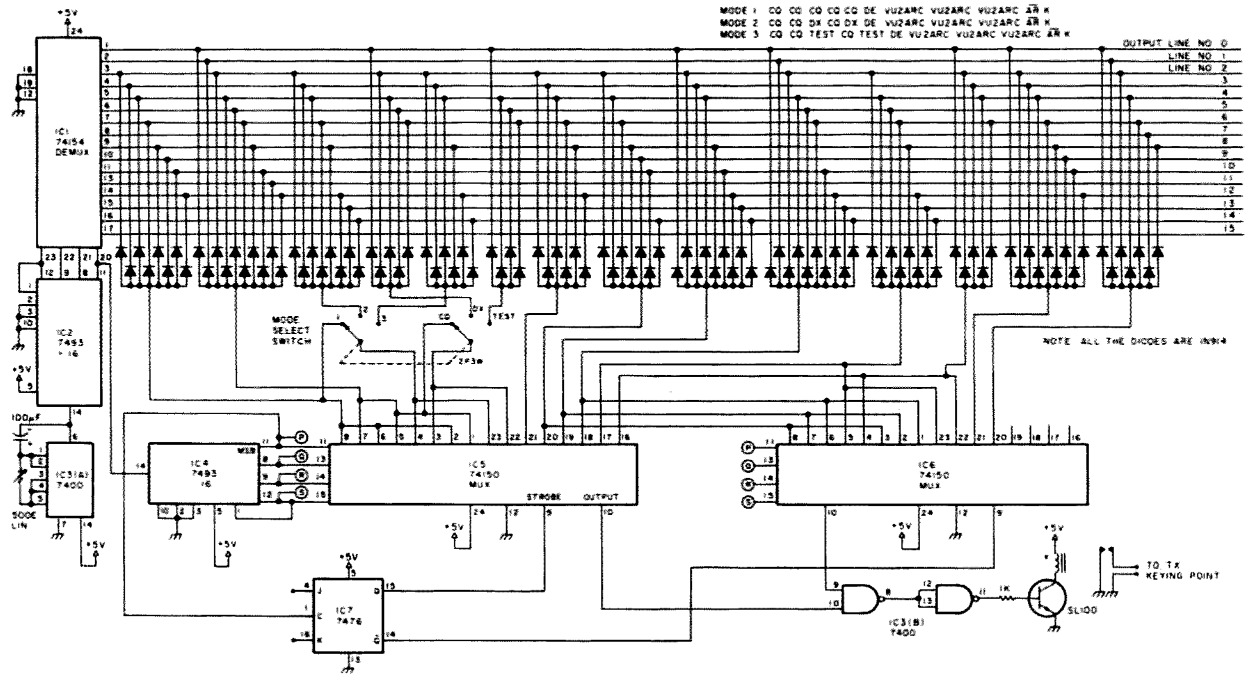


Fig. 3. Improved CQ Sender with different modes.

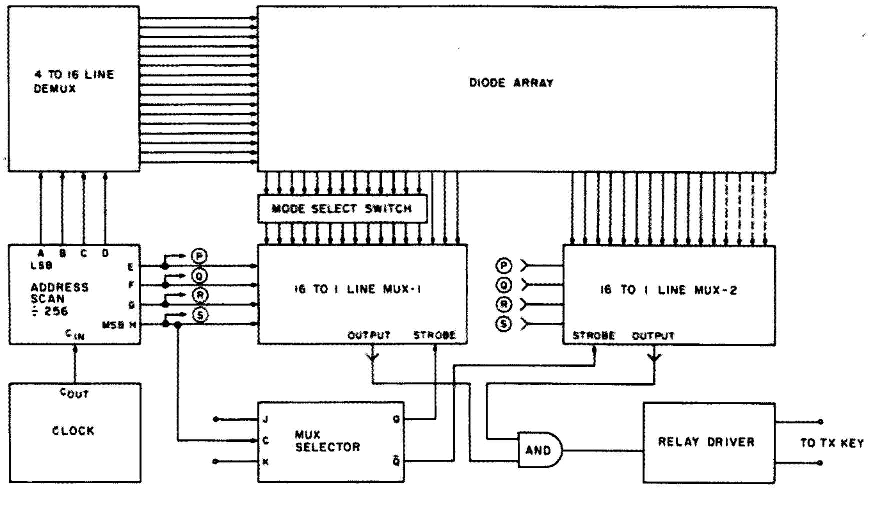


Fig. 4. Block diagram of the "improved" CQ Sender with different modes.

second column of diodes you will notice the letter Q is generated, in the third column again C (notice the 5-unit word space before this C), and in the fourth column Q is generated. In the fifth column the word DE is programmed and so on. All these columns are connected to the individual input lines of the 74150 multiplexer.

The *74150 multiplexer* has 16 data-input lines, one output line, and 4 input addresses. If a 4-bit binary code is applied to its input address, then the data-input line which is the decimal equivalent of the applied binary input address will be connected to its output line. Suppose a binary code like 1000 is applied to its input address. Then data-input line 8 would be connected to its output line (pin 10 of the 74150 IC), and during this period, whatever data is fed to this input line would be made available at its output line (after an inversion, of course). To make it simpler, this multiplexer can be considered as a single-pole, 16-way (1P16W) bandswitch. As soon as the unit is switched on, the pole will be connected to its first "way" (bandswitch in position 1) and at the end of the 16th pulse (from the clock), this bandswitch receives a command through its input address to change its position from the first band to the second band. At the end of the 32nd pulse, this bandswitch moves to the third position and so on. At the 16th position, the bandswitch remains for a 16-pulse duration, then switches back to its first band position and the cycle repeats.

The output of this multiplexer will be a continuous stream of 0s and 1s. This output will then be applied to a switching transistor, SL100. For each 1 the relay will be actuated (holds) and for a 0 the relay will not operate. The relay contacts are used to key the transceiver (alternately, a switching transistor like 2N3696 could be used).

An improved CQ Sender with different modes and an increased memory (Fig. 3) will add either "DX" or "test" to the call and will repeat the callsign three times. The memory of the modified sender is doubled by the addition of a second 74150, a 7476, and an AND gate to create a 32-line-to-1-line multiplexer. This allows the callsign to be repeated three times, although it is programmed only once in the diode matrix.

A double-pole, three-way switch selects the message

to be sent. As it is programmed in Fig. 3, the enhanced CQ Sender will send "CQ" five times, "DE," and then "VU2ARC" three times if the switch is in position 1. In position 2, the message will be "CQ CQ DX CQ DX" with the same sign-off, and in position 3 the sender will emit "CQ CQ TEST CQ TEST," again adding the same ending. In all three modes, it will complete the transmission with $\overline{\text{AR}}$ K.

(In the prototype, the word QRZ was also included as the fourth mode. Later on, it was found not very important and hence it is not shown in Fig. 3.)

Conclusion

With the RC values shown for the clock oscillator, the generated Morse speed can be varied anywhere between 8 and 15 wpm. After calling "CQ CQ DE VU2ARC $\overline{\text{AR}}$ K" once, a pause of about 8 seconds (at 8 wpm) occurs before it starts calling the CQ message once again. During this 8-second gap the transceiver will be in the receive mode to receive a possible reply. The relay output (normally-open contacts) can be connected in parallel with a straight key or to an automatic keyer.

The power supply for this unit was designed using the 7805 3-terminal 5-V voltage-regulator IC.

The programming can be altered simply by rearranging the diode positions in the diode matrix.

The circuit was assembled on a PCB and housed in a ready-made slim metal box and was demonstrated at our club meeting and also at the BEL ARC exhibition held recently in Bangalore. The design was much appreciated by the engineers and by many senior hams like VU2GSM, VU2GZ, and VU2IR. ■

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Yasme and the Call of Abu Ail

It was just a speck in the Red Sea, but it created pileups as big as a mountain.

Lloyd Colvin W6KG
Iris Colvin W6QL
Yasme Foundation
Box 2025
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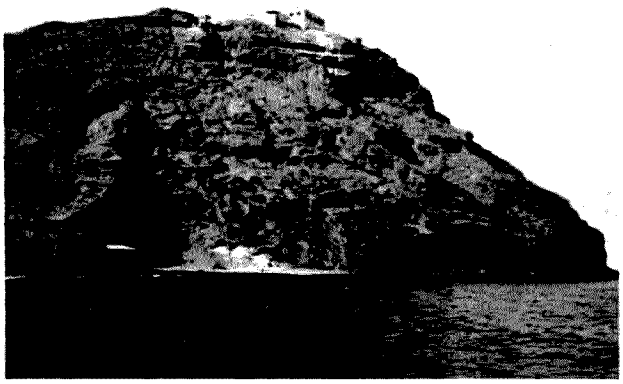
Yasme was the name of the boat on which a radio amateur named Danny Weil went forth in 1954 on a continuous worldwide trip devoted primarily to communication with other radio amateurs throughout the world. He was the first person in the world to make such an expedition. The Yasme Foundation was formed and, over the last two decades, nearly 100 Yasme DXpeditions to rare and semi-rare countries have been made with various operators participating.

This is the story of the December, 1982, Yasme DXpedition to Abu Ail, which is one of the rarest DX countries in the world. Preparations and correspondence pertaining to the trip were in the making for three years.

Abu Ail (with Jabal At Tair) is listed as a separate country by the ARRL. They are both islands with a lighthouse and people on them. Abu Ail is a 350-foot-high rock located in the Red Sea, on the major water route from the Indian Ocean through the Red Sea to the Suez Canal and on north to the Mediterranean. The island is well named (Arabian words meaning "Father Ail") because its lighthouse watches over and guides the many ships away from the rocks. None of them stop, and the lighthouse keeper stays there eight months at a time without leaving the lighthouse.

Abu Ail is an international island owned by no one nation. On a clear day, Ethiopia can be seen to the west and North Yeman to the east.

Permission was eventually obtained from the administrators of the islands, The Compagnie Maritime Auxiliare d'Outre-Mer in Djibouti—who are associated with Red Sea Lights of London—to visit the island and operate an amateur radio station there, thus making a DXpedition to Abu Ail possi-



Abu Ail and the cliff up which everything had to be carried.

Lloyd and Iris in the landing cove with a generator and some gasoline. The Fahnous *is in the background.*

ble. We have been going on Yasme DXpeditions for many years and did most of the planning of the trip up to this point. Additional help then was needed, and fortunately, two French amateurs, Christian Dumont FØECV and Jean Michel Gabouriaud F6GBQ, were recruited. (They are J28DP and J28DL in Djibouti.) They supplied generators and additional needed radio gear.

All four of us had to sign agreements that we and our heirs and assigns accepted full responsibility for any casualty or mishap that might occur. We agreed not to interfere with the functions of the lighthouse in any way whatsoever. We agreed to take with us anything that we needed in the way of food, water, generators, gasoline, and anything else that we might use.

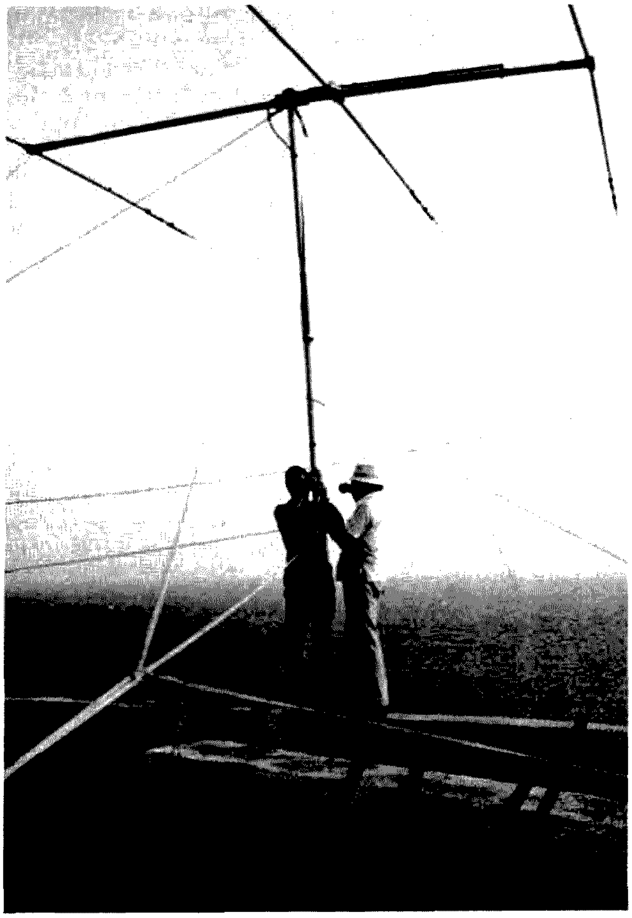
Arrangements were made for passage on the *Fahnous* (Arabian word meaning "lamp"), the supply ship that services the island monthly with food, water, and supplies. We agreed to pay for our passage and for the diversion of the ship from its regular route, putting us ashore on Abu Ail, continuing on to Jabal At Tair, and then returning 48 hours later to pick us up. We fully understood that the ship could not remain anchored near the island and that we must be ready and waiting to board quickly when the ship arrived.

We made a list of essentials, keeping in mind that time was limited and that everything must be carried up the steep cliff. The list included food and water for 48 hours, sleeping bags, gifts for the lighthouse keeper, and our radio equipment, consisting of two generators (one 1.5 kW and one 500 Watts), gasoline, antennas, coax, a Yaesu 707, a Kenwood 520, a Yaesu 902DM transceiver, and a Heathkit 230 amplifier.

The good ship *Fahnous* left Djibouti with the four of us and our equipment aboard at about 3:00 pm on December 4, 1982. The seas were extremely high during the night but were somewhat calmer when we arrived at Abu Ail at 8:00 am the following morning. All of our equipment and ourselves had to be transferred from the ship to a small dinghy. The seas were still rough, and the dinghy was bouncing up and down alongside the ship as much as 6 feet with each wave. Both the loading of the dinghy and the landing ashore were dangerous and tricky. It would have been very easy to have lost our equipment or suffered injury ourselves. Fortunately, the only mishap was to the dinghy, which hit a reef during the landing, causing some damage to its side. After landing, we started the ascent up the cliff with our equipment, giving priority to the actual radio gear. The wind blew continuously, making the trek up even more difficult.

By about 10 am, G5ACI/AA was on the air, using the vertical antenna, the Yaesu 707, and the small generator. A little after noon, both stations were in operation. The four of us took turns operating for sessions of approximately two hours each. At the same time, work was continued to bring the rest of the supplies up the hill and to put up doublets for 40 meters and the new 30-meter band.

We encountered a number of minor setbacks and delays. The limited space at the top of the rock made it impossible to locate the two stations far enough apart for both to operate on some frequencies simultaneously without interference. The guys for the TH3 had to be located over the edge of the cliff, which slowed the process of erecting the beam. We also ran into some difficulties in getting either the Yaesu 707 or the Kenwood 520 on CW operation.



Jean F6GBQ (left) and Lloyd W6KC erecting an antenna on Abu Ail. It is 350' almost straight down to water behind them.

The crew at G5ACI/AA. Left to right, Jean Michel Gabouriaud F6GBQ, Christian Serge Dumont FØECV, Lloyd Colvin W6KC, and Iris Colvin W6QL.

All obstacles were eventually overcome. We stayed on the air continuously, operating on 5 bands, both phone and CW. We made contact with over 4000 amateurs in 105 different countries.

At about 6:00 am on the morning of December 7th, we sighted the *Fahnous* approaching. We began dismantling the stations and pulling down the antennas. We bid farewell to the lighthouse keeper, who said that our visit was an exciting change from his usual routine. The descent was somewhat easier and faster than the ascent. The gasoline had been used up, and any extra food was left behind.

As we boarded the *Fahnous*, we felt tired and exhausted—but we also were very happy over the successful completion of Operation Abu Ail.

A few observations and recommendations to anyone going on a similar DXpedition are listed:

1. Be sure that you obtain proper authorization and licensing, in writing, well in advance.

2. If possible, set up the complete operation, including all equipment (generators, etc.), at your home base before going on the DXpedition. We did this and discovered and corrected a number of time-consuming problems on the test run. These included how to solve problems of guying antennas, what interference we could expect to find, and what frequencies to use when simultaneously operating several stations close to each other. We found that we could operate a station on SSB and a station on CW simultaneously on the 10-meter band—but this could not be done on the other bands.

3. If you are going to climb a steep mountain carrying 50 to 80 pounds, figure out in advance the easiest way to do this. We found that the best thing was to reduce weight. Do not carry one pound of anything that is not required!

4. Try to think of everything in advance. We had small lights to use for nighttime operation, but we forgot to carry shades for the days. We had to waste some DXpedition time fabricating makeshift shades.

5. Don't forget to bring earphones—we almost did. With the noise from generators and two stations operating at once, the use of headphones was essential.

6. Remember to bring a soldering iron. Something will come up when it will be needed. We used ours on two occasions.

7. Figure out in advance how you are going to keep your logs. We were so anxious to get on the air that we got our log-keeping of the two stations a little mixed up at the start.

8. If you are going by sea, bring seasick pills and use them. We had the pills OK, but one of our operators thought that he wouldn't need them. He did.

9. If you have any equipment requiring batteries, bring along extras. Both of our keyers and one flashlight required battery changes.

We were very lucky as to the ability of our operators. All four operators carried their fair share of both the physical work and the operating. All operators were trained, experienced DXers, and the handling of the pileups was no major problem.

The Yasme Foundation and everyone connected with it wish to thank the DX operators of the world for the general courtesy they showed in standing by until they could work the rare country of Abu Ail. ■

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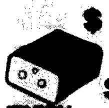

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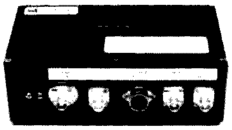

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SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

MAPLE RIDGE BC CAN
JUL 2-3

The Maple Ridge ARC will hold its Hamfest '83 on July 2-3, 1983, at the Maple Ridge Fairgrounds, 30 miles east of Vancouver on Highway #7. The registration fee for hams is $5.00 and for non-hams over 12, $2.00. Features will include a swap and shop, bunny hunts, ladies' and children's programs, and displays. Food and lots of camper space (some with hydro) will be available. Talk-in on 146.20/.80 and 146.34/.94. For registration information (20% off for pre-registration), contact Bob Haughton VE7BZH, Box 292, Maple Ridge BC V2X 7G2, Canada.

SHELLSVILLE PA
JUL 4

The Harrisburg Radio Amateur Club will sponsor the annual Firecracker Hamfest on Monday, July 4, 1983, at the Shellsville VFW picnic grounds, Exit #27 (follow signs 2 miles to Shellsville), I-81, north of Harrisburg. Admission is $3.00, XYLs and children will be admitted free, and there will be no charge for tailgating. There will be plenty of parking, shade trees, tables, and a pavilion. Talk-in on .16/.76 or .52/.52 simplex. For additional details and table reservations, contact KA3HZW, 131 Livingston Street, Swatara PA 17113, or phone (717)-939-4957.

SPOKANE WA
JUL 8-10

The 5-state ARRL Northwestern Division Convention will be held on July 8-10, 1983, at the Spokane Convention Center, Spokane WA. The Spokane Swapfest (normally in April) will be combined this year with the convention as will be the flea market. Registration is $5.00 and swap tables are $10.00. Events will include displays by manufacturers and dealers, seminars on antennas, computers, VHF/EME, weather, traffic handling, and repeater operation. There will be ARRL and advisory committee forums. Ladies' programs will include a luncheon and style show. The Saturday-night banquet will feature Roy Neal, NBC news correspondent, and the Royal Order of the Wouff Hong ceremony will follow at midnight ($1 admission). The DX breakfast and church services will be on Sunday morning. Close-in RV parking is available. For additional information, write Northwest '83, PO Box 3933, Spokane WA 99220.

FARIBAULT MN
JUL 9

The Faribault Amateur Radio Club will hold its 2nd annual swapfest on Saturday, July 9, 1983, from 9:00 am to 3:00 pm, at the Rice County Fairgrounds on the north edge of Faribault MN. General admission is $1.50, admission and selling space is $3.00 (indoor or outdoor), and tables (7-foot and by pre-registration only) are $3.00 each. Lunch and free parking will be available. There will be amateur radio and computer gear as well as electronic equipment displayed. Talk-in on 146.19/.79. For more information, contact Donald Klier, 1118 NW 8th Street, Faribault MN 55021.

OAK CREEK WI
JUL 9

The South Milwaukee Amateur Radio Club will hold its annual swapfest on Saturday, July 9, 1983, from 7:00 am to approximately 5:00 pm, at the American Legion Post #434, 9327 South Shepard Avenue, Oak Creek WI. Admission is $3.00 per person and includes a "Happy Hour" with free beverages. Parking, a public picnic area, hot and cold sandwiches, and liquid refreshments will be available on the grounds. There will be free overnight camping. Talk-in on 146.94. For more details, including a local map, write South Milwaukee Amateur Radio Club, Inc., PO Box 102, South Milwaukee WI 53172-0102.

STATE COLLEGE PA
JUL 9

The Nittany Amateur Radio Club will hold a hamfest and computer fair on Saturday, July 9, 1983, beginning at 8:00 am, at the Pleasant Gap Firemen's Park, Route 144, Pleasant Gap PA (just off Route 26, east of State College). Tickets are $3.00; tailgating spaces are $5.00. Talk-in on 146.16/.76 and 146.25/.85. For further information, write Dave Buckwalter KC3CL, 1635 Circleville Road, State College PA 18801, or phone (814)-234-0759.

MILTON ONT CAN
JUL 9

The Burlington Amateur Radio Club, Inc., will host the ninth annual Ontario Hamfest on Saturday, July 9, 1983, at the Milton Fairgrounds. For more information, write Burlington Amateur Radio Club, Inc., PO Box 838, Burlington ONT L7R 3Y7, Canada.

CROSSVILLE TN
JUL 9-10

The Plateau Amateur Radio Club will hold the Crossville Hamfest on July 9-10, 1983, at the Cumberland County Community Complex, Highway 70 North, Crossville TN. Admission is $1.00 for adults. Exhibit and flea-market space will be available on a first-come basis. There will be a Dutch-treat dinner on Saturday night. Talk-in on 147.93/.33. For further information, contact the Plateau Amateur Radio Club, PO Box 2621, Crossville TN 38555.

ALEXANDER NY
JUL 10

The Genesee Radio Amateurs, Inc., will hold the ARRL-approved third annual Batavia Hamfest on Sunday, July 10, 1983, from 6:00 am to 5:00 pm, at the Alexander Firemen's Grounds, Rte. 98, Alexander NY (9 miles south of Batavia). Registration is $2.00 in advance and $3.00 at the gate. Features will include a large exhibit area, OM and YL programs, contests, a boat-anchor auction, and overnight camping. Food will be available. Talk-in on 8.52 or 4.71/5.31 (W2RCX). For more information or advance tickets (make checks payable to Batavia Hamfest), write c/o GRAM, PO Box 572, Batavia NY 14020.

INDIANAPOLIS IN
JUL 10

The Indiana State Amateur Radio Convention, in conjunction with the Indianapolis Hamfest and Computer Show, will be held on Sunday, July 10, 1983, at the Marion County Fairgrounds at the southeastern intersection of I-74 and I-485. Gate tickets are $4.00 and entitle you to all activities. There will be inside and outside flea markets, a separate computer show and flea market, a commercial vendor's display area, technical forums, club activities, ladies' activities, and professional food services. There will be setups after 12:00 noon on Saturday, July 9th. Security will be provided Saturday night and Sunday, and camper hookup facilities will be available on the grounds. For further information, contact Indianapolis Hamfest, Box 11086, Indianapolis IN 46201.

DOWNERS GROVE IL
JUL 10

The DuPage Amateur Radio Club Hamfest/Computerfest will be held on Sunday, July 10, 1983, from 9:00 am to 4:00 pm, at the American Legion Post grounds, Downers Grove IL. Tickets are $2.00 and will be available only at the gate. There will be food, drinks, and plenty of parking space, as well as a large outdoor flea market. Talk-in on 144.89/145.49. For more information, send an SASE to W9DUP, PO Box 71, Clarendon Hills IL 60514, or call (312)-971-1156.

MONTANA-ALBERTA CAN
JUL 15-17

The 49th Glacier-Waterton International Hamfest will be held on July 15-17, 1983, at Waterton Homestead Campground, just north of Waterton National Park entrance on Highway 6 (Alberta, Can.). There will be a bunny hunt, technical sessions, entertainment, and swap tables. For more information and pre-registration, write PO Box 148, Milk River, Alberta T0K 1M0, Can.

Continued

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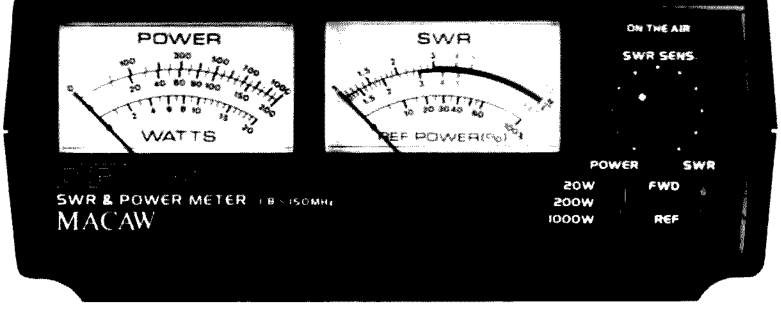

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CARY NY
JUL 16

The Cary Amateur Radio Club will hold its eleventh annual Mid-Summer Swapfest on Saturday, July 16, 1983, from 9:00 am to 3:00 pm, at the Lion's Club Shelter (next to Cary Senior High School), Cary NC. There is no admission or commission charge. Featured will be an open auction at 1:00 pm. Talk-in on 146.28/.88, 147.75/.15, and 146.52 simplex.

SHEBOYGAN WI
JUL 16

The annual Sheboygan County Amateur Radio Club Lakeshore Swapfest and Brat Fry will be held on July 16, 1983, from 10:00 am to 4:00 pm, at the Wilson Town Hall, south of Sheboygan WI. Tables are free and camping is available at Terry Andre State Park. There will also be a public auction. For a flyer and other information, write PO Box 895, Sheboygan WI 53081, or phone (414) 457-3203.

AUGUSTA NJ
JUL 16

The Sussex County Amateur Radio Club will hold its fifth annual hamfest, SCARC '83, on Saturday, July 16, 1983, at the Sussex County Farm and Horse Show grounds, Plains Road, off US Highway 206, Augusta NJ, just north of Newton. General registration is $2.00. There will be acres of free parking and outdoor flea-market space. Pre-registration for sellers is $4.00 ($5.00 at the gate). There will be a huge building for indoor sellers and pre-registration is $5.00 ($6.00 at the gate). Talk-in on 147.90/.30 and 146.52. For more information or registration, write Lloyd Buchholtz WA2LHX, 10 Black Oak Drive, RD 1, Vernon NJ 07462.

MANCHESTER NH
JUL 16

The New Hampshire FM Association will hold an electronics flea market on Saturday, July 16, 1983, beginning at 9:00 am, at the Manchester Municipal Airport. General admission is $1.00 per person (sellers, $5.00). Sellers should tailgate or bring their own table. Commercial displays are welcome. Refreshments will be available. Talk-in on 146.52 FM. For pre-registration, write NHFMA, Inc., 30 Meadowglen Drive, Manchester NH 03103. For further information, contact Dick DesRosiers W1KGZ at (603)-668-8880 or Doug Aiken K1WPM, 30 Meadowglen Drive, Manchester NH 03103, at (603)-622-0831.

EUGENE OR
JUL 16-17

The 8th annual Lane County Ham Fair will be held on July 16-17, 1983, at the Oregon National Guard Armory, 2515 Centennial, Eugene OR. Registration is $4.00 and swap tables are $5.00 each (2 maximum). Doors will open at 8:00 am both Saturday and Sunday and there will be a potluck supper at 6:00 pm on Saturday. Features will include a 2-meter bunny hunt, computer demos, technical seminars, swap tables, bingo, a Kiddie Korner, and women's activities. An all-day snack bar and free parking for RVs (no hookups) will be available. Talk-in on .52/.52, 146.28/.88, and 147.86/.26. For tickets or swap tables, send a check payable to Lane County Ham Fair to Tom Temby WB7WPU, Treasurer, 3227 Crocker Road, Eugene OR 97404, or phone (503)-689-1761.

PALMYRA IL
JUL 16-17

The Quad-Co. Amateur Radio Club will sponsor the 26th annual Hamfest of the Breakfast Club on July 16-17, 1983, at Terry Park, 3/4 mile east of Palmyra IL. Pre-registration until July 7, 1983, is $1.50 (at the gate $2.00). Camping facilities will be open from Friday afternoon until Monday morning. There will be games, contests, golfing, fishing, gear swapping, and on Saturday night, dancing and movies. Bring your own basket lunch; sandwiches and soft drinks will be available on the grounds. Talk-in on 3973 kHz from noon Saturday until 11:00 am Sunday. For more information, write Hamfest, c/o Quad-Co. ARC, 602-D East Walnut, Chatham IL 62629.

LAPORTE IN
JUL 17

The combined LaPorte-Michigan City Amateur Radio Clubs will hold their Summer Hamfest on Sunday, July 17, 1983, from 8:00 am to 2:00 pm, at the LaPorte County Fairgrounds, State Road 2, west of LaPorte IN. The donation is $3.00 at the gate. Good food, cold drinks, and paved outdoor parking will be available. For reservations for indoor tables (40¢/foot), write PO Box 30, LaPorte IN 46350.

EDGEWATER PARK NJ
JUL 17

The 5th annual West Jersey Radio Amateurs Hamfest will be held on Sunday, July 17, 1983, 9:00 am to 3:00 pm, rain or shine, at the Super 130 Drive-In Theatre, Route 130, Edgewater Park NJ (2 miles south of Burlington, 8 miles north of Palmyra). Registration is $3.00 and tailgating is $3.00 (sellers must bring their own tables). Early setup for vendors only is at 7:00 am. Talk-in on 147.75/.15, 144.87/.47, and 146.52. For further information or to order tickets, send an SASE to Mary Lou Shontz N2CLX, 107 Spruce Lane, Route 16, Mount Holly NJ 08060, or phone (609)-267-3063.

CANTON OH
JUL 17

The Tusco ARC (W8ZX) and the Canton ARC (W8AL) will present the 9th annual Hall of Fame Hamfest on Sunday, July 17, 1983, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Tickets are $2.50 in advance, $3.00 at the gate, and children under 16 will be admitted free. Flea-market parking is $2.00 and tables are available on a reserved basis at $3.50 each. A check must accompany reservations. There will be forums, dealers, a flea market, food, and XYL activities. Talk-in on 146.52 and 147.72/.12. For reservations or more information, contact Butch Lebold WA8SHP, 10877 Hazelview Avenue, Alliance OH, or phone (216)-821-8794.

BOWLING GREEN OH
JUL 17

The 19th annual Wood County Ham-A-Rama will be held on Sunday, July 17, 1983, beginning at 8:00 am, at the Wood County Fairgrounds, Bowling Green OH. Admission and parking are free. Trunk sales and food will be available. Advance table rentals are $5.00 and are for dealers only. Saturday will be available for setups until 8:00 pm. Talk-in on .52. For more information or dealer rentals, send an SASE to Wood County ARC, c/o Craig Henderson, Box 366, Luckey OH 43443.

POUGHKEEPSIE NY
JUL 23

The Mt. Beacon Amateur Radio Club will hold its annual ARRL hamfest on July 23, 1983, from 8:00 am to 3:00 pm, at the Arlington Senior High School, Poughkeepsie/Lagrange, Dutchess County NY. Admission is $2.00 (XYL and your children will be admitted free), tailgating space is $3.00 (includes one free admission), and a table space is $4.00 (includes one free table and admission). Hot food, beverages, and free parking will be available. There will be an auction beginning at 2:00 pm. Talk-in on 146.37/.97 and 146.52. For additional information, write Art Holmes WA2TIF, 2 Straub Drive, Pleasant Valley NY 12569, (914)-635-2614, or Walt Sutkowski K2DPL, W. Redoubt Road, Fishkill NY 12524, (914)-897-5158.

GLENWOOD SPRINGS CO
JUL 23

The Ski Country Amateur Radio Club will hold its second annual swapfest on July 23, 1983, at Colorado Mountain College, 1402 Blake Avenue, Glenwood Springs CO. There is no admission charge. Tables are $5.00 each. Talk-in .07/.67. For further information, contact Frank WA0BBI, Box 280, El Jebel CO 81628.

WELLINGTON OH
JUL 23

The Northern Ohio Amateur Radio Society will hold NOARSFEST on Saturday, July 23, 1983, from 8:00 am to 5:00 pm, at the Lorain County Fairgrounds, Route 18, 1/2 mile west of Route 58, Wellington OH. Donations are $2.50 in advance and $3.50 at the gate. Children under 12 will be admitted free. Parking for the flea market is $1.00 per car space. Flea-market setup is from 6:00 am to 8:00 am. Plenty of free parking will be available in a large general parking area. Indoor exhibit spaces with an 8-foot table are $8.00 each. Send check for advance registration to Don Winner WD8RZG, 8927 Torrance Avenue, Brooklyn OH 44144, or phone (216)-749-6594. There will be refreshments and 807s will be furnished by NOARS. Campers may park overnight Friday at no charge but no hookups will be available. Talk-in on 146.52/.52 (K8KRG) and 144.55/145.15. For admission tickets, write NOARSFEST, PO Box 354, Lorain OH 44052.

SEATTLE WA
JUL 29-31

The Western Washington DX Club (W7FR) will host the 31st annual Northwest DX Convention on Friday, Saturday, and Sunday, July 29-31, 1983, at the Double Tree Plaza Hotel, located near the South Center Shopping Mall and the Seattle-Tacoma Airport. There will be a Saturday night banquet and a Sunday morning breakfast, as well as speakers, slides, symposia, and awards. Talk-in on 146.40/147.00 (W7FR). For registration, contact Ruth Bennett WA7RVA, 6729 Beach Drive SW, Seattle WA 98116, or phone (206)-932-1335. For further information, contact WA7RVA or Roy Foote N7AIF, Chairman, 3029 48th Avenue SW, Seattle WA 98116, or phone (206)-935-8041.

OKLAHOMA CITY OK
JUL 29-31

The Central Oklahoma Radio Amateurs will hold the ARRL State Convention at Ham Holiday '83 on July 29-31, 1983, at the Myriad Convention Center, Oklahoma City OK. Pre-registration is $6.00 ($7.00 at the door). Children age 12 and under will be admitted free with a parent. Every pre-registrant may buy one flea-market table for $1.00. In addition to the noncommercial flea market, there will be displays, forums, programs, special group meetings, and a buffet and dance on Saturday night. Ample parking will be available and hotel accommodations with special Ham Holiday rates are nearby. For further information or pre-registration forms, write CORA, PO Box 14268, Oklahoma City OK 73113.

CUMBERLAND ME
JUL 30

The Blackstrap Repeater Association will hold the second annual Greater New England Hamfest on Saturday, July 30, 1983, from 8:00 am to 5:00 pm, at Cumberland Fairgrounds, Cumberland ME. Tickets are $1.00 in advance and $2.00 at the gate. There will be forums, exhibits, meetings, speakers, dealers, and a giant flea market. Food and free camping will be available. Talk-in on 147.69/.09, 146.52, 3.940, and 146.13/.73. For more information, call Ed Williams KA1FZD at (207)-846-3509.

ISHPEMING MI
JUL 30

The Hiawatha Amateur Radio Association of Marquette County, in celebration of its 50th anniversary, will sponsor the 35th annual Upper Peninsula Hamfest on July 30, 1983, from 9:00 am to 5:00 pm, at the Michigan National Guard Armory in Ishpeming. Registration is $1.00 and tables will be available for $3.00 each. Features will include a computer demonstration and net meetings. Talk-in on 146.16/.76. For more information, contact George Lehtinen W8IOC, 100 N. Daisy, R2, Ishpeming MI 49849, or phone (906)-485-5038.

ASHEVILLE NC
JUL 30-31

The Western Carolina Amateur Radio Society will sponsor the WCARS Hamfest and Computer Fair of 1983 on July 30-31,

HAM HELP

I need the schematic and circuit data for the Comdel speech processor.

J. T. Maloney W2BE
152 Hawkins Rd.
Centereach NY 11720

Could someone provide me with QSL information for 9J2DS and TYA11?

Rick Todd N8CWX/DU2
PSC #2 Box 12956
APO San Francisco CA 96311

I am looking for the schematic for an SBE Touch-Com 40.

Lisle T. Hines K2QLA
4 Ellwood Ave.
Cortland NY 13045

I need a source for a 1N23B diode used in a General Radio Slotted Line 874.

Rudolf E. Six KA8OBL
30725 Tennessee
Roseville MI 48066

1983, beginning at 9:00 am, at the Buncombe County Fireman's Training Center, Asheville NC. Features will include an ARRL booth and seminar by Bob Grove WA4PYQ, McElroy Memorial CW competition, a flea market, bingo, RV parking and free camping (no hookups), and computer hardware and software. Talk-in on .31/.91, .61/.76, and .52 simplex. For ticket information, write Garland Lance NC4N, 854 Sandhill Road, Asheville NC 28806.

OLIVER BC CAN
JUL 30-31

The Okanagan International Hamfest will be held on July 30-31, 1983, at Oliver Centennial Park, Oliver BC. Registration will be at 9:00 am (PDT) on Saturday, July 30th and the activities will be from 1:00 pm on Saturday through 2:30 pm on Sunday. YLs may bring crafts, hobbies, and flea-market items for sale or display. There will be a potluck luncheon on Sunday, as well as entertainment and bunny hunts. Talk-in on the .34/.94 repeater or .76/.76. For further information (no advance reservations), write John Juul-Andersen VE7DTX, 8802 Lakeview Drive, Vernon BC V1B 1W3 or Lota Harvey VE7DKL, 584 Heather Road, Penticton BC V2A 1W8.

ALEXANDRIA LA
JUL 30-31

The Central Louisiana Amateur Radio Club will hold a hamfest on Saturday and Sunday, July 30-31, 1983, at the Bolton Avenue Community Center, Alexandria LA. Swap tables will be available.

BELVIDERE IL
JUL 31

The Belvidere Amateur Radio Association will hold its annual hamfest on July 31, 1983, at the Boone County Fairgrounds, Route 76, Belvidere IL. Admission is $2.00 in advance and $2.50 at the door. Tables may be reserved for $2.00. There will be plenty of free flea-market spaces and, if it rains, there will be inside space available. There will be camping on Saturday night. Talk-in on 146.52. For more information, contact Bob Anderson K9DCG, 910 Locust Street, Belvidere IL 61008.

CENTREVILLE MI
JUL 31

The Amateur Radio Public Service Association of Saint Joseph County MI will hold its 5th annual swap and shop on Sunday, July 31, 1983, at the Saint Joseph County Fairgrounds, Centreville MI. Doors will open at 8:00 am. Tickets are $2.00 in advance and $3.00 at the gate. Indoor tables are $3.00; trunk sales are free. Camping will be available on Saturday night only for $6.00. Talk-in on .52. For more information, contact Warren Harder N8EOX, 14820 Broadway Road, Three Rivers MI 49093.

JACKSON WY
AUG 5-7

The 1983 ARRL Rocky Mountain Division Convention, in conjunction with the 51st WIMU Hamfest, will be held on August 5-7, 1983, at the Virginian Motel, Jackson WY. Talk-in on 146.22/.82 and .3923 kHz. For reservations, call the Virginian at (307)-733-2792. For more information, phone R. L. "Pete" Stull WB7AMP at (307)-382-9032 or Dave Gregory N7COA at (307)-875-5324.

MOBERLY MO
AUG 7

The NEMO ARC of Kirksville MO and the Tri-County ARC of Moberly MO will hold the 5th annual North Missouri Hamfest on Sunday, August 7, 1983, at the Moberly Municipal Auditorium, Moberly MO. The auditorium has 12,000 square feet of air-conditioned space for the inside flea market and there will be a limited number of tables available free. Tickets are $1.50 in advance or $2.50 at the door. Doors will open for the flea market and distributors beginning at 8:00 am and for the hamfest, from 9:00 am until 3:00 pm. There will be forums, films, sandwiches, and drinks, as well as donuts and coffee for the early birds. Talk-in on 147.69/.09. For more information and/or tickets, contact Sam Fischer KA8ILO, PO Box 341, Moberly MO 85270.

ANGOLA IN
AUG 7

The Steuben County Radio Amateurs will hold their 25th annual FM Picnic and Hamfest on Sunday, August 7, 1983, at Crooked Lake, Angola IN. Admission is $2.50. Features will include picnic-style BBQ chicken, inside tables for exhibitors and vendors, a large electronics flea market, and overnight camping (fee charged by county park). Talk-in on 146.52 and 147.81/.21.

AUSTIN TX
AUG 12-14

The Austin Amateur Radio Club and the Austin Repeater Organization will sponsor Austin Summerfest '83 on August 12-14, 1983, at the Austin Marriott Hotel, Interstate 35 at Highway 290. Admission is $5.00 in advance and $6.00 at the door. Swapfest tables are available on a first-come, first-served basis, but each seller may also reserve one table in advance for $1.00. Summerfest '83 will combine the Texas VHF-FM Society Convention with forums, meetings, an indoor swapfest, dealer exhibits, and many outside activities for the family at Austin's annual Aqua Festival. Talk-in on 146.34/.94. For more information, write Austin Summerfest '83, PO Box 13473, Austin TX 78711.

DUNKIRK NY
AUG 13

The Lake Erie International Hamfest Association will hold its fifth annual Lake Erie International Hamfest on Saturday, August 13, 1983, beginning at 8:00 am, at the Chautauqua County Fairgrounds, Dunkirk NY. Admission is $2.50 in advance and $3.00 at the gate. Each flea-market space is $1.00 plus admission. There will be indoor dealer exhibits as well as a large flea market. Talk-in on 146.25/.85 and 146.52. For more information, write Lake Erie International Hamfest, PO Box 455, Dunkirk NY 14048.

POMONA CA
AUG 13

The Tri-County Amateur Radio Association will sponsor the TCARA 13th Annual Hamfest and Picnic on Saturday, August 13, 1983, from 8:00 am to 2:00 pm, at the Los Angeles County Fairgrounds in Pomona CA. Tables will be available for ham/computer exhibits and displays. There will be sandwiches and soft drinks available. For more information, contact Tony Skvarek W6ELZ, 1514 W. Mission #14, Pomona CA 91766.

BURLINGTON VT
AUG 13-14

The Burlington Amateur Radio Club will hold its annual International Hamfest and Flea Market on August 13-14, 1983, at the Old Lantern Campgrounds, Charlotte VT. For both days, tickets are $4.00, outdoor flea-market spaces are $2.00, and indoor spaces are $5.00. Food and drink will be available. Talk-in on .34/.94, .01/.61, and .52 simplex. For further information, contact Frank W1CTM, Burlington Amateur Radio Club, PO Box 312, Burlington VT 05402.

WILLOW SPRINGS IL
AUG 14

The Hamfesters Radio Club, Inc., will hold their 49th annual hamfest and picnic on Sunday, August 14, 1983, at Santa Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of Chicago). Tickets are $2.00 in advance and $3.00 at the gate. Featured will be the famous swappers' row. There will be exhibits for OMs and XYLs. For advance tickets, send a check or money order and an SASE to Hamfesters, PO Box 42792, Chicago IL 60642.

FCC

10-YEAR LICENSES

Hoping to save both time and money, the FCC has proposed that the length of amateur licenses be extended to 10 years, with a 2-year grace period for renewing expired licenses. In its comments, the Commission noted that license renewals, which were up to 36,000 in 1982, would be reduced to about 12,000 per year. In addition, the number of licenses which are allowed to lapse inadvertently would decrease, according to the FCC.

Here is the Commission's proposed Part 97 amendment, as it appeared in the *Federal Register*.

PART 97—[AMENDED]

Appendix

It is propsed to amend Part 97 of the Commission Rules, 47 CFR Part 97, as follows:

1. In § 97.13, paragraph (d) would be revised to read as follows:

§ 97.13 Renewal or modification of operator license.

* * * * *

(d) If a license is allowed to expire, application for renewal may be made during a period of grace of two years after the expiration date. During this two year period of grace, an expired license is not valid. A license renewed during the grace period will be dated currently and will not be backdated to the date of its expiration. Application for renewal shall be submitted on FCC Form 610 and shall be accompanied by the applicant's expired license.

(2) In Section 97.47, paragraph (b) would be revised to read as follows:

§ 97.47 Renewal and/or modification of amateur station license.

* * * * *

(b) If a license is allowed to expire, application for renewal may be made during a period of grace of two years after the expiration date. During this two year period of grace, an expired license is not valid. A license renewal during the grace period will be dated currently and will not be backdated to the date of expiration. An application for an individual station license shall be submitted on FCC Form 610. An application for an amateur club or military recreation station license shall be submitted on FCC Form 610-B. In every case the application shall be accompanied by the applicant's expired license or a photocopy therof.

(3) In Section 97.59, paragraphs (a) and (b) would be revised to read as follows:

§ 97.59 License term.

(a) Amateur operator licenses are normally valid for a period of ten years from the date of issuance of a new, modified or renewed license.

(b) Amateur station licenses are normally valid for a period of ten years from the date of issuance of a new, modified or renewed license. All amateur station licenses, regardless of when issued, will expire on the same date as the licensee's amateur operator license.

20M PHONE EXPANSION

After a three-year battle, the 20-meter phone-band expansion went into effect on May 22. The new frequency allocation gave General-class operators use of the frequencies between 14.225 MHz and 14.275 MHz. Advanced-class licensees have phone privileges between 14.175 and 14.225 MHz, and Extra-class ticket holders are allowed to operate phone from 14.150 to 14.175 MHz. The Commission's amendments to Part 97, as published in the *Federal Register*, are shown below.

PART 97—[AMENDED]

Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, is amended as follows:

1. In § 97.7, paragraph (a) is revised to read as follows:

§ 97.7 Privileges of operator licensee.

(a) Amateur Extra and Advanced Class. All authorized amateur privileges including exclusive frequency operating authority in accordance with the following table:

Frequencies	Class of license authorized
3500-3525 kHz	Amateur extra only.
3775-3800 kHz	Do.
7000-7025 kHz	Do.
14,000-14,025 kHz	Do.
14,150-14,175 kHz	Do.
21,000-21,025 kHz	Do.
21,250-21,270 kHz	Do.
3800-3890 kHz	Amateur extra and advanced.
7150-7225 kHz	Do.
14,175-14,225 kHz	Do.
21,270-21,350 kHz	Do.

* * * * *

§ 97.81 [Amended]

2. In § 97.81, in the table in paragraph (a), the row beginning with "14000-14200 (kHz)" is revised by beginning the row with "14000-14150 (kHz)" so that the entire row reads as follows:

14000-14150 .... F1

3. Also in § 97.81, in the table in paragraph (a), the row beginning with "14200-14350 (kHz)" is revised by beginning the row with "14150-14350 (kHz)" so that the entire row reads aa follows:

14150-14350 ________ A3, A4, A5, F3, F4, F5

LETTERS

E.T. FEEDBACK

My wife and I both enjoyed the article on "How E.T. Really Called Home." When we saw the movie and Elliott and E.T. set the communicator up, I said, "That looks like something a ham would build." Looks like I *was right!*

Stephen Wimmer WB0GGT
Raymond NE

THE ELITE MODE

The solution to the question of code or no code can be answered to the satisfaction of everyone. The proponents of code offer the ability to "get through with CW when voice is unintelligible," narrower *bandwidth, etc., as proof that CW is the* ultimate skill that everyone should have as their goal. The thing I don't understand is, if CW is so damned good, why isn't it reserved for the select group that can master it and that have the technical expertise necessary to pass the Advanced- and Extra-class tests?

Instead of reserving CW for those who are most deserving of its fantastic benefits, the CW proponents prefer restricting those least deserving of its benefits to using only CW.

It just plain seems backwards. What needs to be done is to restrict Novices and Techs to voice until they've earned the right to use the far superior method of communicating, namely CW. Under this system, the highest class licensees would be able to use the best possible means of communicating, up to and including CW, while the lower class licensees would be restricted to the less efficient methods, i.e., voice.

What could be simpler or fairer? People who can't master or have no interest in mastering CW wouldn't be saddled with it *while those who do enjoy it would have the* added satisfaction of having the "best," to some extent, reserved for them.

James Delton N7ECC
Tempe AZ

Troublemaker.—Wayne.

FOR VIETNAM VETS

An open letter to all veterans of the US military during the Vietnam era who are now amateur radio operators:

We are trying to form a net of radio operators for each state to participate in communication with each other and with the nonprofit organization, Vietnam Veterans of America. Our objective is to reach all the vets of that era and band together for the purpose of brotherhood, benefits, and discussion of the effects of chemical warfare on us.

We will be publishing a newsletter and participating in the First Annual Convention for the Vets of the Era, in Washington, DC, on November 7-10. If you are interested in participating, contact Mike Kelly, 2101 Crescent Avenue, Eau Claire WI 54701, (715)-834-1738, or Larry Mittman N9AUG, Box 158, Rt. 5, Eau Claire WI 54701, (715)-874-6473.

Vietnam Veterans of America is a non-*profit combat veterans organization certi*fied by the Congress of the United States.

Mike Kelly
Eau Claire WI

GUEST SPEAKER

You mentioned in the December, 1982, issue the woeful lack of good speakers at hamfests. I would like to offer my services to any interested hamfest/radio club. I am the Kentucky state coordinator for the Radio Amateur Satellite Corporation (AMSAT), and I have been active in amateur satellite communication for five years. I have a set of slides and I have a simple non-technical program which will explain the past, present, and future of amateur space activity. I also served a stint as technical editor of *73*, and I can talk about what it's like to work for the best magazine in amateur radio. If your club has any aspiring authors, I can tell you what makes an article worth buying.

I will travel anywhere there is a hamfest or club meeting. The only fee that I require is my travel expenses. I have access to a private plane so I can go anywhere in the eastern USA.

Charles E. Martin AB4Y
Box 3370
Bowling Green KY 42101

BEACON UPDATE

Here is an update on ten-meter beacons for the readers of *73*. The KA1YE/B beacon *in southeastern Connecticut has been* joined by at least two others in the US. They are: WA1IOB/B in the Boston area on 28.208 MHz, and W3VD/B in Laurel, Maryland, on 28.295 MHz. I haven't heard the IOB beacon here, but W3VD/B can be heard on backscatter.

Reception of the KA1YE and WA1IOB beacons has been reported in Great Britain in *Practical Wireless* magazine. In the May, 1983, issue there is a listing of 19 beacons worldwide with a graph displaying dates of reception in the UK. The beacons are from all continents, with VE2TEN being the only other North American beacon listed.

A listing of active beacons is being maintained by Willi HB9AVE. I have sent him the information on my beacon, and he would appreciate information from other individuals and groups operating ten-meter beacons. There is a limited amount of space allocated for unattended operation of beacons on ten meters here in the US, so some prior listening and coordination is highly recommended before putting on a *beacon. This also holds for other bands.*

I am willing to act as a clearinghouse for US beacons, keeping a file on activities and other information. If anyone is planning to put a beacon on ten, or knows of any other beacons active or planned, I would appreciate hearing about them. Please drop me a line. Thanks very much.

W. Keith Hibbert KA1YE
25 Hillcrest Road
Niantic CT 06357

BEST MAG

Your editorial and technical construction material is the best. I just renewed for two more years!

Russ Tower K1DOW
Arcadia FL

A DREAM COME TRUE

On March 30, 1983, I walked into the FCC field office at Syracuse, New York, with a Technician-class license. I walked out with a General-class interim permit. That permit is a dream come true and it has been a 27-year wait.

The reasons why I passed the code test were that I studied the code each day and I used your "Back Breaker" (CT7313) code tape. After two previous failures of the code test, I decided to use your tape. So, thank you very much for the help. Please keep up the good work at *73*.

(Re no-code licensing: I'm dead against it.)

Ben Alabastro WA2PXR
Frankfort NY

Right on there, Ben. If you and I have to suffer, then why shouldn't everyone? And think of the money I'll lose if they pass a no-code license and my code tapes stop selling. That 13-per tape is a rough one. . . I made that almost impossible so that you'd have clear sailing once you mastered it.—Wayne.

MODEM MAGIC

You're always interested in new technical ideas, so here's one you can think about. How about using our standard computer modems over the air and standardizing on these shift frequencies for computer-to-computer communications?

A modem for the VIC-20 is about $100, while commercial RTTY modems start at $150. The phone-line (Bell 103) modems use frequencies of 1070/1270 and 2025/2225 Hz. We could standardize on the lower two frequencies, since they're easily passed by receivers and transmitters, and the 200-Hz shift is within the FCC limits.

The only difficulty is that we'd have to shift the modems from the ORIGINATE position during transmit to the ANSWER position during receive. A relay could do this, and it seems to be a small price to pay to get one modem to serve double duty.

Anyone interested in giving it a try?

Jonathan A. Titus KA4QVK
Blacksburg VA

Hey! Do it and write an article! And you people in Nashua NH, you write one, too!—Wayne.

MULTI-BAND SLOPERS
160, 80, and 40 meters

Outstanding DX performance of slopers is well known. Now you can enjoy 2 or 3 band BIG-SIGNAL reports! Automatic bandswitching • Very low SWR • Coax feed • 2kw power • Compact • Ground or tower feed • Hang from any support 25 ft. high or higher • Easy to install • Very low profile • Complete instructions • Immediate shipment • Check ok

3 BAND SLOPER 160, 80, & 40 Meters 60 ft. long	$ 43.00 frt ppd
2 BAND SLOPER 80 & 40 Meters 41 ft. long	$ 30.00 frt ppd
3-BAND NO TRAP DIPOLE, 160, 80, & 40M • 113 ft. long	$ 66.00 frt ppd
2-BAND NO TRAP DIPOLE, 80 & 40M • 84 ft. long	$ 49.00 frt ppd

FOR ADDN'L INFO on these and other unique antennas: send SASE

W9INN ANTENNAS
BOX 393-S MT. PROSPECT, IL 60056

. . . at last . . .
your shack organized!
A beautiful piece of furniture — your XYL will love it!
$184.50 S-F RADIO DESK
Deluxe - Ready to Assemble

Designed with angled rear shelf for your viewing comfort and ease of operation.

FINISHES: Walnut or Teak Stain.
Floor Space: 39" Wide by 30" Deep
Additional Information on Request.
Checks, Money Orders, BankAmericard and Master Charge Accepted.
F.O.B. Culver City. (In Calif. Add 6% Sales Tax.)
— DEALER INQUIRIES INVITED —

Radio equipment not included

Also Available
Floor Space: 51" Wide by 30" Deep
$199.50

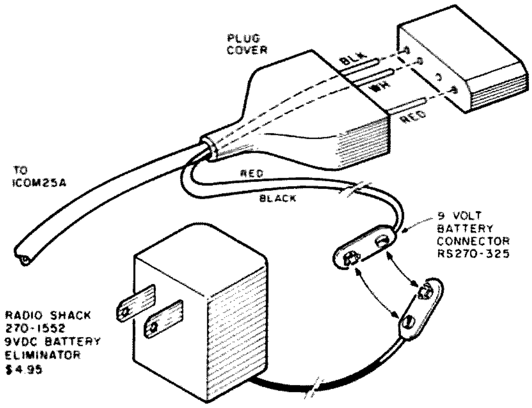
✓65

S-F Amateur Radio Services
4384 KEYSTONE AVENUE • CULVER CITY, CALIF. 90230 — PHONE (213) 837-4870

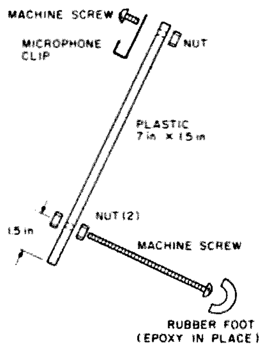
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



MEMORY BACKUP FOR THE ICOM 25A: To retain the memory in the Icom 25A when the power is disconnected, slip back the cover of the power plug and wire a 9-V battery connector to the white (positive) and black (negative) leads. When removing the rig from its power source, snap on a 9-V transistor battery or connect it to a plug-in transformer—Paul Van Bolhuis W4ZBD, Bradenton FL.



SIDE VIEW

MICROPHONE HOLDER FOR MOBILE RIGS: Keep your operating area organized and neat when you are using a mobile rig as a base station. This holder will keep your microphone within easy reach yet out of the way, and the parts for it can be found in almost any junk box.—Thomas Hart AD1B, Westwood MA.

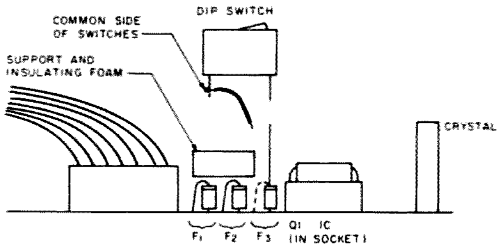


Fig. 1. Side view

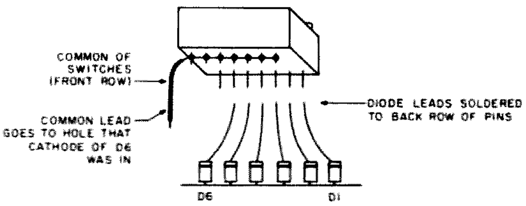
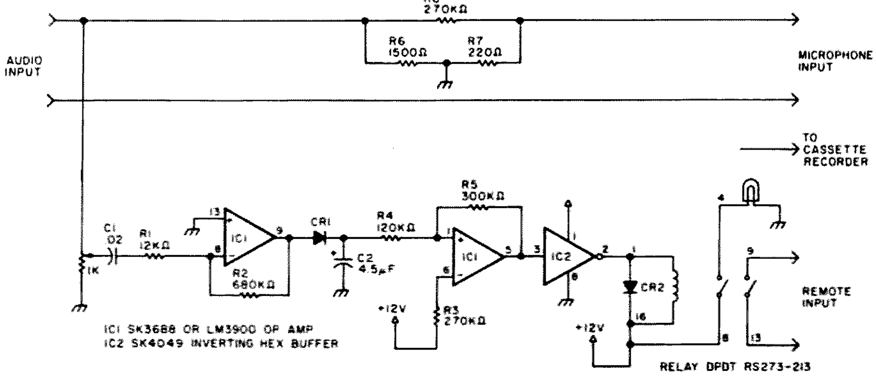


Fig. 2. End view (parts omitted for clarity).

SWITCH-SELECTABLE TONES FOR THE KENWOOD 7950/7930: The TU-79 tone unit for the Kenwood 7950/7930 provides for the selection of 3 preprogrammed tones from the keyboard. With the following modification, the third frequency may be programmed by setting a DIP switch rather than cutting or soldering diodes. First, program the tones for F1 and F2 and verify that they work. Unsolder the cathode leads of the diodes in row F3 and position them as shown in the diagrams. Then mount a piece of stiff insulating foam over the diodes in rows F1 and F2, securing it firmly in place. Orient a 6- or 7-position rocker-type DIP switch so that the pole numbers align with the diode numbers 1 through 6 on the PC board. Solder a common wire to all of the leads on one side of the switch as shown in Fig. 1. Solder diode leads 1 through 6 to the corresponding switch pins; solder the common wire to the hole which previously held the cathode wire from D6. Be careful when making the modification; on my instruction sheet, diodes D1 through D6 were shown in reverse order, but the markings on the PC board were correct.—Clint Williams KB8SY, Portage MI.

EASY COAX CONNECTIONS: Much time and effort can be saved when working with large-diameter coax such as RG-8/U by using a small, inexpensive tubing cutter to help with the stripping. These cutters can be obtained at most local hardware stores and are listed as ⅛- to ⅝-inch copper tubing cutters. Use the cutter to score the jacket of the coax and then simply peel off the jacket. This eliminates the nicked and damaged braid that often accompanies coax work. When the jacket has been removed and the braid exposed, use a soldering gun or high-wattage iron to quickly tin the braid in place. Now, use the tubing cutter to cut through the rigid braid just as if it were tubing. Cut deep enough to remove the braid but do not damage the inner insulation. The inner insulation can also be cut with the tubing cutter but I find it easier just to use a knife at this point. The resulting job is very neat, virtually guarantees no nicks, and makes it very easy to attach a PL-259 connector since the braid is already tinned.—Craig Crichton K7UKW, The Dalles OR.



AUTOMATIC TAPE RECORDING: Don't miss the action while you're away from the rig. This circuit turns on a tape recorder whenever the receiver's squelch is broken. After signal loss, the recorder will shut off following a slight delay.—Gary Anderson KE7H, Nampa ID.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

VENEZUELAN WORLDWIDE CONTEST

SSB—Starts: 0000 GMT July 2
Ends: 2400 GMT July 3

CW—Starts: 0000 GMT July 30
Ends 2400 GMT July 31

The Radio Club of Venezuela invites all amateurs to paticipate in the 21st year of the Venezuelan Independence Worldwide Contest. Use all bands, 80 through 10 meters. Operating classes include: single operator, one band (for each band); single operator, multi-band; multi-operator, multi-band, one transmitter; and multi-operator, multi-band, multi-transmitter.

EXCHANGE:

RS(T) plus a three-digit QSO number starting with 001.

SCORING:

Contacts between stations of different countries count two points. Contacts with stations within one's own country do not count but are valid as multipliers for each band. Count one multiplier for each Venezuelan and USA call area and each country (including own) worked on each band. Use the ARRL DXCC country list. Final score is the total QSO points times the total multiplier points.

AWARDS:

For stations outside Venezuela there will be a plaque presented to the highest scorer in each class. Medals go to the highest scorer in each continent and among the Bolivarian countries (Bolivia, Columbia, Ecuador, Panama, and Peru) in the single-operator, multi-band class. Certificates to all stations in the Americas working 15 YV stations and 10 different countries, all European and African stations working 10 YV stations and 10 different countries, and all Asia and Oceania stations working 5 YV stations and 10 different countries.

ENTRIES:

Logs must show date and time in GMT, station worked, reports exchanged and respective numerical order, multipliers, and points. Use different sheets for each band worked. Include a separate summary sheet showing name(s) of operator(s), callsign, and address. Each participant must include $2.00 US or IRC equivalent with their logs. Entries must be postmarked no later than August 15 for SSB and September 15 for CW and should be addressed to: RCV, PO Box 2285, Caracas 1010-A, Venezuela.

INTERNATIONAL WORLDWIDE DX SSTV CONTEST

Starts: 0000 GMT July 15
Ends: 2400 GMT July 17

This is the third annual DX SSTV contest sponsored by *A5 Magazine*. It is a 48-hour SSTV video contest using 80 thourgh 10 meters within the recommended SSTV calling/operating frequencies listed below. To encourage allband contest usage and promotion, extra bonus points are granted on the 10-, 15-, 40-, and 80-meter band segments. Single- and multi-operator stations are recognized with crossband contacts not permitted. Individual contacts count only once per band with repetitive multiband contacts acceptable.

Barring any unforeseen changes from last year's rules, callsigns and video reports must be in "video" form. Mugshots of the station operator, family, or friends can count only once. Slower clock-rate speeds are encouraged in either 128/16.5- or 256/31-second time bases. Color work must contain a minimum of a 2-color overlay to qualify with standard RGB frame transmissions. Motion SSTV must have a minimum of 2 frames sent with automatic receive switching circuitry or manually operated switching by the receiving operator and 64 x 64 "quadrant" storage of no less than 4 separate pictures with replays.

SCORING:

Each SSTV two-way contact is worth 5 points within the same country, 10 points for DX out of country. Contact bonus points are available as follows: Mugshots—1 point, slow speed—2 points, quad frame—3 points, motion SSTV—4 points, high resolution—5 points, and color SSTV (RGB)—10 points. A band multiplier of 3 can be claimed for contacts on 40 and 80 meters, 2 for contacts on 6, 10, and 15 meters. Stations with over 25 DX countries worked add 25 points, over 50 DX countries add 50 points, over 100 countries add 100 points!

FREQUENCIES:

Advanced/Extra—3845, 7220, 14230, 21340, 28680, 50.150.

General—3990, 7290, 14340, 21440, 28680, 50.150.

AWARDS:

First-place winner receives a 3-year subscription (worth $60) to *A5 ATV Magazine* with front-cover picture plus a gold certificate. Second- and third-place winners receive one-year subscriptions and gold certificates. All entries regardless of score receive gold certificates suitable for framing. Results will be in the November issue of *A5 ATV Magazine*.

ENTRIES:

Submission of logs and totaled scores must be postmarked no later than August 1 and submitted to: Contest Manager, *A5 ATV Magazine*, PO Box H, Lowden IA 52255-0408. Logs will be returned as will any photos, etc. Some log sheets and DX country lists are available from WB0OCD.

CALENDAR

Jul 2-3	Venezuelan Worldwide Contest—SSB
Jul 8-10	IARU Radiosport Championship
Jul 15-17	A5 Magazine SSTV DX Contest
Jul 23-24	Brothers and Sisters QSO Party
Jul 30-31	Venezuelan Worldwide Contest—CW
Jul 30-Aug 1	Armadillo Run
Jul 30-Aug 1	CW County-Hunter's Contest
Aug 6-7	ARRL UHF Contest
Aug 19-21	A5 Magazine UHF FSTV DX Contest
Aug 20-21	SARTG Worldwide RTTY Contest
Aug 27-28	Occupation Contest
Sep 3	DARC Corona 10-Meter RTTY Contest
Sep 9-11	Connecticut Oyster Festival
Sep 10-11	ARRL VHF QSO Party
Sep 10-11	Cray Valley Radio Society SWL Contest
Sep 17-19	Washington State QSO Party
Oct 1-3	Oregon QSO Party
Oct 8-9	ARRL QSO Party—CW
Oct 9-10	ARRL QSO Party—Phone
Oct 15-16	ARRL Simulated Emergency Test
Oct 22-23	MF Runde SW Activity Weekend
Oct 22-23	Clara Ac-Dc Contest
Nov 5-6	ARRL Sweepstakes—CW
Nov 6	DARC Corona 10-Meter RTTY Contest
Nov 19-20	ARRL Sweepstakes—Phone
Dec 3-4	ARRL 160-Meter Contest
Dec 10-11	ARRL 10-Meter Contest

RESULTS

VERMONT QSO PARTY—1983

State	Call	Award	Score	Name	County/ Province
AR	WB5RYB	•	36	Johnson, B.	
AZ	AK7J	•	8	Eliason, C.	
CA	N6CPQ	•	1	Kitchens, J.	
FL	K4DDB	•	90	Earp, R.	
FL	N4FBY		40	Mach, T.	
IL	W9QWM	•	4	Schrock, H	
IN	W9XD	•	9	Drudge, D	
KS	N0CLV	•	10	Gregory, B.	
LA	W5WG	•	85	Owen, W.	
MA	KA1HFN	•	36	Harris, D.	
MA	K1BA		24	Bacon, A.	
MD	WA3EOP	•	24	Pyne, W.	
MD	W3QYL		4	Freidmann, D.	
MO	WB0SET	•	45	Hawley, P.	
MS	W5UCY	•	48	Croysdale, L.	
NH	W1OC	•	120	Littlefield, N. (multi-op)	
NH	AF1T		35	Clement, D.	
NJ	N2CJJ	•	32	Langston, R.	
NJ	WA2ASQ		4	Hausleben, P.	
NM	KB5DQ	•	1	Ridley, D.	
NY	WB2TKD	•	40	Harodecki, M.	
NY	N2BFG		20	Moseson, R.	
OK	N5AFV	•	50	Mattis, A.	
OR	WD6EAW	•	8	Hamilton, T.	
PA	KA3DSW	•	2	Riegel, K.	
PA	WA3JXW	•	2	Christian, D.	
SD	KC0ZU	•	55	Kleinsasser, G.	
TN	KD4PP	•	8	Chaffin, D.	
TX	W5PWG	•	80	Short, D.	
TX	WA5DTK		36	Brewer, J.	
VA	N4GTU	•	24	Frankland, B.	
VA	KF4LY		6	Treadwell, B.	
VT	W1AIM	•	32460	Taylor, G.	Washington
VT	WA1KPJ	••	29172	Vanat, J.	Lamoille
VT	N1BRT	•••	26727	Woodworth, F.	Washington
VT	W2DMC/1	#	24656	Crystal ARC (multi-op)	Windham
VT	K1HKI		24000	Deforge, R.	Orange
VT	KK1U		8134	Nevin, D.	Washington
VT	W1POB		770	Read, B.	Windsor
VT	WA1GYS		120	Merrick, K.	Orange
WA	KN7L	•	33	Parker, C.	
WY	WB7EMA	•	28	Culver, A.	
WY	KC7QE		18	Sutherland, W.	
LU	LU5AMF	•	4	Anselmi, H.	

Legend:

• = 1st in state/county
•• = 2nd in state
••• = 3rd in state
= 1st multi-op (VT only)

BROTHERS AND SISTERS QSO PARTY

The Central Oregon Radio Amateurs (CORA) are sponsoring the contest that will run from 0600 PST Saturday, July 23, until 1200 PST Sunday, July 24. Operations will be from WN7ODD in Brothers, Oregon, and N7CSH in Sisters, Oregon. Phone frequencies will be 10 kHz up from the bottom portion of the General bands. CW will be 15 kHz up from the bottom portion of the Novice bands. QSL via CORA, PO Box 723, Bend OR 97709. Enclose a business-size SASE for return QSL cards.

THE ARC LITE

NEWSLETTER OF THE MONTH

To create a good club newsletter, you don't have to have fancy graphics, typeset text, or professional writers—just a desire to inform and entertain your readers and a willingness to work at it. *The Arc Lite*, newsletter of the Garland Amateur Radio Club in Garland, Texas, is a perfect example of what can be done with simple resources and a little elbow grease.

The Arc Lite is neither typeset nor printed, but the first impression you get is that it is very clean. Obvious care has been taken in its layout, making the most advantageous use of white space without creating an empty look. Each page is bordered with a black line, and stories of special note—such as a recent issue's news flash of the expanded 20-meter phone band—are boxed, giving the newsletter the ambience of a tabloid newspaper.

Each section has been painstakingly labeled with a handsome headline and when a story jumps from one page to another, you are told where it has been continued.

Oddly enough, *The Arc Lite*'s contents are not that variant from the offerings of most other newsletters. Minutes of the last meeting, club news, and information on the club's repeater and station are all standard fare. But there is a difference. The sentences are complete. Misspellings are rare. For newsletter editor Gary Engleman K5HGL, the world of grammar and syntax is obviously not uncharted territory.

In his editorial, "de: Editor," Gary notes that he is selling advertising to help support the new *Arc Lite* format which he created. Gary has obviously seen a need for improvement and engineered a way to make the new idea work.

If your club takes pride in its newsletter, *73* wants to see it. To enter in *73*'s contest, send a copy of the newsletter to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

CW COUNTY-HUNTER'S CONTEST

Starts: 0000 GMT July 30
Ends: 0200 GMT August 1

The CW County-Hunter's Net invites all amateurs to participate in this year's contest. All mobile and portable operation in less active counties is welcomed and encouraged. Stations may be worked once per band and again if the station has changed counties. Portable or mobile stations changing counties during the contest may repeat contacts for QSO points.

EXCHANGE:

QSO number; category (P for portable, M for mobile); RST; state, province, or country; and US county. Stations on county lines give and receive only one QSO number, but each county is valid for a multiplier.

FREQUENCIES:

3575, 7055, 14065, 21065, and 28065. It is strongly requested that only P- or M-category stations call CQ or QRZ on 40 meters below 7055 and on 20 meters below 14065, with all other stations spreading out above those frequencies.

SCORING:

QSOs with fixed stations are 1 point, OSOs with portable or mobile stations are 3 points. Multiply the number of QSO points times the number of US counties worked. Mobiles and portables calculate their score on the basis of total contacts within a state for the state certificate, and on all operation if they operated from more than one state in competition for the High Portable or High Mobile Trophy.

AWARDS:

Certificates will be awarded in three categories:

1) Highest fixed or fixed portable station in each state, province, and country, with 1,000 or more points.

2) Highest station in each state operating portable from a county which is not his normal point of operation, with 1,000 or more points.

3) Highest station in each state operating mobile from 3 or more counties, with a minimum of 10 QSOs in each of at least 3 counties.

Plaques will be awarded to the highest mobile and portable stations in the USA who meet the above requirements for certificates. Additional awards will be issued where deemed appropriate.

ENTRIES:

Logs must show category, date/time in GMT, station worked, band, exchanges, QSO points, location, and claimed score. All entries with 100 or more QSOs must include a check sheet of counties worked or be disqualified from receiving awards. Enclose a large SASE if results are desired. Logs must be postmarked by September 3 and sent to: CW County-Hunter's Net, c/o Jerry Burkhead N6QA, 7525 Baltic St., San Diego CA 92111.

ARMADILLO RUN

Starts: 0001 GMT July 30
Ends: 0200 GMT August 1

The Texas DX Society announces its contest to assist CW operators in gaining USA-CA All Counties Award status. The TDXS will activate all Texas counties by dispatching mobile stations from Houston and activating these stations during the County-Hunter's CW Contest. Several fixed stations will also be activated. To ensure that the largest number of entrants receive equal opportunity to work the mobile stations, operating will generally be restricted to 20 meters.

Entry class for the Armadillo Run is single operator from out of Texas only. Operators must operate from their own station. Mobile operation will generally be restricted to 14055-14075 MHz. Operation on other bands will be in accordance with the County-Hunter's CW Contest rules. During the contest, call CQ TDXS on 14050, 7085, or 3585 and a control station (W5DOZ, K5NA/2, N6HUP) will answer your call and try to answer questions. Information regarding which station will activate specific counties may be received by writing or calling KZ5M between 6:30 and 8:00 pm CDST at (713)-343-1060.

EXCHANGE:

So as not to distract from the County-Hunter's CW Contest, use the same exchange as that required by that contest; QSO number; category (P-portable, M-mobile); RST; state, province, or country; and county for USA stations.

SCORING:

The contest score will be equal to the total number of Texas counties contacted during the contest period. Ties will be broken by the Texas QSO count.

AWARDS:

A unique plaque will be awarded to the station operator contacting the most Texas counties during the contest period. The plaque winner will be flown to Houston for the 1983 ARRL National Convention to receive the award if he contacted over 175 Texas counties. Certificates will be awarded to entrants contacting at least 50 counties. Endorsements will be issued for the following county levels: 100, 150, 175, 200, 225, and 250, as well as All Texas Counties.

ENTRIES:

To qualify for award consideration, log information containing Texas stations worked, time (GMT), band, and the county the station was operating from shall be sent to: the Armadillo Run Chairman, Dennis Motschenbacher KZ5M, PO Box 82, Thompsons TX 77481. Mailing deadline is August 31, 1983. Entrants may forward QSLs to the above address for Texas QSOs made during the contest period. The TDXS will make special efforts to ensure that QSLs received are answered!

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

JORDANIAN AWARDS

The Arabian Knights Awards

This award is issued by the Arab Radio Amateur League (ARAL) members and presented by His Majesty King Hussein (JY1) of Jordan.

To qualify for this recognition of achievement, amateurs must have proof of having contacted at least ten Arab countries, and one contact must be with either JY1 or JY2. All contacts must be made on or after January 1, 1971, on any authorized mode of communications. There are no special endorsements.

To apply for the Arabian Knights Award, the applicant must prepare a list of claimed contacts in prefix order. Each entry must also include the date and time in GMT, the band and mode of operation, and the station worked.

Do not send QSL cards, as photocopies will be accepted. As an alternative, you may have your list verified by two local amateurs, a local radio club secretary, or a notary public.

Enclose this list along with an award fee of ten IRCs and send to the attention of: JY1 Award Manager, PO Box 1055, Amman, Jordan.

The Royal Jordanian Awards

To amateurs throughout the world who qualify, JY1, His Majesty King Hussein I of Jordan, will issue a very elegant award of achievement to recognize one of two levels of accomplishment.

First, the Silver Award is offered in recognition of having worked six different JY prefixes. There are no band or mode restrictions; however, all contacts must be on or after January 1, 1971, to count.

The second and probably the toughest award of all to obtain is the Coral Award, which is issued to amateurs who visit Jordan and make a QSO from Aqaba. Simple, huh? Anyone for a charter trip this winter?

As with all awards sponsored by our Jordanian friends, applicants must prepare a list of claimed contacts made, citing the usual logbook information including RS(T).

Forward this list, stating which award it is you are applying for, along with an award fee of ten IRCs to: JY1 Award Manager, PO Box 1055, Amman, Jordan.

DX AWARDS FROM ITALY

A very good DX friend of yours and mine, John Paul I8KDB, wrote a very complimentary letter about our awards column and asked that we share the awards

ARAB COUNTRIES

JY1	King Huaaain
JY2	Royal Jordanian Family
A4X	Oman
A6X	Unitad Arab Emirates
A7X	Qatar
A9X	Bahrain
CN	Morocco
HZ, 7Z	Saudi Arabia
J2	Djibouti
JY	Jordan
OD5	Labanon
ST	Sudan
SU	Egypt
YK	Syria
YI	Iraq
3V8	Tunlala
4W	Yaman
5A	Libya
5T5	Mauritania
60	Somali
70	South Yaman
7X	Algeria
9K2	Kuwait

program sponsored by the Associazione Radiotecnica Italiana (ARI). John Paul noted that the following general rules apply to all HF awards issued by the ARI and recommended that they be read together with the conditions governing each individual certificate.

All inquiries and/or applications should be addressed to the ARI Awards Manager, Giampaolo Nucciotti I8KDB, Via Francanzano, 31-80127 Napoli, Italy, and include 2 IRCs for airmail reply.

ARI awards will be issued to any amateur who submits a letter, dated and signed, with applicant's name, address, and call. He must certify that he has complied with all rules governing amateur radio in his country and that he has operated with fair play and good sportsmanship; he must include a complete list of QSLs, with callsign, date, frequency, reports, time, and type of emission (CW, AM, SSB, RTTY); and he must submit QSLs for checking. QSL cards must be submitted without corrections, erasures, or additions and must be clearly readable; include US $1.00 or 10 IRCs for foreign applicants. The Marconi Award is free; only a mailing fee is charged.

To get an award in a specific class, the cards must show the corresponding data in a clear format. Foreign applicants may avoid sending QSL cards by submitting a checklist of the cards duly certified by an appointed or elected official or a national amateur-radio-affiliated society or club. The ARI Award Manager reserves the right to check, on request, one or more claimed contacts, as necessary.

Certificato Del Mediterraneo (CDM)

The CDM is issued to those amateurs who can show confirmation of a two-way contact on the HF bands since June 1, 1952, with (a) one fixed station in each of at least 22 countries of the list shown below, and (b) at least 50 amateur stations located in peninsular Italy—an accumulated total of 72 QSLs.

The same station may be worked only once. Two classes of CDM are offered: mixed (AM, SSB, CW, RTTY) or phone only (AM, SSB). The minimum reports allowed to qualify are RS 33 and RST 338.

Countries list: Spain, Balearic Islands, Ceuta and Melilla, Morocco, France, Algeria, Corsica, Sardinia, Sicily, Lebanon, Egypt, Greece, Dodecanese Islands, Crete, Mount Athos, Turkey, Syria, Yugoslavia, Albania, Malta, Gibraltar, Cyprus, Monaco, Tunisia, and Libya.

Worked All Italian Provinces (WAIP)

This province award is issued to those amateurs who can show confirmation of a two-way contact on the HF bands since January 1, 1949, with one fixed station in each of at least 60 provinces of the Italian Republic for foreign amateurs, or one in each of 75 provinces for Italian amateurs. The same station may be worked twice or more if it's in a different province each time. Minimum reports acceptable are RS 33 and RST 338. Starting January 1, 1978, this award may also be endorsed for single band and/or for all 95 provinces.

List of Italian provinces: Agrigento, Alessandria, Ancona, Aosta, Arezzo, Ascoli Piceno, Asti, Avellino, Bari, Belluno, Benevento, Bergamo, Bologna, Bolzano, Brescia, Brindisi, Cagliari, Caltanissetta, Campobasso, Caserta, Catania, Catanzaro, Chieti, Como, Cosenza, Cremona, Cuneo, Enna, Ferrara, Firenze, Foggia, Forli, Frosinone, Genova, Gorizia, Grosseto, Imperia, Isernia, L'Aquila, La Spezia, Latina, Lecce, Livorno, Lucca, Macerata, Mantova, Massa, Matera, Messina, Milano, Modena, Napoli, Novara, Nuoro, Oristano, Padova, Palermo, Parma, Pavia, Perugia, Pesaro, Pescara, Piacenza, Pisa, Pistoia, Pordenone, Potenza, Ragusa, Ravenna, Reggio Calabria, Reggio Emilia, Rieti, Roma, Rovigo, Salerno, Sassari, Savona, Siena, Siracusa, Sondrio, Taranto, Teramo, Terni, Torino, Trapani, Trento, Treviso, Trieste, Udine, Varese, Venezia, Vercelli, Verona, Vicenza, and Viterbo.

Diploma Guglielmo Marconi (DGM)

This award celebrates the experiments carried out by Marconi in various parts of the world and brings them once again to the attention of radio amateurs. The DGM will be awarded to those who make contacts with the localities in which Marconi once conducted his experiments. To qualify, it is necessary to forward to the ARI all details of your contacts and a) 40 QSLs chosen from the list of contacts for DGM, or b) 35 QSLs chosen from the list plus the QSL from the official commemorative station, II4FGM, and one from any other G. Marconi memorial station, for a total of 37 QSLs.

When required (i.e., G = London, I4 = Bologna), the QSLs must indicate the city or region of the locality. The DGM is made available for AM, SSB, CW, RTTY, SSTV, and mixed modes. There is no band limitation; however, all contacts must be made on or after January 1, 1973.

LIST OF QUALIFYING CONTACTS FOR DGM

Country	Specific region or city	Prefix
Capo Verde Island	Any	D4C
Portugal	Lisbon	CT1
Madeira Island	Any	CT3
Morocco	Any	CN8
Spain	Cadice	EA7
Ireland	Any	EI
France	Any	F
Corsica	Any	FC
England	London	G
England	Flatholm Island	GB
England	Wight Island	G
Northern Ireland	Any	GI
Scotland	Any	GM
Switzerland	Any	HB
Vatican	Any	HV
Italy	Bologna	I4
Italy	Any	I5
Italy	Rome	IØ
Italy	Fondaz G. Marconi	IY4FGM
Italy	Torre, Tigullio Marconi	IP1TTM
Italy	Sicily	IT9
Italy	Sardinia	ISØ
Japan	Any	JA
Argentina	Buenos Aires	LU-A-B-C
Belgium	Any	ON
Brazil	Rio de Janeiro	PY
Sweden	Stockholm	SM
Sweden	Gotland Island	SM1
USSR	Leningrad	UA1
Canada	Any	VE1
Newfoundland	Any	VO1
Labrador	Any	VO2
Australia	Sydney	VK2
Bermuda	Any	VP9
USA	Massachusetts	W1
USA	New York State	W2
USA	New Jersey	W2
USA	Missouri	WØ
USA	Illinois	WØ
India	Any	VU
Gibraltar	Any	ZB
Yugoslavia	Any	YU2
Libya	Tripoli	5A
Any	Memorial Stations	Any

QRP INTERNATIONAL

Being somewhat of a 10-meter QRP enthusiast, using a converted CB rig, I contacted Hugh Aeiker WA8CNN, who happens to be the Awards Custodian for the QRP Amateur Radio Club International. After hearing everyone on the band claiming to run QRP or QRPp, I figured once and for all I would get the true definition of these terms from one of the originators of an organized QRP group. Not only did I get this group's point of view as stated in their constitution and by-laws, but also I became the recipient of a full packet of information concerning their awards program.

It appears that this QRP fraternity, founded in 1961 by K6JSS, set the QRP standard to mean 100 Watts CW/AM or 200 Watts PEP input. As for QRPp status, we find the group recognizing this power only in the 5-Watt or less range. Now this is not to be confused with standards set by other QRP societies, such as the Michigan QRPp Club International, which also defines QRPp as under 5 Watts output, yet QRP is much less than 100 Watts.

As for their awards program, it is packed full of incentives, as you'll witness by reading on.

The main objective of the QRP ARC International Awards Program is to demonstrate the use of limited power which creates less QRM on the amateur bands, while still allowing us to enjoy the usefulness of the hobby. The club issues the following awards which are available to any amateur meeting the requirements as set forth for each below.

QRP-25

This award is issued to any amateur working at least 25 members of the QRP ARC International. Endorsements are issued for 50, 100, 200, and every additional increment of 100. To apply, send copies of logbook data, $1.00 or 5 IRCs, and a signed statement that you limited your power to 100 Watts input (200 Watts PEP SSB). Your list should also include the membership numbers of each station worked. There are no restrictions on band or mode recognition.

WAC-QRP

This award is issued to any amateur for confirmed contacts with low-power stations in all six continents. Power inputs again must be carefully adhered to and a statement must be made certifying the power was within rules governing the program. Keep in mind also that both your own station and the station you are contacting must be using QRP to qualify. Your QSL cards received must state the station's power used. Fee is $1.00 or 5 IRCs.

WAS-QRP

This WAS award is issued to any amateur using QRP power who contacts stations, one in each of the 50 US states, who are also using QRP power or less. Award fee is $1.00 or 5 IRCs. GCR apply.

DXCC-QRP

This DX award is issued to any amateur who utilizes QRP power and contacts 100 different countries, each of which must also be using low power as must be stated on their QSL card. To apply, send log data and $1.00 or 5 IRCs. GCR apply.

KM/W 1000-Mile-Per-Watt Award

This award is issued to any amateur transmitting from or receiving the transmissions of a low-power station, such that the Great Circle bearings between both sides divided by the power input of the low-power station equals or exceeds 1000 miles per Watt. Confused? Ah, it's not all that bad! Special endorsements are given for single-band or mode achievements. To apply, send copies of full log data including power used on both sides, signal reports exchanged, band and mode, and specific location of QTH on both sides. Include $1.00 or 5 IRCs. GCR apply.

DXCC-QRPp

Issued to any amateur for confirmed contacts with stations in 100 DX countries; power levels of 5 Watts or less must be used by the applicant. Reading the rules closely, I find no power restriction on the stations you must work. To apply, send log-book data, including power used and type of equipment used. Enclose $1.00 or 5 IRCs. GCR apply.

WAS-QRPp

Issued to any amateur for confirmed contacts with each of the 50 US states while operating 5 Watts maximum output. To apply, forward all pertinent log data and $1.00 or 5 IRCs to the Award Manager. GRC apply. Application for the award may be made when the first 10 states have been worked, with further recognition at the 20, 30, 40, and, finally, 50 levels.

As with all awards offered by the QRP ARC International, in order not to delay processing of your award, please furnish not only the data, but also the power levels used for each award and the type of equipment used.

All award applications should be sent to: Hugh Aeiker WA8CNN, 5 Keiffer Drive, St. Albans WV 25177.

• • • • •

My special thanks go out to Ade WØRSP/K8EEG, QRP editor for *CQ Magazine*, who recently provided me with the latest up-to-date information concern-

ing some very popular awards being offered by amateur fraternities.

DXCC-QRPp

This award, initiated in 1971 by the *Milliwatt: National Journal of QRPp*, offers a very distinctive challenge to dedicated QRPp stations the world over.

The award requires contacts with DX stations in 100 different countries of the world with the aid of list- or net-type operations. The rules clearly state that power must be limited to five Watts or less output. To apply, the applicant must submit a log in alphabetical order of callsign prefix of the station worked, indicating date, time, and frequency of each contact. QSL cards must accompany your listing and a signed declaration must be made as to the maximum power and type of equipment used. Application fee is $15.00 to help defray the cost of the large 30-inch engraved trophy.

DXCC Milliwatt

This award is also sponsored by the *Milliwatt: National Journal of QRPp*. The same rules apply for this award as for the DXCC-QRPp except that all indications of power level should read "under one Watt output." Applications are the same as for DXCC-QRPp.

The *Milliwatt* Field Day Trophy

Initiated in 1970, this trophy is awarded to the highest-scoring QRPp station in the ARRL Field Day event held each year in the month of June. To enter, you must submit an ARRL summary sheet, plus a listing of the stations you worked, band by band. You must state in your application the power level used, the type of equipment, and your method of measuring output power. If you use 1-5 Watts, you may multiply your score by four.

For power levels less than one Watt, you may multiply your score by 5. In addition, another 1.5 times your score may be added for operating your QRPp station independent of power mains. Another 150 bonus points are earned for full portable setup away from your QTH.

All three awards, the DXCC-QRPp, the DXCC Milliwatt, and the *Milliwatt* Field Day Trophy, are obtainable by making application to: Adrian Weiss WØRSP, 83 Suburban Estates, Vermillion SD 57069.

XV WORLD JAMBOREE MONDIAL

The Calgary Amateur Radio Association will be operating VE6WSJ from the site of the XV World Jamboree Mondial on July 1-16, 1983. The station will operate all bands and modes. Suggested frequencies: 7.030 MHz CW on the half hour; 14.190 SSB on the hour.

NATIONAL TOM SAWYER DAYS

The Hannibal Amateur Radio Club, Inc., will issue a third annual special certificate from the National Tom Sawyer Days celebration in Mark Twain's boyhood hometown, Hannibal, Missouri, on July 3-4, 1983. Hours: 1500-2100 UTC both days. Frequencies: phone—7.245, 14.290, 21.400, and 28.770; CW—7.125 and 21.125 MHz. Help us celebrate! To receive the certificate, send a large (8 × 10) SASE and your personal QSL card confirming the contact to Hannibal Amateur Radio Club, Inc., WØKEM, 2108 Orchard Avenue, Hannibal MO 63401. For further information, contact Tony McUmber at the above address or call (314)-221-6199.

SPACE DAY '83

The Cascades Amateur Radio Society (CARS), in conjunction with the Michigan Space Center in Jackson, Michigan, is offering a Space Day certificate to all stations who work WB8CSQ during Space Day activities. Look for WB8CSQ on 3.900, 7.235, 14.285, 21.360, and 28.510 starting at 0000 GMT July 9 through 1700 GMT July 10. A one-dollar contribution is asked to cover cost of postage and materials. Mail your log information and $1.00 to CARS, Space Day '83, PO Box 512, Jackson MI 49204.

USS COD

Having started in June, members of the Northern Ohio Amateur Radio Society will be operating daily through Labor Day from the *USS Cod*, a World War II submarine on permanent display at the port of Cleveland, Ohio.

Using the callsign K8KRG, NOARS members will be operating in the lower portion of the General band on 80 through 10 meters. Special Novice operations will be conducted on July 9 and 10 and August 20 and 21. On those dates, signals from the *USS Cod* will be found in the middle of the Novice band.

A special 8 × 11 certificate will be available upon request. Please send a QSL confirming the contact and $1 for handling and postage to WD8RZG, 8927 Torrance Ave., Brooklyn OH 44144.

ANNIE OAKLEY SPECIAL EVENT STATION

Again, it is the pleasure of W8UMD, the Treaty City Amateur Radio Association, Inc., to bring you the Annie Oakley Special Event Station from Greenville, Ohio, on Saturday, July 30, and Sunday, July 31, 1983. We will be operating from the Garst Museum which houses two rooms of memorabilia, guns, trophies, and costumes of "Little Sharpshooter," the name given to Annie by Chief Sitting Bull. Operating times will be 1400 to 0100 UT on Saturday and 1400 to 2200 UT on Sunday. Frequencies will be 20 kHz up from the General phone portion of the 40- and 20-meter bands, with excursions into the Novice segments of 40 and 15 meters. Your QSL and an SASE to TCARA, PO Box 91, Greenville OH 45331, will bring you a beautiful certificate and a pamphlet about Annie Oakley.

DETROIT ARSENAL

The Tank-Automotive Command ARC will operate W8JPW on 30 July 1983 from 1300-2000Z to commemorate the 42nd year of the Detroit Arsenal, home of the nation's first defense plant and the US Army Tank-Automotive Command. Frequencies: phone—7.250-7.274, 21.400, and 146.49 MHz; CW—7.055 from 1500-1700Z. Please put your QSO number and frequency on upper left-hand corner of your outer envelope. For an unfolded certificate, send a 9" × 12" SASE to: W8JPW, US Army Communications Command, Attn: CCNC-TAC-M, 28251 Van Dyke, Warren MI 48090.

BIX BIEDERBECK

The Davenport Radio Amateur Club will operate WØBXR to commemorate the great jazz player Bix Biederbeck and the city of Davenport during the Bix Biederbeck Memorial Jazz Festival, from 1600Z July 30 to 0300Z July 31, and from 1600Z to 2300Z on July 31. Operation on phone and CW, all bands about 10 kHz up from lower end of General-class band edges. To receive a certificate, send a large SASE to DRAC, c/o David Johannsen WBØFBP, 2131 Myrtle St., Davenport IA 52804.

LINCOLN BOYHOOD MEMORIAL

The Pike County Amateur Radio Club will operate station W9CZH from the Lincoln Boyhood Memorial, Lincoln City, Indiana, from 1700Z July 30 to 1700Z July 31. Special QSLs will be issued for your QSL and an SASE to Richard Bailey KC9VH, Box 311 RR 1, Winslow IN 47598. Frequencies will be: 3.925, 7.265, 14.305, and 21.395 phone; 14.090 RTTY; 146.52 FM; and 7.133 CW.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
c/o 73
Peterborough NH 03458

I'm going to start out this month by answering a question I raised last month, one that I'm sure has been just burning in the minds of many of you. Just what does Mr. Ferrell do with stations lacking a callsign in the alphabetical listings in his new *Guide To RTTY Frequencies*?

Well, shortly after last month's column was put to bed, I received a full copy of this new book, and I now can tell you the answer—they are not included in the alphabetical-by-callsign list. Only those stations with callsigns are! Reviewing the pages in the missing signature also shows a neat, short treatise on callsign origins and some other trivia in the same vein. Makes a good bit of reading. The second edition *Guide To RTTY Frequencies* is available from Gilfer Associates, Inc., PO Box 239, 52 Park Avenue, Park Ridge, New Jersey 07656, for $9.95. As always, plug this column when you write, ok?

Never in all my wildest expectations did I anticipate the veritable flood of responses to my offer of a 6800 and/or 6502 RTTY terminal program. In the past, several such comments have drawn but a lukewarm response, but not now! With more letters received than on any other single topic in the more than six years of this column, over half of the letters pleaded for 6800 software, with the majority of the others backing the 6502-based Atari 400/800. Let's take a look at a sample of what some of you said.

Philip Deem K9PD, Indianapolis, Indiana: "Let me identify myself as one of the very interested 6! (people worldwide interested in the 6800). I do, however, disagree that the 6800 is a dead system. This is possibly the only microcomputer ever offered whose purchasers have been able to make relatively inexpensive mods to remain current with the state of the art."

Horace Hall WB4OGM, Peterson AFB, Colorado: "In response to your request for comments . . . I, for one, would certainly be interested! I really don't think the 6800 is dead, though the ham fraternity may wish to hear more about the department-store computers since they are so readily available and the prices are so good. If all is lost for the 6800 and the new department-store computers are what RTTY hams want to hear about, then *at least* choose one with an honest-to-gosh keyboard. After all, we are going to have to type on them to get our messages across, so let's try to do so comfortably."

Weldy Moffatt VE5NM, Regina, Saskatchewan, Canada: "Please don't set the 6800 aside. There are a large number of these machines about and most are in the hands of persons that like to get into the innards. The 6800 on the S-50 bus is the ideal machine for the hobbyist that wants to tinker with hardware and software."

Joseph Ryan WB5LLM, Florence, Mississippi: "About dropping interest in 6800-based micros: Stop! Please don't give up on 6800-based micros. 6800 assembly-language programs can be cross-assembled to 6809 language."

Nick Hulbert KG5N, Lubbock, Texas: "The 6800 with the S-50 bus is an experimenter's dream. A person who likes to build and add to his system can simply put whatever he wants on the 30-pin card and plug it in. In fact, if I want to go to the 6809 or even the 6502, I can get a CPU card to do this and plug it into my 6800 mainframe. A far cry from what you can do with some of the other machines (easily). I'm trying to say that the 6800 is *not dead* and there are a bunch of units out there."

John Davison WØZFN, Kirkwood, Missouri: "I am very much interested in anything you want to print on the 6800. It might be dead, but mine is very much alive! It is a D-1 Motorola evaluation board."

Thomas Hand WD4IUG, Louisville, Kentucky: "I am interested in a RTTY program for the 6800-type computer. I have an APF computer which I enjoy very much."

Of course, not everyone is so universally behind the 6800 as the ideal CPU. For example. . .

Howard Busson W8WGB, Akron, Ohio: "I quit reading your column when you got off on the 6800 kick. I would suggest that you lean more towards the el cheapos (like the color computer)."

Stephen Carter KØGVZ, Rifle, Colorado: "It is truly unfortunate that the market did not support the 6800-6809 microprocessors, because they were easy to program and had really quite elegant architecture. However, realities being what they are, I suspect that any article based on a 6800 would have an extremely limited audience. On the other hand, if you used the Timex-Sinclair, VIC-20, Atari, or Radio Shack Color Computer, the low prices of

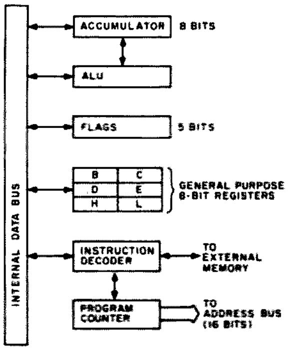


Fig. 1. 8080 block diagram.

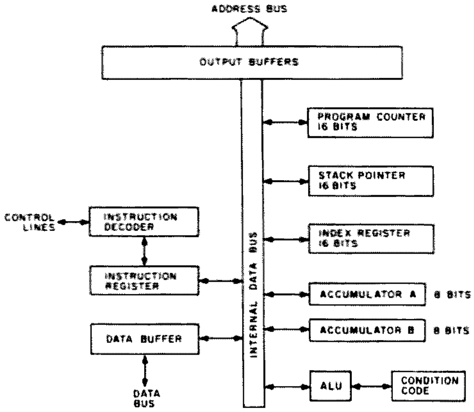


Fig. 2. 6800 block diagram.

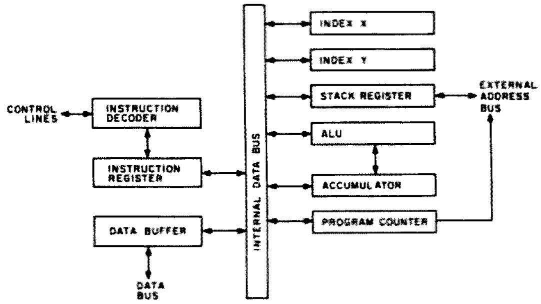


Fig. 3. 6502 block diagram.

these computers would make it feasible to buy one and dedicate it only to ham radio." I might point out to Steve that the CoCo *is* 6809-based.

James Theisen WB8REH, Gaylord, Michigan: "I am trying to understand machine code and hope to write or modify an existing RTTY program for the Pet." Stay tuned!

Rich Gehle N4DPQ, Nicholasville, Kentucky: "If you are considering a program for Atari on RTTY, please go for it. The present program is so restrictive and inconvenient, we are looking for relief."

It occurs to me that, to a large extent, a good deal of the above may be beyond the ken of many readers. 6800, 6809, 6502, 8080, Z-80—these are the substances of articles in *Byte* or *68 Micro Journal*, material rarely consumed by the average amateur. The truth is, for most commercially-available systems, the software offered is far more important than the central processing unit, or CPU, which is what all those numbers above were all about. But, if we will be writing software, we are going to have to commit to a particular CPU, or at least a similar group. Perhaps a look at history will be revealing.

In the beginning, there was no microprocessor, only big computers with tubes or discrete solid-state devices. After much work, trying to produce a general-purpose calculator integrated circuit, the Intel 4004 was born. This four-bit handler was the forefather of today's microcomputer breed. The next step was increasing the data capacity to eight bits, and the 8008 was born. I still remember the Mark-8 computers, home-brewed to use this chip in the early 1970s. An updated 8008 was introduced by Intel in 1973, called the 8080, and within two years the microcomputer revolution was off and running.

The design philosophy of the 8080 was an attempt to implement a calculator-type architecture on one chip, tracing back to the 4004 roots. Six general-purpose registers, stack and program counters, and a flag register work with one accumulator to provide internal data manipulations. Input and output is directed over special I/O channels. A block diagram of the Intel 8080 is shown in Fig. 1.

A year after the introduction of the 8080, Motorola presented its version of the eight-bit microprocessor, the 6800. Rather than the register orientation of the 8080, the 6800 is memory-oriented, that is, any memory location can serve as data, instructions, a register, or even an input/output device. By freeing up the organization, the 6800 becomes easier to program, and the more flexible addressing allowed by the 6800 makes this series, and ones to follow in this line, inherently more powerful. Fig. 2 shows the simple organization of the Motorola 6800, which contains two accumulators, an index register, stack and program counters, and condition code, or flag, register.

The next move was taken by several ex-employees of Motorola who joined forces with a calculator chip manufacturer, MOS Technology, to produce an enhanced 6800. The index register, a two-byte pointer in the 6800, was broken into two eight-bit index registers, and new modes of addressing were added. The B accumulator was discarded, and other refinements were made to some of the internal architecture. The result was the 6502, the block diagram of which is shown in Fig. 3.

The net result is that there are two major families among popular microcomputers: the 8080, with its enhanced version, the Z-80, and the 6800, 6502, and lately the 6809, an enhanced 6800, series. Although important differences exist between members of these groups, as a rule programs that are written for one may be translated, not always directly, from one to the other.

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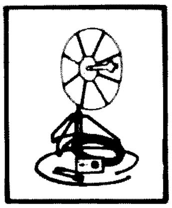

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WAS YOURS BIG ENOUGH?

The middle of the summer provides a time for reflection and anticipation for the DXer. DXing is at its worst of the year, with high absorption on the higher bands and static and noise on the lower bands. So the DXer reflects on "the ones that got away" last year and anticipates the next DX season.

In fact, the weather might even be nice enough to entice the DXer away from static crashes of the rig and outside for a critical look at the skyhook.

Have you ever heard of a DXer who is totally satisfied with his antenna farm? Summer brings thoughts of a "real" antenna. A *big* one! Wouldn't it be great to be known as a Big Gun . . . to be first in the pileups!

Alas, the limitations of the lot, the neighbors, and the pocketbook seem to rule out instant Honor Roll status, but perhaps a small upgrading is in order. After all, the bands are only going to get worse over the next few years, and there are many more DXers today than at the last sunspot minimum in 1975-6. Competition will be intense. More antenna and refinement of operating skills are the only defenses against deteriorating sunspot numbers.

"If your antenna lasted the winter, it wasn't big enough," the saying goes. Unfortunately, there are many amateurs whose antennas were indeed large enough for this past winter. For them, summer brings the chore of rebuilding, perhaps a little better than before, and on a stronger tower, of course.

Now that we're all in the mood for some serious antenna work, I must share the following. Picture an amateur sitting at a desk, laboriously writing a letter to an insurance company:

"I am writing in response to your request for additional information in block number three of the accident-reporting form. I put 'poor planning' as the cause of my accident. You said in your letter that I should explain more fully, and I trust that the following details will be sufficient. I am an amateur radio operator. On the day of the accident I was working alone on the top section of my new 80-foot tower. When I had completed my work, I discovered that I had, over the course of several trips up the tower, brought up about 300 pounds of tools and spare hardware. Rather than carry the now unneeded tools and material down by hand, I decided to lower the items down in a small barrel by using a pulley, which fortunately was attached to the gin pole at the top of the tower.

"Securing the rope at ground level, I went to the top of the tower and loaded the tools and material into the barrel. Then I went back to the ground and untied the rope, holding it tightly to ensure a slow descent of the 300 lbs. of tools. You will note in block number eleven of the accident-reporting form that I weigh only 155 lbs.

"Due to my surprise at being jerked off the ground so suddenly, I lost my presence of mind and forgot to let go of the rope. Needless to say, I proceeded at a rather rapid rate of speed up the side of the tower. In the vicinity of the 40-foot level, I met the barrel coming down. This explains my fractured skull and broken collarbone. Slowed only slightly, I continued my rapid ascent, not stopping until the fingers of my right hand were two knuckles deep into the pulley.

"Fortunately, by this time, I had regained my presence of mind and was able to hold on to the rope in spite of my pain. At approximately the same time, however, the barrel of tools hit the ground and the bottom fell out of the barrel. Devoid of the weight of the tools, the barrel now weighed approximately 20 pounds. I refer you again to my weight in block number eleven. As you might imagine, I began a rapid descent down the side of the tower. In the vicinity of the 40-foot level, I met the barrel coming up. This accounts for the two fractured ankles and the lacerations of my legs and lower body.

"The encounter with the barrel slowed me enough to lessen my injuries when I fell onto the pile of tools and, fortunately, only three vertabrae were cracked. I am sorry to report, however, that as I lay there on the tools in pain, unable to stand, and watching the empty barrel 80 feet above me . . . I again lost my presence of mind . . . I let go of the rope."

So now you are forewarned! I came across this gem in the Kansas City DX Association's newsletter. W0FI's column, *The Preacher's Corner*, credits the Sterling-Rock Falls newsletter. Anyone know the author of this delightful piece?

Lloyd W6KG and Iris W6QL Colvin accept their 9K2QL license in the office of the Minister of Communications in Kuwait.

Seriously, antenna and especially tower work is dangerous stuff. Even a task as simple as changing the coax to the antenna can lead to life-threatening consequences. So take a little *extra* care the next time you climb your tower. Remember, the secret to DX success is longevity, not hardware. Live to DX another day!

Some of you have asked what happened to the DX column the last two months. A fierce relapse of the same pneumonia which curtailed my African DXpedition to 9L1CA, C5AAQ, and 6W8MM laid me low recently. Sorry about not being able to write the columns, and thanks for your cards and notes. I'll try to have some extra-special columns in the rest of the year.

NOTES FROM ALL OVER

Tahiti FO0 Did you work Jay or Jan O'Brien W6GO and K6HHD while they operated from Tahiti in 1982? The husband and wife team racked up nearly 9000 contacts in their two-week stay in FO0 last October, sponsored in part by the International DX Foundation. About half of the team's contacts were with stateside stations, and another quarter of their QSOs came out of Japan. Ten meters was their most productive band, producing about half of their contacts. The 9000 contacts included 128 countries! The O'Briens survived a misplaced antenna and 100-kph winds during their DXpedition. Jay writes, "Had we not lost our 40- and 80-meter antennas to the winds, our totals [on these bands] would be higher, as this is where the demand exists." Jay and Jan made more than 4000 contacts in the *CQ* WW SSB contest.

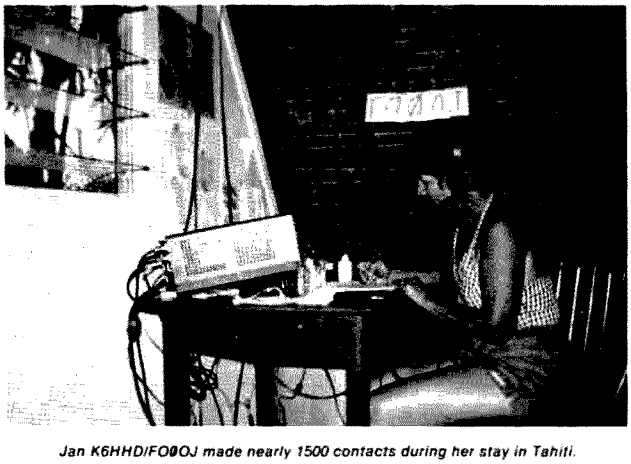
QSL cards for FO0OJ (QSL via Jan K6HHD) and FO0JO (QSL via Jay W6GO) have been sent out in answer to cards received. If you haven't received yours yet, try another card. Incidentally, Jay and Jan, who publish a list of QSL managers, *The W6GO/K6HHD List*, got their FO0 callsigns reversed in the advance publicity. No problem; QSL either call through Box 700, Rio Linda CA 95673.

Lloyd W6KG and Iris W6QL Colvin made another Yasme-backed DXpedition this past year, hitting, among other places, Saudi Arabia, Qatar, and Kuwait. They report:

Saudi Arabia HZ "We visited HZ1TA and HZ1TC in the capital of Riyadh, which is a large modern city. It is unusual in that it is not uncommon to see stores closed, with many items that they sell left in front of the store unguarded. Also, stores can occasionally be found open with no attendant present. One reason for this is that the people are very religious, and secondly, if a thief is caught, his hand is cut off! We also visited HZ1AB in Dhahran. There are 30 operators there, and they agreed to let us make a Yasme DXpedition for the two days of the ARRL International CW DX Contest, 19-20 February, 1983. We made some 1500 QSOs in that period, with four of the regular operators helping. All QSLs for HZ1AB for these two days should go to Yasme, PO Box 2025, Castro Valley CA 94546."

Kuwait 9K2 "Our next stop was Kuwait, where we were extremely fortunate to re-

Jay W6GO/FO0JO installs the tribander at Moorea.



Jan K6HHD/FO0OJ made nearly 1500 contacts during her stay in Tahiti.

ceive the special call 9K2QL. This is the only special call issued to visiting amateurs in a long while. The first few days we stayed at the Marriott Hotel, which is a converted ocean liner, similar to the *Queen Mary* in Long Beach. The problem of operating there was that the portholes could not be opened and there was no way to get the coax line into the stateroom. We finally moved to one of the chalets nearby. We convinced the manager that our 3-element beam would be a desirable addition to the swimming pool and garden area of his 5-star hotel! We made 6500 contacts with amateurs in 125 countries from 9K2QL."

Qatar "Qatar is similar to Oman because it is a recently rich oil country with tremendous new expansion. Although the treatment of women here is more liberal than in the past, only approximately 5% of the people seen on the streets or in the restaurants of the modern city of Doha are women. The biggest supermarket in town has one day set aside just for women and their families. It is not felt appropriate to have single men and single women go shopping together!

"For the first time ever, we operated from a skyscraper building. Our antennas were located on top of a 14-story hotel with a perfectly clear view in all directions. The great height seemed to help us both on transmission and reception; we averaged consistently about two QSOs per minute while on the air. In three weeks of operating, we made 8000 QSOs with amateurs in 135 countries, on both SSB and CW, 10–40 meters.

"Visiting personnel of all kinds, especially radio amateurs, are not encouraged to visit in the Arabian countries. We are extremely grateful to Mike A71AD who has helped us enter and operate in several Arab countries."

CORRECTIONS

The fine photographs in my article "Build this Classic Transmitter" in the May, 1983, issue were taken by Steve Finberg W1GSL. It is with regret that I notice due credit was inadvertently omitted from the published article.

Penn Clower W1BG
Andover MA

In the time since publication of "Confessions of a Counter Evolutionary," in the August and September, 1982, issues of *73*, several errors have come to my attention. Some corrections were listed in the October, 1982, issue on page 142. The following is a list of the remaining known corrections:

Table 1: IC10-11 goes to IC1-1, not IC1-38.

Fig. 7: IC10-11 should be 20 Hz to IC1-1, not 50 Hz.

Fig. 7: IC3 is actually wired as IC2-7 to IC3-14, IC3-12 to IC3-1, and IC3-11 to IC5-15.

Fig. 11(a): IC24-8 to IC13-4 is correct, but the connector is not "E". Delete "E".

Fig. 13: "PM" IC23-4 connects only to IC14-12, not to IC36-1 and not to IC23-12.

Fig. 13: Gate omitted from schematic:

Fig. 16: IC36-1 should not connect to "PM", but to IC20-8, as above.

Fig. 16: Input to IC18-1 should be IC3-14, not IC1-3.

Fig. 23: IC13 is a 74C74, not a 4013.

Part I, page 107, column 1, line 11 reads: "A 50-kHz signal is picked off the TBOD chain." Replace with: "A 100-kHz signal is picked off the TBOD chain. Because the gate control circuit, Fig. 11(a), operates on a 50% duty cycle, the 100-kHz signal becomes, in effect, a 50-kHz clock."

IC24-1,2,3 is an unused gate.

Thanks to WA1CST/7 and K2SHL for pointing out several of the above errors.

Display-Scan Modification

After a year of heavy use, the prototype WA2FPT counter blew a 75491 segment driver chip. It was replaced, but the new one failed after only a few weeks. I discovered empirically that Texas Instruments brand 75491 devices work more reliably in the published display scan circuit (see part I, page 105, Fig. 9) than National or ITT chips.

Sound engineering design practice should minimize such vendor dependency for circuit reliability, so I relented and added eight 10-Ohm, 1/4-W resistors, each in series with one of the eight segment lines to limit the current from the 75491 segment drivers, IC21 and IC25.

The resistors are mounted on a DIP header, socketed directly below IC35 and designated H2. See part II, page 52, Fig. 23. The resistors are mounted like this:

Here are the wiring changes for the display-scan modification.

SIGNAL	*AS PUBLISHED*	*MODIFICATION*
Segment a	IC25-9 to CONN-16	IC25-9 to H2-1 H2-16 to CONN-16
Segment b	IC25-6 to CONN-15	IC25-6 to H2-2 H2-15 to CONN-15
Segment c	IC25-2 to CONN-14	IC25-2 to H2-3 H2-14 to CONN-14
Segment d	IC21-13 to CONN-13	IC21-13 to H2-4 H2-13 to CONN-13
Segment e	IC21-9 to CONN-12	IC21-9 to H2-5 H2-12 to CONN-12
Segment f	IC21-6 to CONN-11	IC21-6 to H2-6 H2-11 to CONN-11
Segment g	IC21-2 to CONN-10	IC21-2 to H2-7 H2-10 to CONN-10
Segment D.P.	IC25-13 to CONN-9	IC25-13 to H2-8 H2-9 to CONN-9
Scan rate	IC6-15 to IC1-39 (1 kHz)	IC2-7 to IC1-39 (100 kHz)
Scan reset	IC10-11 to IC1-1 (20 Hz)	IC6-15 to IC1-1 (1 kHz)
D.P. clock	IC2-7 to IC18-1 (100 kHz)	IC2-15 to IC18-1 (1 MHz)
No name	IC35-7 to GND	IC20-6 to IC35-7 IC27-4 to IC20-4,5

The last four wiring changes altered the original scan display cycle to eliminate the 20-Hz flicker. The "no name" signal change resulted in the addition of another gate to Fig. 16:

Thank you for the favorable responses. If there are other errors or problems "encountered," please write and I will make every effort to resolve them.

D. N. (Nick) Ellis WA2FPT
57 Memorial Ave.
Alice Springs NT 5750
Australia

SATELLITES

Amateur Satellite Reference Orbits

Date		OSCAR 8 UTC	OSCAR 8 EQX	RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
Jul	1	0041	95	0028	311	0110	327	0149	333	0006	305	1
	2	0046	96	0023	311	0054	324	0139	333	0003	305	2
	3	0050	97	0018	311	0039	322	0129	332	0001	306	3
	4	0054	98	0012	312	0024	320	0120	331	0158	337	4
	5	0059	99	0007	312	0008	317	0110	330	0155	338	5
	6	0103	100	0002	312	0151	345	0100	329	0152	339	6
	7	0107	102	0156	342	0136	342	0051	328	0149	339	7
	8	0112	103	0151	342	0121	340	0041	327	0146	340	8
	9	0116	104	0145	343	0105	338	0031	326	0143	341	9
	10	0120	105	0140	343	0050	335	0022	325	0141	342	10
	11	0125	106	0134	343	0034	333	0012	324	0138	343	11
	12	0129	107	0129	343	0019	331	0002	324	0135	344	12
	13	0133	108	0124	343	0004	328	0152	353	0132	344	13
	14	0138	109	0118	344	0147	356	0142	352	0129	345	14
	15	0142	111	0113	344	0132	354	0133	351	0126	346	15
	16	0003	86	0108	344	0116	351	0123	350	0123	347	16
	17	0008	87	0102	344	0101	349	0113	349	0121	348	17
	18	0012	88	0057	344	0045	347	0104	348	0118	348	18
	19	0016	89	0052	344	0030	344	0054	347	0115	349	19
	20	0021	90	0046	345	0015	342	0044	346	0112	350	20
	21	0025	91	0041	345	0158	9	0035	346	0109	351	21
	22	0029	93	0036	345	0143	7	0025	345	0106	352	22
	23	0034	94	0030	345	0127	5	0015	344	0104	353	23
	24	0038	95	0025	345	0112	2	0006	343	0101	353	24
	25	0042	96	0020	346	0056	0	0155	12	0058	354	25
	26	0047	97	0014	346	0041	358	0146	11	0055	355	26
	27	0051	98	0009	346	0026	355	0136	10	0052	356	27
	28	0055	99	0003	346	0010	353	0126	9	0049	357	28
	29	0100	100	0158	16	0153	21	0117	8	0047	357	29
	30	0104	102	0152	16	0138	18	0107	7	0044	358	30
	31	0108	103	0147	17	0123	16	0057	7	0041	359	31
Aug	1	0113	104	0142	17	0107	14	0048	6	0038	360	1
	2	0117	105	0136	17	0052	11	0038	5	0035	1	2
	3	0121	106	0131	17	0036	9	0028	4	0032	1	3
	4	0126	107	0126	17	0021	7	0019	3	0029	2	4
	5	0130	108	0120	18	0006	4	0009	2	0027	3	5
	6	0134	109	0115	18	0149	32	0000	1	0024	4	6
	7	0139	110	0110	18	0134	29	0149	30	0021	5	7
	8	0000	86	0104	18	0118	27	0139	29	0018	6	8
	9	0004	87	0059	18	0103	25	0130	28	0015	6	9
	10	0009	88	0053	19	0047	22	0120	28	0012	7	10
	11	0013	89	0048	19	0032	20	0110	27	0010	8	11
	12	0017	90	0043	19	0017	18	0101	26	0007	9	12
	13	0022	91	0037	19	0001	16	0051	25	0004	10	13
	14	0026	92	0032	19	0144	43	0041	24	0001	10	14

NEW PRODUCTS

ELECTRONIC SOLDERING SYSTEM

The new Electronic System 9000 temperature-controlled soldering system from the Ungar Division of Eldon Industries enables a tip temperature to be varied from 420 to 800 degrees F with an accuracy of ± 10 degrees.

Solid-state circuitry, including microcircuit chips, samples the tip temperature 120 times per second. LEDs on the temperature-controller instantly display each 20-degree temperature increment reached, creating an illuminated bar chart that clearly represents the tip temperature to within ± 10 degrees F.

Ungar's recently announced Thermoduric™ heating element, which combines a highly efficient heater and sensitive tip-temperature sensor, recovers tip temperature after each solder joint in less than one-half the time of other systems. The smaller heating element also makes possible a micro handle that is cooler than other models.

Electronic circuitry in the controller prevents tip-temperature overshoot that could easily cause faulty solder joints.

The controller can be calibrated by a front-panel adjustment, using room temperature as a reference. For ultra-precise soldering, any temperature within the temperature range can be calibrated to be accurate within ± 5 degrees F.

Following the modular concept of Ungar irons, the controller is separate from the soldering-iron holder assembly. The controller can be mounted on a wall, side of a bench, or other convenient location. A tray, useful for holding parts or small tools, is exposed on the stand when the controller is removed. The iron holder can quickly be changed to the left or right side of the stand.

The system is electrically conductive from the tip to a grounded wall plug to prevent static electricity damage to microcircuits.

Further information is available from *Ungar, 100 W. Manville St., Compton CA 90220; (213)-774-5950*. In Canada: *Eldon Industries of Canada, Markham, Ont. L3R 1H5, Canada; (416)-495-9407*. Reader Service number 483.

CONTROL CHIP

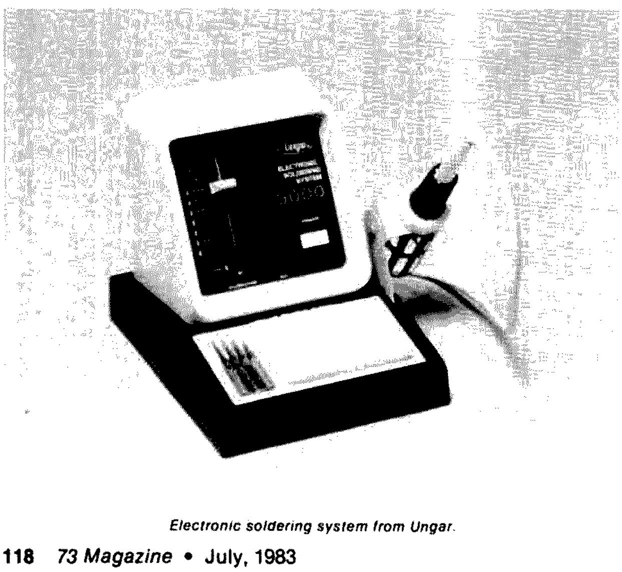
Digital Microsystems, Inc., a Massachusetts-based firm which has been active in the microcomputer and software business for seven years, has announced a family of custom-integrated circuits aimed primarily at the amateur and hobbyist markets. The integrated circuits make use of the latest in sophisticated Large Scale Integration (LSI) technology. Each is designed to be tailored to its application by the user through a wide range of programmable features. The first product to be announced is a single-chip repeater control circuit designed to meet amateur and industrial needs for low cost, high reliability, and high performance control of repeater stations. The new chip will be offered initially in commercial and extended temperature versions. A full military device is planned.

The single-chip repeater control features crystal-controlled timing accuracy for ID, tail, and time-out timers. The period of each timer is programmable by the user. In addition, each chip features an audio generator for generating the repeater station's callsign as well as several useful control messages such as "TEST" and "PF." The chips are equipped to interface directly with PL decoders and also feature a PL enable input.

Additional features include a tune input for holding the transmitter on while making adjustments, a "force ID" input for manual trigger of an ID sequence, user-selectable Morse code transmission rates, and compatibility with a planned autopatch controller.

For additional information, contact *Digital Microsystems, Inc., 607 Sudbury St., Marlboro MA 01752*. Reader Service number 484.

Control chip from Digital Microsystems, Inc.



Electronic soldering system from Ungar.

HEIL TRANSVERTER

A unique 2-meter-to-10-meter linear translator has been introduced by Heil, Ltd. This new product allows a transceiver covering 144.00 to 146.00 to transmit and receive from 28.00 to 29.70 MHz. The translator is limited to a 1-Watt input.

The model 210 is primarily designed for use in the 29.30-to-29.70-MHz FM mobile band, using a 1-Watt handie-talkie or mobile transceiver for excitation, but it is also usable on SSB, CW, AM, and RTTY by exciting with an all-mode 2-meter rig. The model 210 has three SO-239 connectors on the rear panel—a 2-meter 1-Watt input, a 2-meter antenna, and a 10-meter antenna. With the front-panel function switch in the Out position, the 2-meter antenna is connected to the 2-meter transceiver or handie-talkie. Switching to the In position will cause the transverter to operate and produce a signal in the 10-meter band. The receive sensitivity is .3 uV for 10 dB quieting. The output power is approximately 4 Watts out at 29.60 MHz.

For more information, contact *Heil Sound, Ltd., Heil Industrial Blvd., Marissa IL 62257*. Reader Service number 480.

AUTOPATCH AND DTMF DECODER MODULES

Hamtronics® recently released two new modules to complement their line of VHF and UHF repeaters. The Autopatch Module provides full telephone patch and reverse autopatch functions for a repeater or duplex rural radiotelephone installation. In addition, it allows primary repeater control via phone line *and* secondary control via the repeater receiver, and it allows a control operator to monitor the repeater receiver by telephone even when the transmitter is shut off.

The Autopatch features a choice of either automatic answer or on-air tone ringing when a party calls the reverse patch function. It also features automatic level limiting, time-out timer, tape-receiver relay for logging, and access-code-tone muting for security.

The DTMF Decoder/Controller Module can be used with the Autopatch, or it can be used alone for control of repeaters and other devices by radio link. It has outputs to control two on/off functions independently. Typically, it is used to control a repeater and autopatch, but there are many other remote-control jobs it can perform in radio, industrial, mining, and scientific applications. The decoder uses a four-digit DTMF code, and several safety features are provided for security against falsing or tampering. The unit is all solid-state (no relays) and uses commonly available ICs.

For more information, ask for *Autopatch Data Sheet* and a complete free catalog including information on transmitters, receivers, converters, repeaters, etc., contact *Hamtronics, Inc., 65F Moul Rd., Hilton NY 14468-9535; (716)-392-9430*. (For overseas mailing, please enclose $1 or 4 IRCs.) Reader Service number 482.

TVRO RECEIVER

A TVRO receiver was introduced recently at the Satellite TV Trade Show by Gillaspie and Associates, Inc., of Sunnyvale, California. The Gillaspie 9600 completes the manufacturer's uniquely-designed six-foot system package—the first in the industry to offer a combination of optimized components that are each clearly defined and made to work with each other.

The receiver introduces several new features, including an infrared remote-control channel selector, customer-oriented controls, built-in polarity switching and tuning, and state-of-the-art video demodulation circuitry. Its design includes a walnut wood cabinet.

Gillaspie and Associates, Inc., expects to be able to manufacture 10,000 to 20,000 receiver units a month by the end of 1983. The product will be distributed through the company's exclusive distributors—North American Satellite Antenna in Fresno, California, Nevada Satellite in Las Vegas, Nevada, Satellite Communications Corporation in Silver Lake, Kansas, and Multivision in Oak Ridge, Tennessee—and a network of 800 dealers.

For additional information, contact *Gillaspie and Associates, Inc., 365 San Aleso Ave., Sunnyvale CA 94086; (408)-703-2500*. Reader Service number 485.

HF/VHF ANTENNA LINE

Ten-Tec, Inc., the amateur/commercial radio transceiver manufacturer of Sevierville, Tennessee, has just announced acquisition of the Bassett antenna line. The new Ten-Tec antenna line includes both multiband fixed-station and single-band mobile antennas.

The fixed-station trapped dipole antennas are offered in 13 models of two, three, four, and five band systems covering 10 through 75 meters. All models use helium-filled traps and baluns, stainless-steel hardware, and copperweld wire. Each model operates as a fundamental broadside dipole, band change is automatic, and no tuner is required to achieve vswr of 1.5:1 or less. Power ratings are 2 kW PEP.

The single-band mobile whip antennas feature helical inductors sealed in helium-filled lower sections with stainless-steel top whips. Models are available for all bands from 2 through 75 meters. Average weight is just 6 oz., yet they remain vertical and resonant at all highway speeds and are impervious to weather. Power ratings are 750 Watts PEP.

Accessories include a single-hole 5/8" fiberglass Mobile Deck Mount and a noninductive 5-band switchable Mobile Matcher to match 3-30-MHz mobile antennas to 50-Ohm coax. The balun, which features a helium-filled high-efficiency air core rated to 5 kW PEP, is also available separately, as are the helium traps for 30 meters.

The new acquisition also permits Ten-Tec to supply custom commercial mobile and fixed-station antennas.

For complete information, write *Ten-Tec, Inc., Sevierville TN 37862; (615)-453-7172*.

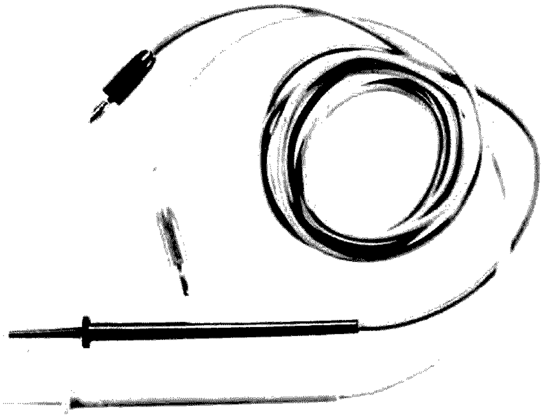
SWISS QUAD FOR 6 METERS

TET Antenna Systems announces its model SQ-61. The Swiss Quad is a two-element quad with both elements driven. The elements and the phasing line between them are made of aluminum tubing. The larger diameter of the tubing gives improved bandwidth over conventional wire-element quads. The elements are self-supporting, thus eliminating the usual support structure. This makes a lightweight antenna with low wind resistance.

The gain is higher than a 3-element yagi, but the turning radius is half that of a yagi. It is ideal when space is restricted. Both elements have trombone sections so they are easy to tune to favor any part of the band. Both elements are grounded to the boom, giving static discharge and lightning protection. The feed system matches 50-Ohm coaxial cable without need for a balun.

For further information, contact *TET Antenna Systems, 1942E W. Mission Road, Escondido CA 92025*. Reader Service number 477.

Yaesu's FT-726R multi-mode transceiver.



New test leads from Non Linear Systems.

FT-726R TRIBAND MULTI-MODE TRANSCEIVER

Yaesu Electronics Corporation has announced the availability of the FT-726R, the world's first amateur HF/VHF/UHF transceiver capable of full duplex operation for satellite work.

The basic FT-726R comes equipped for 2-meter operation on SSB, CW, and FM. Optional units may then be plugged in, enabling operation on 10 or 6 meters, 430-440 or 440-450 MHz on 70 cm. The optional SU-276 Satellite Unit allows crossband full duplex operation, for simultaneous uplink transmit and downlink receive operation on amateur satellites.

Controlled by an eight-bit microprocessor, the FT-726R features a dual vfo plus memory frequency management system, with independent frequency/mode storage on each vfo or memory; mode-inverting satellite transponders are therefore covered with ease. The transmit and receive frequencies may be varied during satellite work to allow easy zero-beat capability while following Doppler shift.

Equipped with many features found only on HF transceivers, the FT-726R includes an SSB speech processor, i-f shift, variable i-f bandwidth tuning, i-f noise blanker, RIT, multi-mode squelch, and a receive audio tone control. A CW filter, DTMF encoding microphone (YM-48), desk microphone (MD-1B8), external speaker (SP-102), and CTCSS units are all available as options.

For more details about the FT-726R, contact *Yaesu Electronics Corp., PO Box 49, Paramount CA 90723; (213)-633-4007.* Reader Service number 479.

TEST LEADS

Two test lead sets have recently been placed on the market by Non Linear Systems, Inc. They consist of flexible silicone rubber leads, 48 inches in length, with a rated working voltage of 1000 volts ac rms and a maximum of 10 Amperes.

Each type is terminated at one end with insulated stainless-steel prods which may be extended by more than two inches. Extension, retraction, or locking the prods is easily accomplished by rotating a knurled ring on the probe from left to right. Testing in remote circuit areas is easy through the extendable-prod feature.

P/N 51-160 test leads are terminated at the other end with standard banana plugs for use with the NLS Touch Test 20 series digital multimeters or other instruments with standard banana-plug receptacles. P/N 39-895 test leads are terminated with mini banana plugs for use with NLS LM-type meters.

Both sets of test leads are available nationwide from local NLS electronics distributors. For additional information, contact *Non Linear Systems, Inc., PO Box N, Del Mar CA 92014.* Reader Service number 478.

RECEIVER MULTICOUPLER

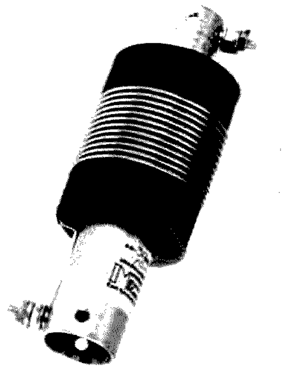
Two shortwave receivers may be operated from one antenna, thanks to a new multicoupler just released by Grove Enterprises, manufacturer of accessories for listening.

The CPL-2 multicoupler acts as a signal splitter, providing equal signal levels to two receivers simultaneously from one antenna.

Designed for flat response from 3-30 MHz, the inexpensive splitter comes equipped with interconnecting cables and adapters for different types of lead-in connections.

A scanner verison of the multicoupler is also available as model CPL-1.

For further information, contact *Grove Enterprises, 140 Dog Branch Road, Brasstown NC 28902; (800)-438-8155* (except NC). In NC, call *(704)-837-2216.* Reader Service number 476.



Microwave Filter Company's 30-meter antenna coil.

30-METER ANTENNA COIL

Microwave Filter Company has released its KW-30 antenna coil which allows trapped dipole coverage of the new 30-meter band. The resonant frequency is designed to provide a perfect half-wave dipole. The KW-30's power handling capability is 2 kW PEP, and the tensile strength is 800 pounds. An acrylic lacquer waterproof coating and all-aluminum hardware help to resist interface corrosion on the 5.5" × 1.8" coil.

For additional information, contact *Microwave Filter Company, Inc., 6743 Kinne St., East Syracuse NY 13057; (800)-448-1666.* Reader Service number 481.

REVIEW

VHF/UHF MANUAL

Well, old chap, brew up a spot of tea and settle in your easy chair. The *VHF/UHF Manual* is here from the Radio Society of Great Britain, and quite a good read it is.

Edited by G.R. Jessop G6JP, this is the fourth edition of the manual, and it includes the latest in theory and circuits for the modern experimenter's paradise. The book runs to a healthy 528 pages, which is somewhat larger than the last edition. Subjects range from propagation to space communications, hitting tuned circuits, antennas, and test equipment along the way.

The authors begin the book with a germane point—that VHF/UHF communications is no longer the arcane art that most amateurs believe it to be. Indeed, they suggest that those frequencies provided the backbone of some of Marconi's earliest experiments, and that in 1924, the magnetron made 900-MHz oscillation possible.

By the '30s, the basic techniques for these frequencies had been developed, and since that time, the progress of solid-state equipment has provided a more comfortable environment for VHF/UHF experimentation. And with the proliferation of 2-meter equipment, there is no longer any excuse for amateurs not to know their way around the rarified atmosphere of 144 MHz and above.

The chapter on propagation leaves no stone unturned in its coverage of the odd twists and turns of VHF/UHF signals. Since propagation here is dependent on the troposphere rather than the ionosphere, meteorology comes into play when attempting to understand how the VHF signal travels. For those not familiar with the ways in which weather is studied, appropriate concepts such as dew point, adiabatic changes, and vapor pressure are explained, with particular attention paid to their effect on communications. The more bizarre forms of propagation—sporadic-E, meteor trail, and auroral—also are explained, using current theory.

Fortunately for the reader, the authors make frequent use of visual aids and include real-world examples. This is an attribute I noticed throughout the book. Drawings are frequently provided in conjunction with the schematics, providing better insight.

The manual is not all theory, however; in subsequent sections, some good old down-to-earth construction projects are described. The construction-oriented chapters make up the bulk of the book, and they cover receivers and transmitters, converters, filter, microwaves, and test equipment. The authors' selection of circuits runs a wide range, from timeout timers and simple tube converters to synthesized 2-meter equipment.

With the continent's generally more stringent regulations concerning EMI, the circuits cited in the manual are considered to be fairly clean designs. As a homebrewer, I was also concerned about the availability of foreign components used in the circuits. But most of those included in the manual use standard European nomenclature for transistors, and a conversion chart can quickly give you the US equivalent. And regardless of where you are, an Ohm is still an Ohm.

Other projects offered include SSB equipment, ATV signal processors, and 144-MHz amplifiers. 432-MHz gear is also well represented, but because of the European focus of the book, relatively few opportunities for the 220-MHz buff present themselves.

The manual's treatment of antennas, the last refuge of the experimenter on a budget, is equal parts theory and construction; some sound design parameters are offered, but you are not likely to find any radical departures from tradition here.

Space communications, which may prove to be this decade's mode (as 2-meter FM was in the '70s), has been

somewhat slighted as well. The manual has provided the basic information on understanding, tracking, and designing amateur satellites, but little about the nuts and bolts of designing your own satellite station. To their credit, the authors included up-to-date information on Phase III, and the rapidly changing face of satellite communications may have forced the authors to be sparing in their suggestions.

Moonbounce has been relegated to a mere two pages of text—which is exactly where it belongs, for few hams have the money, space, or time to fiddle with the demanding requirements of EME.

Overall, this book is a winner, whether you want to home-brew your own VHF/UHF gear or just understand what goes on inside your black box. And as proof positive that this book is in tune with the times, many of the old tube circuits have been left in. No contradiction here: according to the editor, tubes are about 100 times less susceptible to damage from EMP radiation—which is one of the by-products of an atomic explosion.

For more information, contact the *Radio Society of Great Britain, 35 Doughty St., London WC1N 2AE, England.* Reader Service number 488.

Avery L. Jenkins WB8JLG
73 Staff

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

GORDON WEST CODE TAPES

The concept of using tapes to teach the code is almost as old as the Morse code itself, and almost all of the variations of tape-taught code have been tried. I thought I had seen them all until I encountered Gordon West's Radio School code cassettes.

Gordon West WB4NOA has managed to come up with a new idea—his tapes are in stereo, with one channel consisting only of code and the other channel containing a voice translation of what is being sent. This is an interesting idea, particularly for the beginning student who needs to know if he is getting his characters straight.

The tapes I reviewed are for the first-time student who has no knowledge of the code. The four-tape series is divided into an equal number of 90-minute "modules," each representing a higher level of achievement (or difficulty, depending on how you look at it). The first two modules introduce the student to all of the letters, numbers, and punctuation marks in common usage. The remaining modules work toward reinforcing the previous lessons.

West begins lessons by introducing a few new characters, repeating them several times, and then sending a series of the new characters on one channel while identifying them in voice on the second channel. The purpose of the stereo is to allow you to listen to the code only and then go back and check your copy. Or, on your first round through that lesson, you can listen to both channels until you feel confident with the new characters being introduced.

Each lesson works gradually into more complex sequences. As more characters are introduced, the strings of letters become words and then sentences. The longer strings and sentences are not simultaneously translated on the voice channel. Instead, West identifies the end of each string with a period. This marker tells you to turn up the other channel for the voice translation of what was being sent.

Between lessons, West identifies possible trouble spots and offers tips to help beginners learn the code. From the sound and inflection of his voice, it is obvious that West has had broadcasting or announcing experience. His voice is easy to listen to and the script is delivered in an informal, chatty manner.

The tapes may also be played on a monaural system. The only difference will be that both channels will be played and you cannot blank out the voice-over as you can with a stereo cassette deck.

However, this compatibility with both mono and stereo systems is also one of the tapes' drawbacks. Since not all of the practice sessions are simultaneously repeated on the voice channel, the advantages of the stereo capability are not used to full advantage. Throughout much of the tape, the only difference between the West tapes and a standard mono tape is that you have to turn up the volume of one channel to catch the answers to the practice session.

After several hours of use on both stereo and mono tape players, I found that it was almost easier to listen to the tapes on the mono cassette player. The advantage to the separate channels occurs primarily when new letters are being introduced.

Another aspect of the West system which I did not like was the use of words and sentences. Unless random code groups are used, it becomes too easy to memorize the characters being sent rather than improve your recognition. After only a few trials on the tape, I could predict with fair accuracy the upcoming characters. Granted, I was not trying to learn the code at the same time, but the same process would occur at a slower rate with a beginning student.

West uses the standard system of teaching the code, beginning with the easiest characters such as i and e and progressing to the more difficult ones. Repetition—the key to successful memorization—is used to great advantage here. However, he does not send the characters themselves at a higher speed so that the student can get used to the sound of the code at 10 or 15 wpm. Time and again, it has been shown that this technique provides the best results because the student does not have to relearn the code each time he or she advances in speed.

I did not find that there were any clear advantages to West's stereo system. The tapes are professionally produced, and West has paid a lot of attention to the psychological factors of learning. His breaks are well-timed to coincide with the length of time most people can concentrate, and his informal manner to a certain extent overcomes the impersonality of tape-teaching.

But in his attempt to make the tapes compatible with both stereo and mono systems, West has somewhat weakened the effect of this novel technique.

West's code tapes list for $39.95 for a set of four. For more information, contact *Gordon West's Radio School, 2414 College Drive, Costa Mesa CA 92626; (714)-549-5000.* Reader Service number 486.

Avery L. Jenkins WB8JLG
73 Staff

AEA'S KT-2 KEYER/TRAINER

OK, all you would-be General- and Extra-class hams out there—you no longer have any excuses for not upgrading. At least, not since the people at AEA camé out with their KT-2 keyer/trainer. The KT-2 is a flexible unit which doubles as a code-practice device (CPO) and a keyer. In short, it will not quickly outlive its usefulness.

As quality equipment should be, the outside of AEA's little black box is deceptively simple, with only an on-off/volume knob and a DTMF keypad as external controls. On the back, there are jacks for headphones, a key, and outputs to either cathode-keyed or grid-keyed transceivers. However, the many capabilities of the KT-2 belie its plain appearance.

As a training unit, the KT-2 has several special features of note to the person trying to move his or her code speed up to that elusive 13 wpm. One of these features is the optional use of the Farnshaw method of practice.

The Farnshaw technique has proven to be one of the most successful ways of learning the code. More commonly known as "fast" practice, the Farnshaw style consists of sending the characters at a fast speed—say, 15 wpm—while maintaining a longer inter-character spacing to create a lower overall speed. In this way, the student does not have to relearn the sound of the characters as he advances in speed. You can, therefore, program the trainer to send its random code at 10 wpm, while keeping the character speed at 20 wpm. Actually, the trainer has the capability of sending from 5 wpm to 98 wpm, with a character speed of up to 99 wpm. Not too bad for a little black box.

AEA's KT-2 keyer/trainer.

Pumping Iron

Coupled with this option is the ability to program the keyer to automatically increase the code speed during a training session. I dubbed this the "pumping iron" technique since it parallels the method used by professional body-builders to develop muscles. On power-up, the trainer is set to start out at 5 wpm and accelerate to 20 wpm over 10 minutes; as workouts go, that's nothing to laugh at. But through the keypad, you can adjust both the starting and finishing speeds as well as the duration of the session.

More programming gives you further options. If you prefer the traditional method, hitting two keys on the pad will give you the code at exactly the speed you choose—no reduced intra-character spacing and no acceleration. Or if, like me, you prefer to listen to 20-wpm characters sent at 13 wpm with no speed-up to overload you, that can be arranged, too.

Randomize, Don't Memorize

Nine pseudorandom sequences may be chosen, and no sequence will repeat itself until about 34,000 characters have been sent. Even if you manage to memorize all of those without bringing your code speed up to where you want it, AEA has provided an escape valve. Starting a practice session with the ***# sequence will randomly select your starting point.

The length of word groups may be random or 5 characters per group. And if you really want to get tough on yourself, the KT-2 is divided into two character sets—a common set which includes the alphabet, numerals, and six frequently-used punctuation marks, and a second set which includes CW abbreviations and little-used punctuation. Those with an intense desire to copy apostrophes and parentheses won't be left out.

Though the sequences of keys you have to press to program and begin the trainer look complex, I found that I had them down pat after only a few sessions. None of the commands take more than four keystrokes, and AEA thoughtfully provides an easily-used table for quick reference.

Another advantage to using the KT-2 is that, unlike on-the-air practice, you don't have to guess at the speed. The KT-2 is calibrated to be extremely accurate, using the PARIS method. The word "PARIS" has 10 dots, four dashes, nine intra-character spaces, four inter-character spaces, and one word space for a total of 50 code elements. In adjusting code speed—for different dot-space and dash-space ratios—PARIS is used as a reference to determine the actual speed of the code.

The Keyer

The KT-2 is no contest keyer, but not all CW buffs are contesters—and as a keyer, the KT-2 offers you the options you need most.

First of all, it can be used with an iambic paddle, a bug, or a straight key. With the latter two, you simply key the dash input and the KT-2 produces a sidetone. As a full iambic keyer, this unit shines. Both dot-space and dash-space ratios (weighting) are adjustable from the normal 3:1. And when you change the weighting, the keyer will adjust the output automatically so that you will be sending at precisely the speed you set.

The keyer sidetone (as with the trainer) is adjustable from its power-up frequency of 1111 Hz, and the KT-2 also has dot and

dash memories. The memories allow you to insert a dot in a string of dashes (or vice versa) just by squeezing the appropriate paddle. Without this feature, you would have to release the dash paddle, squeeze the dot paddle, and then key the dash side again. But if you prefer old-style sending, you can turn this option off.

And for tune-up, the keyer has a lock-on position which produces a solid tone while you fiddle with your finals. You can cancel the tone by hitting any button on the keypad.

The manual for the KT-2 is well-written. AEA provides an initial testing procedure to ensure that your unit is operating correctly, and the operating instructions are clear and concise. In addition, there is a complete schematic, parts list, and PC board layout. The unit uses a 12-V supply, and AEA sells a wall-plug adapter, a cigarette lighter cord, and a nicad pack to accompany it.

At the list price of $139.95, even Ted McElroy would have bought the KT-2.

For additional information, contact *Advanced Electronic Applications, PO Box C2160, Lynnwood WA 98036.* Reader Service number 487.

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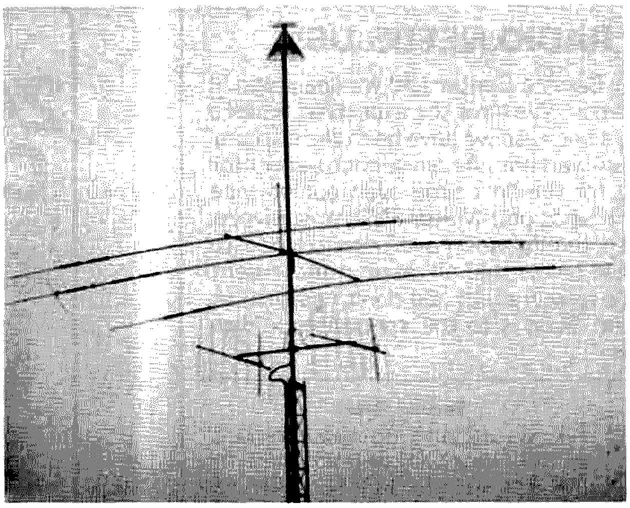
CUSHCRAFT A3/A73 TRIBANDER



AG9V's stack: 2 × 7-el/146 MHz at 67', the Cushcraft A3 at 70', and home-brew Discone for 144/220/450 at 80'. (Photo by K9JQE)

After years of helping to build (and use) other people's ham stations, I finally settled down and found a home that was compatible with ham radio. It didn't take long before a tower started growing in the backyard. No more semi-verticals and very random wires for me!

But having a tower meant that I had to find something to put on top of it—and monobanders were out (at least until next year!). I decided on the Cushcraft A3 triband beam with an A73 40-meter add-on kit. The A3 is a three-element beam for 10, 15, and 20 meters, and the A73 kit adds an additional set of traps and some length to the driven element so that the antenna will work as a rotatable dipole for 40 meters. With the A3/A73, I can cover four bands with one antenna and feedline, and that makes designing an antenna farm a lot easier.

The A3 is a small antenna with a boom length of only 14 feet, although the driven element (with the A73 kit installed) is about 35 feet long and uses a truss and cord to reduce element sag. The beam went together easily, and the instructions, which consist almost entirely of diagrams, were simple to follow. Element dimensions for use on the CW, phone, or mid-band segments are given so that the antenna can be tuned up in your favorite part of the band. I used the CW settings for mine.

The wind load of the A3/A73 is 4.94 square feet (4.63 sq. ft. if set up for 30 meters). The antenna is well built and should survive any reasonable wind.

After assembly, the crew (two on the ground and WA9SRW on the tower) hoisted the antenna up to its final resting place at 70 feet without any trouble. Some quick swr checks indicated that everything was as it should be, and off I went to work the world.

About a month after the A3 was installed, disaster struck. While operating with a kilowatt input on 20-meter CW, I watched with horror as the swr rose from its usual 1.1 to 1 up to 3+ to 1. After letting things cool down a bit, I tried again, this time using 100 Watts output. When first keyed, the swr was right where it should be, but I could watch it rise until, after about 45 seconds, it was back up to 3 to 1.

A check of other bands showed that 40 meters also was affected, but that 10 and 15 meters were not. This led to the suspicion (confirmed by a phone call to Cushcraft) that I had a bad 40/20-meter trap on the driven element. Analyzing the failure, it appeared that there had been an arc in the trap. The failure occurred on a damp, misty night, and apparently the moist air provided the path that began the arc-over. Cushcraft whipped up a modified set of traps with increased clearances that should eliminate any such problems.

Once the weather cooperated and we got the new traps installed (these things always seem to happen in the middle of winter!), everything was back to normal. Subsequent misty nights have proven to be no problem. Cushcraft has informed me that these modifications will be used in future production A3/A73s.

Now for the $64,000 question—how does the A3 perform? Considering the compromises that are inevitable in a multiband beam, the answer is very well indeed.

Let's look at the compromises first. There are two problems with a small, trapped beam. First, traps aren't 100 percent efficient and they do introduce some loss, but more important, they shorten the elements by adding inductance to the antenna circuit. Of course, this has the advantage of creating a smaller antenna, but it also means that like most shortened antennas, the bandwidth will be reduced and the swr curve will be sharper.

Second, the spacing between elements is a compromise—if the elements aren't too widely spaced for 10 meters, they will be closely spaced for 20 meters. Closely-spaced elements tend to reduce gain, front-to-back ratio, and bandwidth.

Gain and front-to-back bandwidths usually get narrower along with swr bandwidth, and particularly on 20 meters, these measurements won't be near their peak values at the end of the band away from where the A3 is tuned.

These compromises most affect the lowest frequency band in use, and on the highest band, performance should be very close to that of a full-sized beam. In practical terms, the trade-offs don't make a tribander (or in this case, a "quadbander") like the A3 an inferior performer, and they certainly result in a very practical antenna design.

The A3's swr bandwidth, most noticeably on 20 and 40 meters, is much narrower than that of a full-sized antenna, and if the A3 is tuned for CW, you'd better figure on dealing with a rather high swr at the top of the phone band. On 40 meters, in fact, the 2 to 1 bandwidth is only about 125 kHz. Narrow swr bandwidth itself isn't a serious problem unless your rig won't load into the mismatch—and that's what antenna tuners are for. According to Cushcraft, the A3 will handle a full kW if the swr at the antenna (and not measured through a transmatch) is less than 3 to 1. An swr that high should occur only on 40 meters.

In use, the A3 isn't noticeably inferior to a full-sized antenna. The gain on 20 meters may be a dB or two below that of a monobander, but it's still a lot louder than a dipole! I spend most of my operating time haunting the bottom end of 20 CW, and I don't feel that the A3 is a handicap. If a pileup is so huge that I can't get through, it would take a lot more than a bigger antenna to make much difference.

My CW-tuned antenna does have lower gain and front-to-back ratio at the top of 20 than at the bottom. Setting the elements to mid-band dimensions would tend to even things out, but at some loss of CW performance. This is where the monobander has the edge, and where an operator demanding optimum performance across the entire band might be unhappy with the A3 or with any small tribander.

Of course, if you get into the battles on 20 phone or if you contest in a big way, you'll need all the antenna you can get, but I think that most of us can live quite nicely with an antenna like the A3—particularly when you consider the cost of an A3 and the modest tower it takes to support it versus the cost of a stack of monobanders, a huge rotor, and a heavy, guyed tower. That ultimate dB is very, very expensive!

I haven't talked to many folks who use a tribander with a 40-meter add-on, so I was very interested in how the A3/A73 would work for DXing from the midwest, a couple of thousand miles further from the DX than are you lucky coastal types. My other 40-meter antenna is a half-delta loop over a pretty good ground. It seems to work very well, and I've worked a fair amount of DX with it.

Well, folks, the A3/A73 beats the half-delta every time. It hears less noise and seems to talk as well or better than the other antenna. The nulls off the end of the rotatable dipole are very noticeable, and it is possible to null out European broadcasters by 10 to 20 dB merely by rotating the antenna 90 degrees away from Europe.

Of course, having the antennas at 70 feet doesn't hurt any, and at a lower height, the dipole might well lose to the half-delta. But in any installation, the A3/A73 has an advantage because it puts the 40-meter antenna up where it can perform best. It will nearly always be installed as high as it possibly can be, and unlike most wire dipoles, it will be in the clear and away from guy wires and other antennas. Under these conditions, a dipole can do an amazingly good job on the lower bands, particularly since fewer of the gang are using beams on 40 meters.

Incidentally, the A73 kit may also be set up to cover the new 30-meter band instead of 40, so it's an easy way to add a new band to your station without a lot of hassle if you already have an antenna for 40.

The A3/A73 antenna will provide respectable performance on 40 through 10 meters without unreasonable cost or complexity. It's a good choice for the ham who has limited space and/or funds for antennas, yet who wants to be able to punch through a pileup now and again.

For further information, contact *Cushcraft Corp., PO Box 4680/48 Perimeter Road, Manchester NH 03108.* Reader Service number 489.

John Ackermann AG9V
Green Bay WI

HAM HELP

I am interested in setting up a regular sked with other hams who are interested in working with historical photographic processes such as Carbro, Bromoil, or Oil Transfer.

Tracy Diers W2OQK
58-14-84th St.
Elmhurst NY 11373

I need a modulation tramsformer for a Johnson Viking Valiant transmitter. I will gladly pay shipping.

Mitchell Sisak
10180 Marquette St.
Montreal, Quebec
Canada H2C 3E4

I would like to find the pinouts and any other information on the American Microsystems S 2566 rhythm generator.

Dirck Spicer
Wildwood Lane
Durham CT 06422

I am disabled with a stroke, and in the past two years I have had cancer surgery three times. Reading would help me regain my health, and if anyone could send me some magazines, old or new, I sure could use them.

Bobby Welch N4GWQ
2903 Azalea Dr.
Flatwoods KY 41139

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 8

After all, what's the real difference? Radio waves go everywhere, so from a radio point of view, it is of little consequence whether the operator is in Burma, Thailand, or Sri Lanka. For that matter, one of the best DXpeditions of all time, Heard Island, was done from up near Vancouver, Canada. Just think of the trouble everyone was saved on that!

When you move the DXpedition nearer the US like that, you don't let propagation or distance screw up the contacts. You save a fortune on boat charges and have a much lower chance of getting killed. You save weeks of sailing, a bunch of gas, and in every way cut costs enormously. And your QSL cards are as valuable as if you'd gone to all that silly trouble and expense.

No, today's DXpeditioners seem to have lost their spark of originality and imagination. Poor Lloyd and Iris Colvin had to go through all sorts of trouble to get into the Persian gulf countries and get on the air. It cost 'em a bundle, too. And for what? Just to give a few thousand of us a card from a new country...one which would have been infinitely easier to get if they'd operated from some place nearer home. All you need is to make the contacts, provide some good-looking documentation to the ARRL, and thousands of hams are happy as clams.

The first truly imaginative DXpeditioner is still with us. I see him almost every year at Dayton. He set up and gave us contacts from a bunch of African countries while happily sitting in Casablanca. Once he broke the ice, we saw many of the previous DXpeditioning problems solved. That did away with quite a few arduous boat trips, eased country restrictions, eliminated customs problems for equipment, and so on.

Why take a chance on braving the wild South Atlantic storms when you can save tremendous time and keep out of danger by operating from near Venezuela? That's where a pair of well-known DXers did it. And, you know, it isn't much easier to blast through pileups to Peter and Paul Rocks if they have been moved, for convenience, to Venezuela instead of the Atlantic. Those same Texas and Missouri DXers are still in there tail-ending for twenty minutes, alternating calls so no one can tell if the DX station is transmitting or not.

I say let's get more fun into DXing by going back to the old system. Let's get a nice little DXpedition for Spratly going...with the spoilsport ARRL chaps who are making people get killed on the boat out of Singapore and the rest of us out on Catalina Island running two Watts to a wet string.

DIGITAL PERSPECTIVE

Having gotten bitten by the digital bug some 35 years ago when I got involved with amateur radio teletype, I haven't had as much trouble getting into the digital revolution as many of the more conservative (tube-oriented) old-timers. And now we're reading about the marvels of digital audio, the coming revolution in compact laser-playing disks...maybe even digital television.

As much of a fan of new ideas and pioneering as I am, I'm not yet totally convinced about the laser disk idea. The basic idea of digital audio is great. With this technology it's possible to make recordings where you have zero noise from the recording medium. Yep, no tape hiss...zero. No record groove hiss, snap, crackle, and pop. The idea is just fine. And the technology makes it possible to extend the dynamic range of recordings from 60 dB out to 90 dB. Remember, if you will, that every three dB means a doubling of power, so that extra 30 dB will buy you a thousandfold increase in power capability. Whooey, thousand-Watt audio amplifiers?

Digital audio has some benefits and some drawbacks. For the audiophile, the results of DA are so spectacular that he has no choice but to go digital. But this means a lot of expense, because while digital disk players will work with analog preamplifiers and amplifiers, a purist would blanch at anything less than digital right on through to the speaker. Digital speakers? No, little of this technology has even been invented yet, but it will be along. This will be a wonderful area for small entrepreneurs to get going, working toward starting megabuck corporations on the coattails of yet another budding high-tech industry.

The messy part of this whole scam lies in that vaunted laser disk. The problem is that we're way behind on inventing storage media for data. We're still horsing around with round, flat records which have to be spun...a hangover from the early recordings of Edison. You'd think we would get the message on this when we see $3,000 record players. And even those aren't as good as the early model laser digital players. Look at all the agonies we are going through with Winchester disks for data storage in computers! It's almost time to start seriously working on a mass memory system which is not mechanical.

They're talking about being able to put laser disk players into cars. It's laughable. Do you know that the silly record player they've invented to play those four-inch laser disks has to change speed as you go from the inside grooves to the outside from 600 rpm down to 200 rpm? And once you know that, you realize that the speed of the record player has to be different for every single groove it plays. Talk about a mechanical monster!

We may have to use some mechanics to retrieve data from a transportation medium, but spinning a record at an infinite number of speeds doesn't seem optimum. Perhaps we can come up with a card which can be read as it moves by a reader, using a memory cache to smooth out the flow of data. Or we might want to go to some sort of optical/film data storage system which might give us higher density of storage than micro holes blasted in thin films of metal.

On the bright side, there's no way that cassettes will be able to handle the data storage requirements, so we may see a drop in the copying of records.

These are wonderful days for amateurs...and we should remember that most of the really important breakthroughs in technology have historically been made by amateurs. If you've worked in any R&D firms, you know why this is as well as I...and I've done my homework on this one, too. I worked for an R&D lab at one time and saw with my own eyes why virtually no significant developments in technology can emerge.

The key lies in the funding process. R&D labs do not hire people to do what is called basic research...at least few of them do. Basic research is experimenting for the hell of experimenting, with no commercial product in mind. We used to spend a lot of money this way before WWII, but when the war came we stopped this "wasteful" spending and only worked on projects where there was a good potential for results.

It's still this way. If the lab manager is able to convince management that there is an almost certain chance for a profitable product to emerge, the research funds can be found. Iffy projects are tabled. The amateur, of course, with no one to stop him, can work on anything his heart desires. And if he comes up with something fantastic, he's got it made. If not, well, at least he's had the fun of trying. This is why hams in the past have come up with most of the real breakthroughs in radio technology.

It's getting time to experiment over the air with some digital audio. We might even want to try some digital stereo and see what we can do with it. A sampling rate of 10 kHz might work out fine for our type of communications rather than the 44 kHz they use for high-fidelity music. That's a little broad, but, after all, we're just experimenting. We might be able to get that down to 6 kHz and still have better voice communications than we have now.

The objective is to get a maximum of information through for a given band of frequencies and a given time, so whether we find it better to do with a 50-kHz-wide band or a 2-kHz band isn't as relevant as the throughput. If we can digitize voice and then send it in short blasts at high speed with error-correcting, we could end up with a very efficient communication medium.

The world of digital audio is

just getting going. It is going to turn into an enormous business. Are you going to be one of the winners in this?

DENTRON

A piece in *Newsweek* a few weeks ago about a suit by Ron Hubbard's son to take over the Hubbard Scientology empire, claiming that no one has seen Hubbard for over two years and that he is presumed dead, brought to mind a recent rumor that DenTron had been bought by Scientology.

Having more than a casual interest in Hubbard and Scientology, I called DenTron to see what was up. Scientology has been getting a lot of flak of late, with exposés on television, books exposing it, and so on. Well, having been around when it began and having personally known Hubbard, I like to keep up with what's going on.

Scientology got started back in 1950 with the publication of an article in *Analog* magazine (science fiction). I'd been reading the magazine for many years and was particularly interested in an article on a new book being published by Hubbard on Dianetics, a new science of the mind. I got the book, started right in experimenting with some of the techniques described therein, and had some truly amazing experiences.

Hubbard's book was flamboyant and his claims extravagant, but since the fundamentals of it made more sense than any other approaches to the mind, I decided to look into it further. I took a six-week course at the Hubbard Dianetic Research Foundation in Elizabeth, New Jersey, and became an accredited Dianetic Auditor.

The school was fascinating. There was the element of baloney with the Hubbard claims of producing "clears" who had eidetic recall and were in most respects perfect people. We never saw anyone like that. But the concept was a good one and the techniques did produce the most incredible results in a hurry.

The story going around the school was that the whole idea for Dianetics was developed by someone else and that Hubbard had come across the manuscript for the work when the real author was in a hospital and died. So the claim went that Hubbard took the extensive research as his own, adding what he thought might result from the therapy—clears—as an accomplished fact.

Now Hubbard is, or was, a very magnetic person. He was a good writer and a persuasive BS artist. But the quick success of Dianetics seemed to distress him. It didn't take long before there were many people using the techniques from his book with more success than he enjoyed. Keeping in mind his enormous ego and the weight on him of the success of the therapy which he claimed to have discovered, I was not at all surprised when he came up with a new approach which was mostly his own. . .and which he called Scientology.

It's emotionally difficult to be a guru pretending something is your own when it isn't, so he came up with his own. This was cloaked as a religion, both as a way to get around laws against medical treatment by non-doctors and as a way of brainwashing the impressionable.

Having been at the HDRF, I remained on the Scientology mailing lists for years, getting their literature and receiving hundreds of letters suggesting I come in for updating. I kept answering all letters with the question: If you are able to really do such marvelous things, please show me one single example of a person who has been so improved by Scientology that he or she now stands out in some way over the rest of us. I never saw any indication that Scientology could even come close to Dianetics in effectiveness. . .and so no one seemed to emerge as outstanding in talents from the process.

Large numbers of Scientologists were used to write personal letters to prospective recruits. They had to write by hand. . . sincere. . .and encourage the correspondent to come in for a "test run."

One of the results of just about *any* type of mental therapy is the feeling that one has improved. Just as the sugar pill placebo given by doctors is capable of remarkable cures of some illnesses, the application of almost any psychotherapy seems to make some people feel better. Trading on this response, the Scientologists quickly get newcomers involved with their strange perception of reality, and they find it difficult to get loose.

Hubbard was able to build up his Church of Scientology into a multinational organization, with the headquarters at St. Hill, a huge estate in England. When governmental pressures from some countries grew too great, he moved his personal HQ to a converted cargo ship served by the elite of his group. I remember the glowing brochures asking for volunteers for this. Golly, the enthusiasm and excitement of those brochures was fun and almost too much to resist.

The church is now a large, rich organization with branches all over the world. And, I suspect, judging from the DenTron example, they are investing in businesses these days, not just in their own growth. I was assured by the president of DenTron that the Scientologist who had worked with them had recently left and that there was no more connection.

Getting back to Dianetics. . . I've kept in touch with most of the better known psychotherapies over the last thirty years and I know of none which works with the ease, speed, and thoroughness of Dianetics. I got to be quite good with the techniques involved and found that I was able to discover the roots of most problems people were having and could help them substantially in a matter of hours. But I also found that very few people really want to be helped. They've adjusted to some degree to their mental problems and are defensive about them.

Many of the basics of Dianetics were pooh-poohed by the establishment back in 1950, so it has been interesting for me to keep abreast of the development of these other schools of therapy and see them gradually accepting the very concepts which they found so totally ridiculous in 1950.

One of the basic concepts had to do with the way the brain ties up part of its ability to think when faced with a painful situation, either physical or mental. The most fundamental rule for any organism is to survive and thus pain signals are interpreted as a threat to survival. By deconditioning these painful moments in the past, we found that IQs increased and the ability to think zoomed upward.

Fortunately for our peace of mind, all of these pain memories and the subconscious responses they force upon us are carefully hidden from our conscious mind, with behavior, no matter how weird, rationalized.

Well, sorry for the usual digression, but I don't think I've ever written about Scientology or Dianetics before, and I suspect that very few people alive know about the possibly true roots of this amazing psychotherapy. And, yes, I'm familiar with Freudian analysis, the Karen Horney school, Gestalt psychology, Korzybsky, Examiner Therapy, Integration Therapy, and so on.

Did Hubbard come across the manuscript for Dianetics in a hospital in Burma during the war and pick it up from the dying real author? If Hubbard is dead, we may never know. But we do know that he was able to use that start to build a multi-billion dollar empire reaching around the globe.

HAM HELP

I am looking for the schematic and instruction manual for the Hewlett Packard 170A oscilloscope. I will pay all costs.

John Goodyear W6HVB
2985 Saratoga St.
Riverside CA 92503

I need the manual for the Knight G-30 grid-dip meter. I will pay reproduction and postage costs.

J. E. Smith K5PTC
2504 Conflans
Irving TX 75061

I would like to use my Atari 800 computer for RTTY, both Baudot and ASCII. Can anyone help me find information and hardware?

Ron Griesback WD9HDO
1712 N. Harriman
Appleton WI 54911

I am looking for schematics and operating manuals for the following equipment: a US Navy 4.0-27.0-MHz RBC-1 receiver; a Lakeshore Industries "Band Hopper" SSB vfo; and a Central Electronics model 20-A multi-phase exciter. I will pay for manuals or copying costs.

Peter Doherty W1VO/7
PO Box 291
Port Townsend WA 98368

My flea-market Eldice transmitter, model SSB 100ML, manufactured by Eldice Electronics of Mineola NY, did not come with a manual or circuit diagrams. I would like to buy a manual from someone who has a spare set or borrow some that I could copy.

Richard E. Downing W1TXS
16 Woodside Terrace
Springfield MA 01108

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Whiting NJ 08759

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ALASKA	14	14	14	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7A	7	14	14	14	21	21A	21
AUSTRALIA	21	14A	14	14B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	14	7	7	7	14	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14A	14A	14	14
HAWAII	14A	14A	14	7	7B	7B	7	7	14	14	14	14
INDIA	14	14	14B	7B	7B	7B	14	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7	14	14	14	14	14
MEXICO	14A	14	14	7A	7	7	7A	14	14	14	21	14A
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	14	7	7	7	14	14	14	14A	14A	14A
SOUTH AFRICA	7B	7B	7B	7A	14	14	14A	14A	21	21	14	14B
U.S.S.R.	7A	7A	7	7	7	7A	14	14	14	14	14	14
WEST COAST	14A	14	14	7	7	7	7	14	14	14A	14A	14A

CENTRAL UNITED STATES TO:

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ALASKA	14	14	14	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7A	7	7A	14	14	21	21A	21
AUSTRALIA	21	14A	14	14B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14A	14	7	7	7	14	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14A	14	14
HAWAII	14A	14A	14	7A	7	7B	7	7	14	14	14	14A
INDIA	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7	14	14	14	14	14
MEXICO	14	14	14	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	21	14A	14	14	7	7	14	14	14	14A	14A	14A
SOUTH AFRICA	7B	7B	7B	7B	7B	7B	14B	14	14	14A	14	14B
U.S.S.R.	7A	7A	7	7	7	7B	14B	14	14	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7A	7	7B	14	14	21	21A	21
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ENGLAND	14	7A	7	7	7	7	7	7A	14	14	14	14
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U.S.S.R.	7A	7A	7	7	7	7B	7B	14B	14	14	14	14
EAST COAST	14A	14	14	7	7	7	7	14	14	14A	14A	14A

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

JULY

SUN	MON	TUE	WED	THU	FRI	SAT
					1 G/G	2 G/G
3 F/F*	4 P/F*	5 F/G	6 F/G	7 F/F	8 F/F	9 P/F
10 F/G	11 G/G	12 G/G	13 G/G	14 G/G	15 F/G	16 F/F
17 F/F	18 F/G	19 F/G	20 F/G	21 F/F	22 F/F	23 F/F
24 F/G 31 G/G	25 G/G	26 G/G	27 F/F	28 P/F	29 F/G	30 G/G

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Issue #275

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A Wayne Green Publication

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World's Simplest COR
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Save Your Slow Scans
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CQ de Sealand
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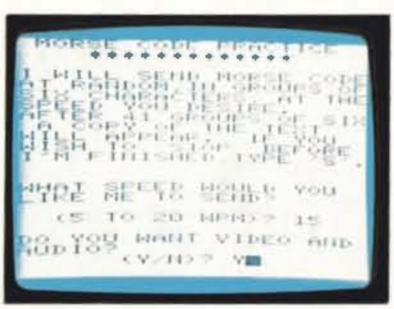
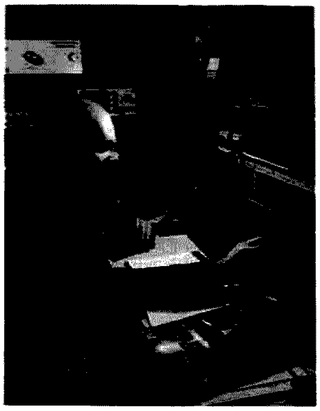


VIC 20 Code—14

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



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STILL ANOTHER FCC REVOLUTION

The FCC is still pursuing deregulation with a passion and, for the most part, I'm in tune with this. I think amateur radio would be much more able to provide the services it is supposed to if we had far fewer limitations. Well, they just may be in the works, according to some information sent in by watchful K1NEB.

Docket 83-114, "A Re-Examination of Technical Regulation," has the intention of eliminating burdensome technical regulations for all Services, and that obviously includes Amateur. If you think about this for a bit, you'll see that this could be the weight lifted off our shoulders that we have been needing for years.

Within the purview of this docket, we could find the limitations on RTTY speeds, frequency shift, and so on eliminated. We've never needed these. We've been perfectly able to test out our own technical parameters and set our own standards without the help of the FCC, with their usual limitations which have been brought forward from years ago.

If we can get rid of these bothersome remnants of the past, we can experiment with more efficient data communications and error-correcting codes without always having to fight for Special Temporary Authority releases. The pressures of the marketplace will encourage the development of standards, but the freedom from oppressive regulations will allow us to try different ideas and keep finding better ways of communicating.

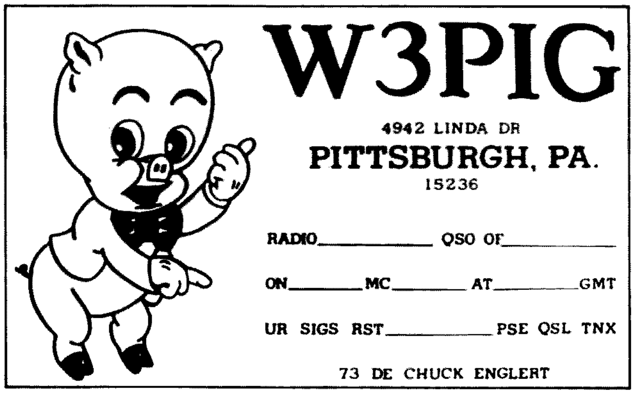
We're going into a digital world—digital messages, digital pictures, digital voice, digital music. If we don't keep up with all of this, we are going to find ourselves redundant. Will we still find pileups of analog voice DXers trying to get through to DXpeditions in twenty years? Or will we be sending bursts of digitalized voice at high speeds which will be received by a holographic-coherence detector and queued up for response?

The Honor Roll contingent may want to fight it to the death, but all those jokes about automatic DXCC rigs are getting believable. As soon as someone comes up with a good automatic-identifying system for rigs, we are well along that road. Once it's possible to have your rig work and confirm 300 countries in a day all by itself, we may be waking to a time when amateurs in rare countries will actually be able to have interesting contacts instead of being hounded off the air every time they show up.

The dropping of technical restrictions could help the development of facsimile and slow-scan television, allow more realistic power limitations for some repeaters, allow FM stations to add more services (such as teletext, communications, and calling), and might let amateurs experiment with wider band systems which transmit shorter times to make up for the use of frequencies. After all, our limitation is a combination of frequencies and time and it is getting time to think about this.

You know, just as the video

Continued on page 102



QSL OF THE MONTH

To most hams, a callsign is as important as a name. Countless hours have been spent devising memorable phonetics for calls or selecting the absolute best phonetics for a specific purpose—those with the most audio punch for ramming through the DX pileups or those with the shortest number of syllables for rapid contest calls. But there are hams among us who have the good fortune of a callsign instantly recognizable. Such is the case with this month's QSL of the Month winner, Chuck Englert W3PIG. Although the suffix to Chuck's call is none too complimentary, he has turned it into an interesting and memorable QSL card. With this familiar face looking out at you from the wall of the shack, you might forget the QSO, but you will never forget the call.

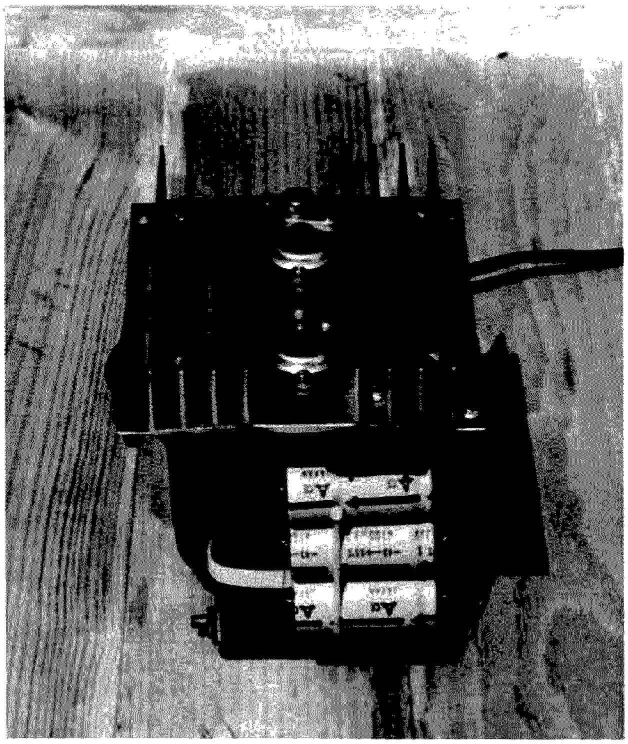
To enter *73*'s QSL of the Month contest, put your card in an envelope with your choice of a book from *73*'s Radio Bookshop and send it to *73*, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not mailed in an envelope or which do not specify a book will not be accepted.

David L. Oliver W9ODK
Rte. 2, Box 75A
Shevlin MN 56676

Construct This Customized Power Supply

Whether you want 5 Amps or 30, this supply can give it to you. But you only pay for what you need.

With more and more equipment on the market requiring a separate source of 12 V dc, almost every ham shack needs a power supply capable of operating such equipment on 115 V ac. Even if your 12-volt transceiver is normally mobile, you might want to bring it into the house for testing or as a substitute for the base station. Many HF transceivers operate at a high power level requiring 20 to 30 Amps on transmit while QRP rigs and VHF transceivers require 5 to 10 Amps or less. This article describes a general power supply design which can be expanded in 5-Amp steps from 5 to 30 Amps. That way you do not need to build a larger unit than your requirements dictate.



The completed 10-Amp unit.

This power supply is unique in both its simplicity and its immunity to damage from overloads. The heart of the circuit is an LM340T-15 integrated circuit, a fixed 15-V regulator with short-circuit and high temperature protection. It provides excellent regulation and is virtually immune to overload and short-circuit damage. The output of this regulator IC is fed to a Darlington-connected emitter-follower which increases the rated 1.5-Amp output of the IC to as high as 30 Amps. A single driver transistor, Q1, is used with from one to six output transistors, Q2-Q7, connected in parallel depending on the output current required. One 2N3055 power transistor is used for each 5 Amps of output. The 0.15-Ohm resistor in the emitter of each transistor performs a dual function. It serves as a current-sense resistor providing a voltage output proportional to the current through its transistor and provides for equal sharing of current among the parallel-connected transistors.

The LM340 is so well-protected from overload that it can operate into a short circuit all day. If the chip temperature becomes too high, the internal thermal protection will simply shut it down until the heat sink cools off. The external current-amplifying transistors need some protection, though, since their power dissipation could far exceed their ratings in the case of a short

Supply Capacity	C1	F1	T1
5 Amps	7,500 uF, 25 V	2A SB*	Triad F-242u
10 Amps	15,000 uF, 25 V	4A SB	Triad F-243u
15 Amps	22,000 uF, 25 V	6A SB	Triad F-244u
20 Amps	30,000 uF, 25 V	8A SB	Triad F-244u
25 Amps	40,000 uF, 25 V	10A SB	Triad F-245u
30 Amps	50,000 uF, 25 V	12A SB	Triad F-245u**

*Slow-blow fuse.
**CW & SSB service only.

Table 1.

circuit or sustained overload. To accomplish this protection, the voltage across one of the emitter resistors is fed to the gate of SCR1. A current of 5 Amps develops 0.75 V across the 0.15-Ohm resistor, which is sufficient to trigger the SCR. As soon as SCR1 has fired, the pass stage of the regulator is shut down completely and the output of the LM340 is connected directly to the load. The IC regulator then supplies its short-circuit current (about 1.5 Amps) to the load through the SCR. This current holds the SCR on until the power supply is shut off and allowed to reset itself automatically. The function is essentially that of an electronic circuit breaker.

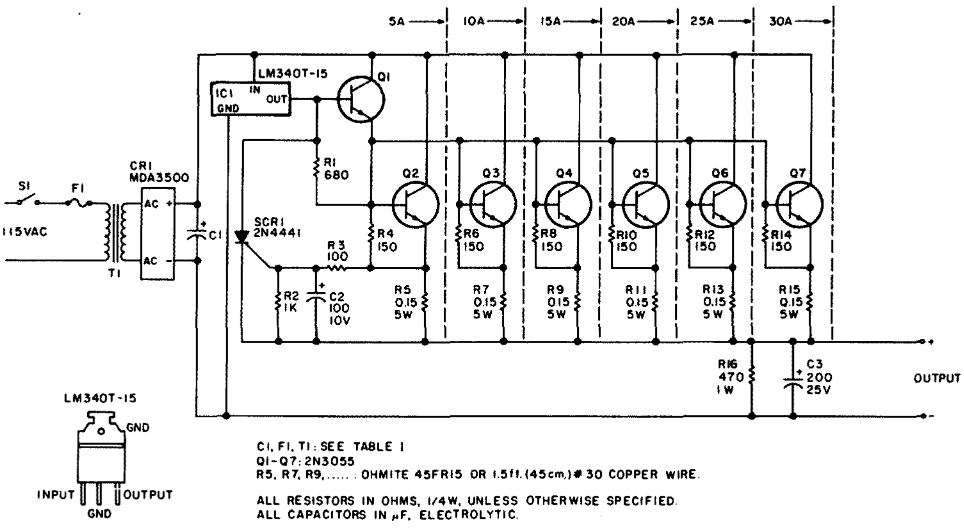


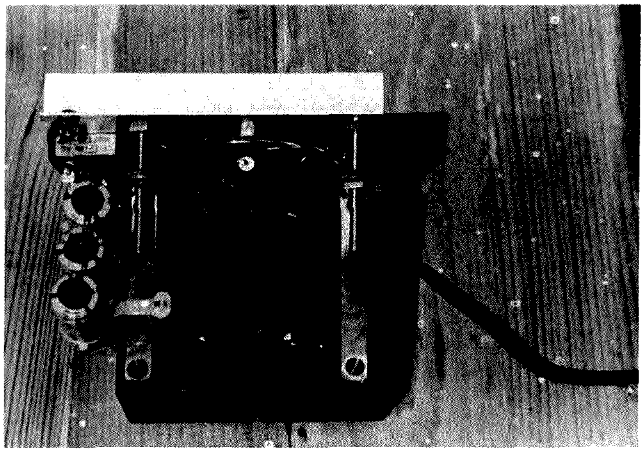
Fig. 1. 13-V-dc power supply schematic.

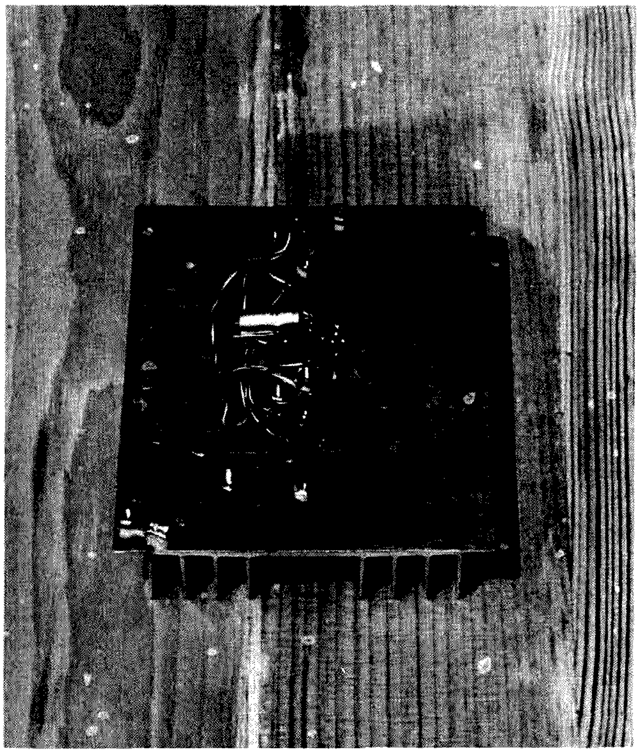
Another advantage of using the LM340 is thermal protection. If the IC is mounted on the heat sink near the output transistors, the internal temperature-sensing circuitry will detect the sink temperature and shut the whole supply down if it becomes excessive.

The output of the supply is equal to the output of the IC regulator (15 V) minus the base-emitter drops of the driver and pass transistors and the voltage across the emitter resistor. Since this voltage varies with current, the output voltage will change from 14 V at no load to about 13 V at full load. This is much tighter regulation than an automotive electrical system where variations of 11 to 16 V are possible. All amateur equipment which requires a nominal 12 V is designed to operate over this range with 13 to 14 V being optimum. Line regulation is essentially perfect with no variation in output seen for varying ac line voltages.

Construction can be as simple or elaborate as the builder desires. The photos show that the whole circuit can easily be built right on the heat sink. In the author's 10-Amp version, the heat sink was mounted on the transformer with 3/16" bolts, creating a compact and sturdy open-frame design. The 115-V-ac connections were heavily insulated with plastic rubber for safety. If your supply can be tucked away out of sight, this is an ideal (cheap) construction method. If appearance is important, the supply could be built into an attractive box, into the speaker cabinet in the station, etc. The heat sink(s) must be mounted external to an enclosed cabinet so that adequate cooling can take place.

Table 1 lists suggested components for various power levels of the supply. The transformer, T1, must be chosen to supply about 18 to 20 V to the filter capacitor, C1, at the full load. The LM340T-15 requires a minimum of 17 V to oper-


The heat sink can simply be bolted to the transformer to make a compact open-frame supply.


All of the circuitry fits neatly on the heat sink.

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ate. The higher the unregulated voltage, the greater the power dissipation will be in the power transistors. To keep heat-sink requirements within reason, a voltage higher than the low 20s should not be used. In the parts list, Triad F-240 series transformers are suggested. These have two secondary windings which should be connected in parallel. Try salvaging a battery-charger transformer; the voltage should be about right. If only SSB and CW operation are contemplated, then some skimping can be done on the transformer and heat sink. However, continuous operation such as FM, RTTY, or SSTV requires a transformer whose amperage rating equals the full output of the supply, and heat-sinking of 2° C/Watt per transistor or better. One Wakefield 401 or equivalent for each transistor should be adequate. Be sure to mount the fins vertically and in a location where free air circulation is provided. Fan cooling will greatly reduce the heat-sink size required. The fan should be controlled by a thermostatic switch (70° C would be a good temperature rating) mounted near the hottest part of the sink.

Many power supplies are available to operate 12-V-dc ham rigs, many of which are very expensive. With the exception of the transformer, all the components specified in this circuit are quite economical. A little scrounging and ingenuity will result in a power supply of exceptional performance and reliability for a very low cost. ■

All parts, including a 30-Amp transformer, are available from All Electronics Corp., PO Box 20406, Los Angeles CA 90006. Send for a catalog.

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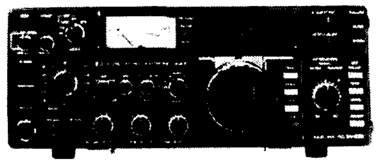

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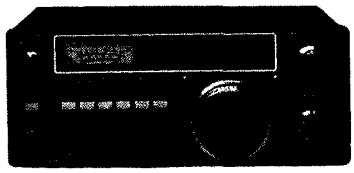

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VisiCode: The VIC 20 Way to Extra Class

First you get random practice groups. Then you get the answers.

Photos by KA7AQA

Well, it finally happened. After a concentrated, purposeful effort for several years to ignore computers, I succumbed as I knew I eventually would. To justify the expenditure, I decided to get a computer that could be used for games and have both sound and color so as to interest my 8-year-old son, Tom. And, of course, it had to be relatively inexpensive. I chose the Commodore VIC 20.

```
                MORSE CODE PRACTICE

100 REM  VIC 20 CODE PRACTICE PROGRAM*W7LTH*KA7AQA
110 PRINT"] MORSE CODE PRACTICE"
120 PRINT"     **************"
130 PRINT"■I WILL SEND MORSE CODE",
140 PRINT"AT RANDOM,IN GROUPS OF",
150 PRINT "SIX CHARACTERS, AT THE",
160 PRINT"SPEED YOU DESIRE."
170 PRINT"AFTER 41 GROUPS OF SIX A COPY ",
180 PRINT"OF THE TEXT   WILL ",
190 PRINT"APPEAR.  IF YOU  WISH TO  STOP  ",
200 PRINT"BEFORE I M FINISHED,TYPE 'S'."
210 PRINT"■WHAT SPEED WOULD YOU  LIKE ME TO SEND?"
220 INPUT "■  (5 TO 20 WPM)",P
230 IF P<5 OR P>20 THEN 220
240 V=P
250 IF P>12 THEN K=1:GOTO 270
260 K=ABS(INT(P*42+153-8807/P)):F=13
270 P=ABS(INT(P*(-2.333)+96-1387/P))
280 PRINT "■DO YOU WANT VIDEO AND AUDIO?"
290 INPUT "        (Y/N)";O$
300 IF O$="Y" THEN 320
310 POKE 36879,107
320 PRINT"]■■■CHECK YOUR ACCURACY■■"
330 POKE36878,10:REM VOLUME
340 A=INT(RND(1)*47)+44
350 IF(A=64) OR (A>57 AND A<63) THEN 340
360 FOR I=44 TO A
370 READ A$
380 NEXT
390 FOR I=1 TO LEN(A$)
400 D$=MID$(A$,I,1)
410 IF D$="L" THEN L=3*F: REM DAH LENGTH
420 IF D$="S" THEN L=F  REM DIT LENGTH
430 POKE 36876,232:REM PITCH
440 FOR J=1 TO L :NEXT J
450 POKE36876,0
460 FOR J=1 TO P:NEXT J:REM PAUSE BETWEEN DITS AND DAHS
470 NEXT I
480 REM END OF LETTER
490 PRINT CHR$(A);
500 RESTORE
510 GET E$: IF E$="S" THEN 620
520 C=C+1
530 IF C=6 THEN C=0: GOTO 560 REM CHECK 6 CHAR. GROUP
540 FOR J=1 TO K :NEXT :REM SPACE BETWEEN CHARACTERS
550 GOTO 340
560 FOR I=1 TO P*6+2*K:NEXT REM SPACE BETWEEN GROUPS
570 G=G+1: H=H+1
580 IF G=3 THEN G=0: GOTO 610
590 IF H=41 THEN 620
600 PRINT"  ",
610 GOTO340
620 REM END
630 POKE 36879,27
640 POKE 36878,0
650 PRINT"■  YOU HAVE COPIED"H"  GROUPS OF SIX LETTERS     AT "V"W.P.M."
660 PRINT CHR$ (31)
670 PRINT"■■■■■■■■■■■■■■■■■■■■■"
680 END
690 DATA LLSSLL,LSSSL,SLSLSL,LSSLS
700 DATA LLLLL,SLLLL,SSLLL,SSSLL,SSSSL,SSSSS,LSSSS,LLSSS,LLLSS,LLLLS
710 DATA B,B,B,B,B,SSLLSS,B
720 DATA SL,LSSS,LSLS,LSS,S,SSLS,LLS,SSSS,SS,SLLL,LSL,SLSS,LL,LS,LLL,SLLS,LLSL
730 DATA SLS,SSS,L,SSL,SSSL,SLL,LSSL,LSLL,LLSS
READY.

 EXPLANATION
 ] = CLEAR SCREEN
 ■ = CURSOR DOWN
 ■ = HOME
```

Program listing.

In recent months, this computer has become very popular, especially among the local hams. I decided it would be fun to incorporate some ham uses for the VIC 20, and as a first attempt, recalling having read an article in *73* about a Morse-code learning program for the Commodore Pet, I thought a similar program would be appropriate. Looking back through my library of *73*s, I retrieved the article, "The Code Pet," by Alden Lansdowne AA∅G, December, 1981.

Using Alden's program as a guide, I began converting (in computerese, "transporting") the Pet code program into a format that the VIC 20 would like. I can tell you that there is no better way of learning how your computer works than to get into programming, and transporting a program is perhaps a little less traumatic than starting from scratch.

After many hours of hair-pulling and mumbling unkind words, I finally got a usable program going. I still had some timing problems with the code speed, and I enlisted the aid of Hoa Nguyen KA7AQA, who is one of our local VIC 20 experts. He quickly solved the problem. The finished program is one that will make it easy for anyone with a VIC 20 not only to learn Morse code, but also to be able to increase code speed up to 20 wpm.

The program features a choice of code speeds of 5 to 20 wpm and also a choice of having the characters displayed directly after being sent (good for learning at the slower speeds) or keeping the screen blank until 41 groups of random characters have been sent—then automatically displaying them so that you can check your accuracy. You also can stop the program for an immediate display by pressing the S key.

Code groups traditionally have consisted of five characters, but due to the VIC 20 displaying 22 characters per line, I decided that three groups of six would avoid split groups on the screen. I stopped at 41 groups to avoid scrolling.

The listing should be self-explanatory to an experienced programmer. However, here are a few remarks as to what is taking place within the program that may be of help to a beginner.

Lines 260–270 contain the formula for selecting the code speed.

- P controls the character speed.
- K controls the space between characters.
- P and K together control the pause between character groups.

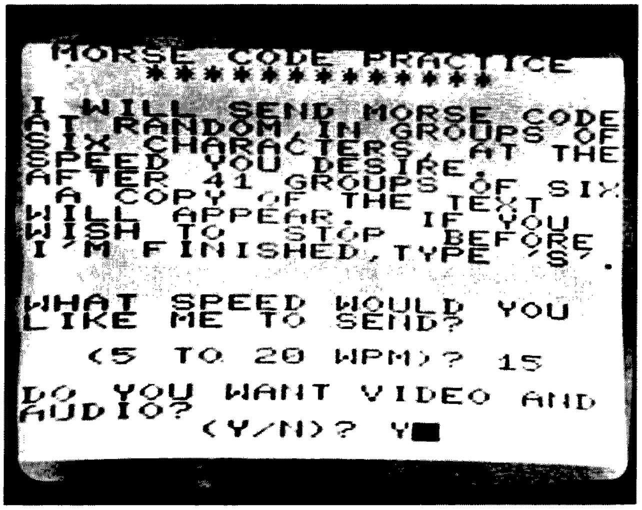

Photo A. Screen display after loading program and selecting code speed and audio plus video.

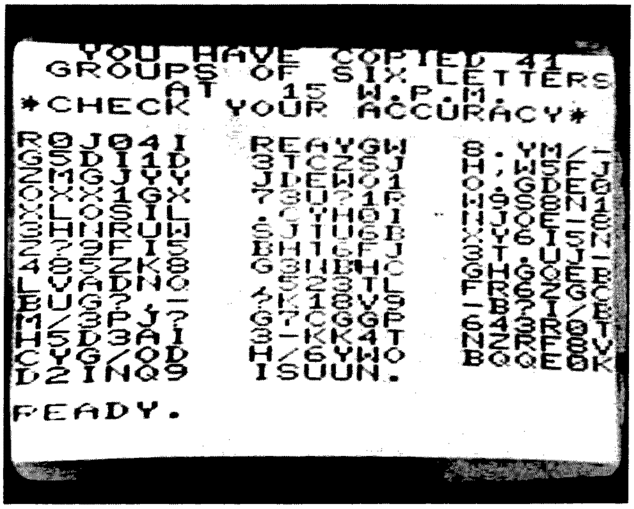

Photo B. Screen display after 41 groups of characters are shown (full screen).

It was found that a formula involving 1/P gives more accurate code speed than the linear equation AA0G used.

● Line 340 generates a character.

● Line 350 selects only the ASCII characters of the alphabet, numbers 0 to 9, plus certain punctuation marks.

● Line 490 puts the character on the screen. If you wish to see each character before the code is sent, change this line number to 355.

This has been a very interesting learning experience and I know you will enjoy using the program. It should be very useful in radio clubs for group code practice as well as individual use.

Feel free to customize it in any way you like. I am convinced that computers are compatible with ham radio and are here to stay.

For any of you who would like a taped copy of this program, send me a blank cassette tape along with $3.00 for postage and handling, and I will make you a copy. ■

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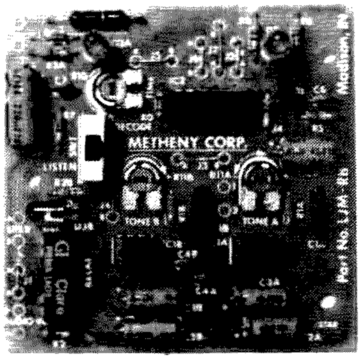

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Running Scared at Spratly

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Ed. Note: In late April, a yacht carrying four German hams on a DXpedition to the Spratly Island area was fired on by Vietnamese forces. Deithelm Mueller DJ4EI and Gero Band DJ3NG perished following that attack, which occurred about 350 miles south of Vietnam in an area claimed by both Vietnam and China. The rest of the party was later rescued by a freighter.

The following is from the log of the sailing yacht *Banyandah*, South China Sea, Saturday, March 31, 1979.

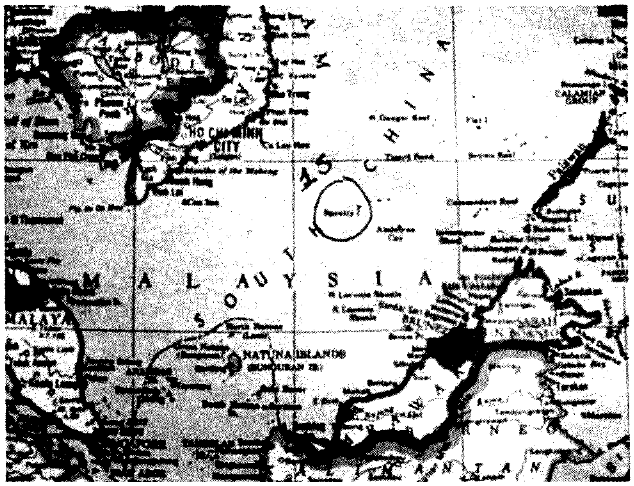
0600:
Dawn is breaking on this, our third day at sea since departing Brunei, North Borneo. On the far western horizon, an expanding band of changing pastels is rising. The sea and sky are becoming distinct.

The sky brightens further, highlighting the pearl-grey clouds with crowns of liquid gold, and a charge of excitement runs through all on board. Silhouetted against this display of nature's beauty, my six passengers are scanning the horizon for the first hint of our mysterious destination. Their chatter sounds like a flock of birds greeting a new and lovely day.

Ahead, somewhere, lies Amboyna Cay of the Spratly Islands. According to the pilot book, we should find only a 50-yard circle of sand surrounded by a bit of fringing reef. But recent hostile military activity in this area may have changed all of that.

0700:
According to my calculations, we should be very close. I shall climb to the masthead lookout for a look around.

0715:
A tiny irregularity breaks the otherwise barren horizon, and pointing to it I yell



Map of the South China Sea area, with the Spratly Islands circled.

Amboyna Cay, showing the military camp.

Victory! Wharfside Brunei, after 1S1DX

The sailing yacht Banyandah.

down, "Land, ho!" A cheer rises up from the deck, and happy, excited faces turn to follow the direction of my outstretched arm.

Since nothing can be seen from deck level, a barrage of questions assaults me as I climb down the 50-foot mast. "How big is it?" "Is it sand?" "Any trees?" "Did you see any buildings?"

"Hold on, you guys. It was just a tiny blip. In a half-hour it will pop up out of the ocean as if by magic."

0745:
Through binoculars, a crescent of yellowish sand is just visible, rising out of the sea as we ride up the swell, disappearing as we slide down. Everybody wants a look through the glasses, but Harry Mead VK2BJL, the team leader, gets the first chance.

"Jack, is that a rock I see on the right-hand side?" We rise up on a large swell and I see what could be a rock, a wreck, or almost anything. It's just too small to make out.

0800:
It's not a rock or a wreck. It now looks like a huge tent—like a circus tent, only tan in color. Other objects, possibly structures, are situated about it. I'm beginning to get worried. Who could be on our island? The guys are getting edgy also; Stew K4SMX keeps talking about a letter he has which explains that we are a scientific expedition studying radio propagation. He keeps saying that the letter is written in both Russian and Vietnamese. That sounds as if he knows something I do not.

0810:
People are visible on the island. Three distinct groups are equally distributed around that tiny mound of sand, with a smaller group at the top. The "top" is only eight feet above sea level.

0815:
The smaller, centralized group has begun signaling us with semaphore flags. Everyone turns to me, and John KV4KV asks the obvious: "What are they saying?"

"Look, I haven't a clue. But I think I'll anchor the boat just offshore and row in for a friendly chat. After all, we don't even know who they are. Besides, they can only tell us to go away, right?"

My wife doesn't look so sure, but the rest of the group nod or mumble comments like, "We've come this far; we ought to give it a go."

After everyone agrees, Stew beams his gracious southern hospitality smile and says, "I'll even go in with you."

Trouble

0915:
We're running scared, powering away from Amboyna Cay just as fast as our eighty-horsepower engine will push us. And we're searching the horizon in every direction for any intruder, deathly frightened that we might sight one.

What happened back there was insane. I mean, we're just ordinary folk—peaceful family men—out on an adventure. We meant them no harm, and there was definitely no reason for them to try to kill us.

I guess things really began to happen once we came within a mile of the island. From that distance, we could see that the cay was about half the size of a football field and that at the center were several buildings of clapboard and corrugated iron, as well as two radio towers. We also could see that the perimeter was reinforced with a wall of sandbags and that on this wall was a sign which read in large white letters, "BAOTHEP."

I began my final approach with one operator at the radio, scanning the bands, listening for a possible contact with the island. The other operators were on deck, clustered close together by the center cockpit. Judith was at the controls, and I was at the bow, searching for a clear patch in which to anchor.

I remember that it had become deathly quiet—I heard only the distant sounds of a light wind upon the sea and the sound of my heart beating in my ears as it pumped adrenaline through my body. Then, as I

reached out for the anchor-release mechanism, an abrupt order rang out, and groups of green-clad men began to scatter.

Explosions cut the air—boom . . . boom . . . boom. The physical impact of the concussions slammed into my body, and I was involuntarily flung to the deck, my mind already beginning to record every intimate detail of those hour-long seconds.

I saw four puffs of grey-white smoke hanging in mid-air above the cay. I heard a shrill whistle and felt heat on my cheek. I saw the five operators throw themselves headlong into the cockpit, heedless of any injury. As I looked along the deck, I saw the two drums of gasoline nakedly lashed to the rail. For an instant, my mind's eye imagined a huge blossoming orange-red ball of death erupting from them. Then I screamed, "Move it! Move it! Full power!"

Getting myself up on all fours, I saw Judith at the helm, kicking bodies away from the controls. And then, with her eyes sunk deep in their sockets and her teeth exposed in a grin of animal fear, I watched her slam the boat into gear and push the throttle to full power.

For what seemed like hours, we waited, rigid and unmoving, our every nerve straining, searching for the slightest warning of a new attack. But none came. We were lucky.

Success At Last

1S1DX, Spratly Islands 1979, is now history. Directly after the attack, we returned to Brunei. Three expedition members thought it too dangerous to continue; secretly, so did I. But Harry, Stew, and Bill K1MM wanted to try again. A new island was chosen, one which US government officials assured us was "safe." That assurance reinstated my confidence, and I accepted the charter. Later, those assurances proved nothing more than hogwash.

We docked at Maura port in the early morning hours of the 3rd. We reprovisioned that day and departed that night. Two and a half days later, on a morning very similar to the one at Amboyna, we made landfall. Immediately, two unmarked ships closed in on us from opposite directions. One steamed directly across our bow, only 200 yards off. It appeared to be a phantom ship—no flag, no markings, and no crew visible. When it had passed, we altered our course, put on the power, and prayed.

Again, we were lucky. But all of us thought we had just about used up our quota of luck. We were tired and fed up with feeling scared all the time. We decided to head for home.

I set a course for a reef which was charted as completely submerged, but which was near our rhumb line and worth investigating. We arrived the next morning, a glassy smooth day with absolutely no swell or wind.

As we circled the reef, I watched from the masthead, shaking my head in disbelief as we rounded the weather end. Our luck was still holding, for right on the edge a cluster of coral rocks had been dashed up by some long-ago storm and a baby sand island was forming. It was no larger than my deck area, but it was above water at all tides.

This tiny scrap of sand, surrounded by miles of open ocean and hostile forces, became 1S1DX, the last active amateur radio station in the Spratly Islands. ■

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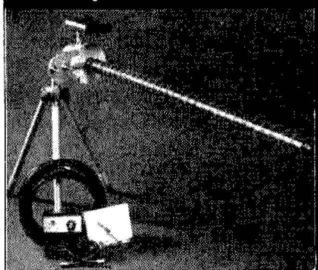

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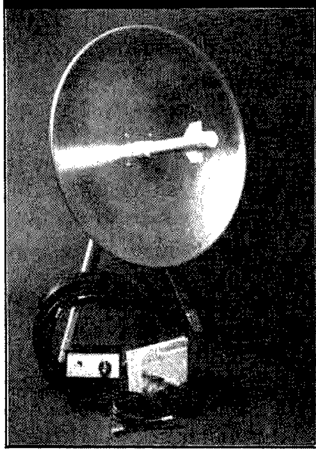

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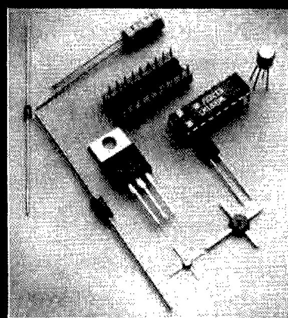

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An average repeater will trigger about 25,000 to 100,000 times per year. This requires a COR with very reliable components to ensure continuous operation over many years. This particular relay, COR-1, is very simple in construction and throughout its design uses quality parts readily available at reasonable prices.

The COR-1 is constructed on a standard plug-in PC card. Messing around with ICs and timers on top of a remote mountain can be a frustrating experience, and it was to make replacement easy (should it ever be necessary) that I designed the COR-1 on a plug-in card, as well as the matching access-code and tone-decoder boards. The following circuit has been on the air in my 220-MHz repeater for over five years now and has never given me any problems.

Description

The COR is a control module designed for repeater use. In the presence of a carrier, the repeater receiver will activate the COR causing the relay to energize and triggering a 3-minute timer. After this time has elapsed, if the received carrier has been continuously present, the COR circuit will open the relay and the repeater will "time out" until the signal breaks for at least 200 ms. A delay that can be set from .1 to 4 seconds will hold the relay in operation whenever the carrier shuts down ("squelch-tail timer").

The ID input does the following: (a) switches the relay on when activated, (b) allows for normal COR input

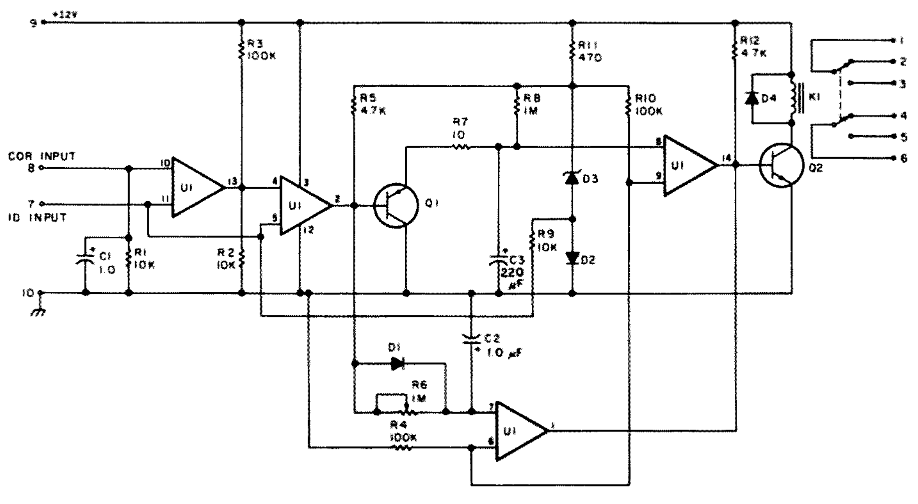

Fig. 1. Schematic of the COR-1.

operation when opened, and (c) disables the circuit when shorted to ground.

Theory of Operation

With the ID input open, a positive voltage greater than .8 volts applied to the COR input will change the status of the comparator's outputs 2 and 13. Transistor Q1 opens and C3 starts charging through R8 for the 3-minute timing. Comparator output pin 1 will drive Q2 and the relay. Each time the COR input goes below .6 volts Q1 will turn on, discharging C3 and resetting the 3-minute timer; also, C2 will discharge through R6, holding the relay in operation.

The ID input has been designed to be driven by any voltage above 1.2 volts, and when in the standby position should be left open. An internal bias circuit (D2, R3) fixes the potential at pins 5 and 11 close to .75 volts. An open collector PNP transistor is the appropriate way to attack the ID input. Any logic or analog input will do if an isolating diode is inserted in series (cathode to ID input). If shorted to ground, the ID input will disable the circuit.

For proper circuit operation, the inputs should not be driven above the power supply level; they can withstand up to 30 volts without any damage. Negative voltages at the inputs must be avoided if greater than 300 mV below ground level.

R1 and C1 are assigned to establish the input impedance and filter squelch pulses coming from the repeater. Their values can be adapted to other requirements. The circuit will operate from 9 to 16 volts.

Testing

Apply 12 volts to the COR. With all inputs open the output relay will be off. Using a jumper, put 12 volts in the COR input. The relay will operate immediately. By taking the 12 volts out, the relay will hold for a few moments before it goes off (set this time by rotating R6).

To check the main timer, hold a 10k-Ohm resistor in parallel with R8 while activating the COR input with 12 volts. After a few seconds the relay will kick off. That means the timing circuit is operating normally.

Ground the ID input with a jumper. The relay will not operate whatever the COR input condition is. Remove the ground and apply 12 volts to the ID input. The relay will operate and the circuit will perform just as with the COR input.

I am sure that with one possible exception, the relay, you can find most parts for this project in your junk box. It should take only a few minutes to put the COR together once you have the PC board finished. A direct-contact PC print of the 1:1 positive takes only a few minutes to make. Good luck!

If you have any problems with the construction or parts availability, you can buy the entire COR-1 board, fully tested and assembled, from me for $23.00 postpaid. Please address me at 7016 NE 138th, Kirkland WA 98033. ■

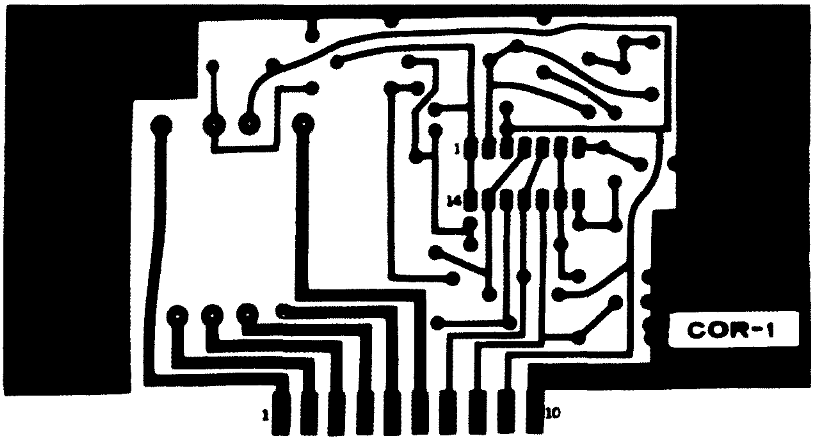

Fig. 2. PC board.

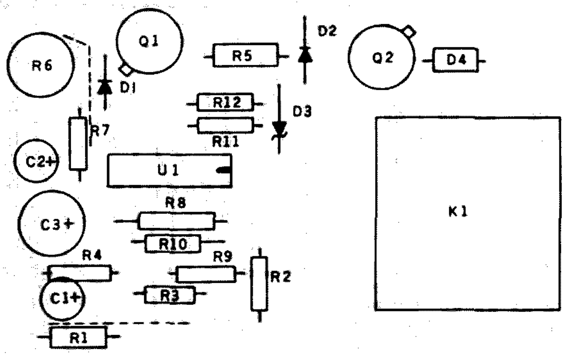

Fig. 3. Parts placement.

Parts List

R7	Resistor, ¼ W, 5% carbon, 10 Ohms
R11	Resistor, ¼ W, 5% carbon, 470 Ohms
R5, R12	Resistor, ¼ W, 5% carbon, 4.7k Ohms
R1, R9, R2	Resistor, ¼ W, 5% carbon, 10k Ohms
R4, R10, R3	Resistor, ¼ W, 5% carbon, 100k Ohms
R8	Resistor, ¼ W, 5% carbon, 1 megohm
R6	Potentiometer, 1 megohm
C1, C2	Capacitor, electrolytic, 1 uF, 35 V
C3	Capacitor, electrolytic, 220 uF, 16 V
D1, D2	Diode, switching (1N914)
D3	Diode, zener, 5.1 V, 400 mW, 5%
D4	Diode, rectifier, 1 Amp, 100 V (1N4002)
Q1	Transistor, 2N2905A or 2N4402
Q2	Transistor, 2N2270 or 2N4400
U1	Integrated circuit (LM339N)
K1	Relay, 12 V (NC2D-JP-DC12V)
	Printed circuit board

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Precision Speed Control for the Billboard Keyer

Get more for your money by adding this circuit to last month's project.

Sooner or later, every CW operator tries to determine just how fast he or she can send or receive Morse code. For those reaching for a higher class of license, the need to know is far more significant than somebody trying to win a lie-swapping contest at the local club meeting. Recent issues of various ham magazines have shown different approaches to solving the problem in a state-of-the-art manner.[1,2,3] My contribution in this direction (reference 1) generated a considerable amount of mail from readers interested in duplicating the device or adapting the idea to their own needs. As stated in that article, the design was interfaced with a home-brew keyboard keyer which resulted in a very accurate method of determining code speed.

A second-generation CMOS keyboard keyer I designed[4] did not lend itself well to an LED readout circuit due to the heavy current demands of TTL integrated circuits and the seven-segment displays. A low-current CMOS design with liquid crystal display was contemplated but discarded as too costly. Months of frustration ended when the diagram of a low-frequency synthesizer was discovered in the *CMOS Cookbook* by Don Lancaster. It featured a low-cost, integrated circuit phase-locked loop and appeared promising. A prototype was quickly constructed and proved to be ideal in this application.

That which follows is a description of the basic theory, construction, and operation of such a synthesizer and its application to my latest keyboard keyer.

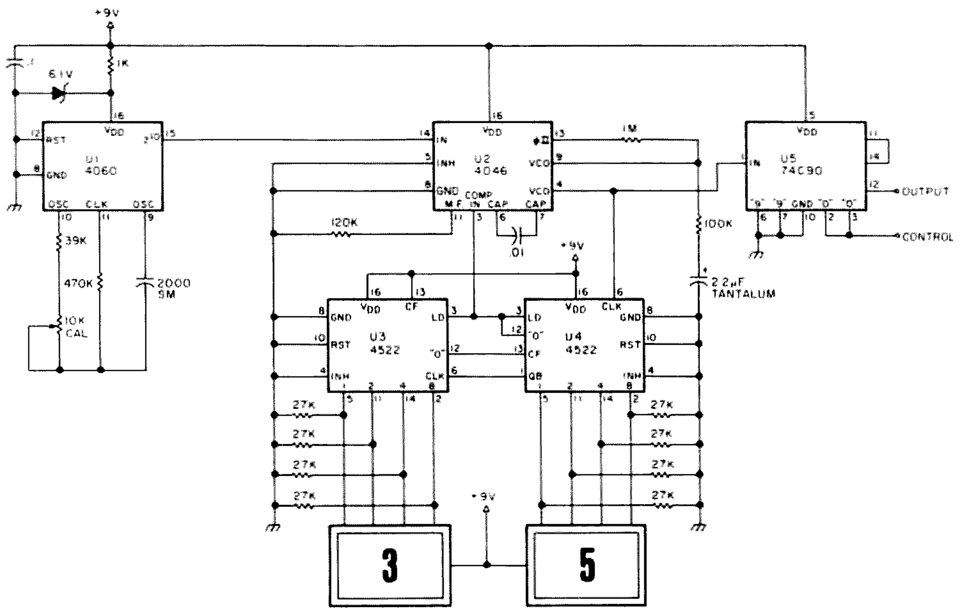

Fig. 1. Schematic diagram of the synthesized clock for the Billboard keyboard keyer.

What's Involved

Code speed in an electronic keyboard keyer such as the "Billboard" can be determined from the following formula: clock speed (Hz) × 2.4 = speed (wpm). Solving for a code speed of one wpm gives us the figure of 0.41666 Hz. This frequency is the basis for all frequencies generated in the synthesized clock.

The actual theory of phase-locked loops and frequency synthesizers using these devices is well beyond the scope of this article. Numerous papers on the subject have been published and the reader is encouraged to consult one of these if he or she feels the need for additional background. An excellent source of information on a very basic level is, again, the *CMOS Cookbook*. In fact, the majority of the circuitry presented here came directly from that book.

The function of the PLL circuitry in the synthesized clock is to multiply the reference frequency by any number between one and

ninty-nine as dialed up by the thumbwheel switches. The end result is the proper frequency necessary to generate any code speed from one to ninty-nine wpm.

A brief look at the schematic clearly indicates the simplicity of the circuit. Integrated circuit U1 is a unique and very versatile chip. It consists of a fourteen-stage binary ripple counter in addition to a pair of uncommitted gates. This IC and its associated components form the timebase which generates the reference frequency. The resistors and silver mica capacitor connected to pins 9, 10, and 11 along with the two previously mentioned gates form a digital relaxation oscillator. The 10k-Ohm potentiometer is a miniature ten-turn device and is used to adjust the oscillator frequency to exactly 4,266.6 Hz. The oscillator frequency is fed internally to the counter stages of U1 and is available at pin fifteen divided by 1,024. The resultant frequency is a 4.1666 Hz square wave which is fed to the input of the phase-locked loop chip, U2. Sharp-eyed readers will note that the decimal point has been moved one place to the right, thus corresponding to a clock speed necessary to produce code at ten words per minute. This is the actual timebase used, but a later stage will divide the output by ten for reasons which will be explained shortly.

A 6.1-volt zener diode and 1,000-Ohm resistor provide the necessary voltage regulation for the timebase oscillator to ensure both long- and short-term frequency stability. Likewise, a silver mica capacitor is specified in the timing circuit.

Integrated circuits U2, U3, and U4 perform the function of multiplying the reference frequency by the numbers indicated on the thumbwheel switches. Thus, if these switches are set to 35 as shown on the schematic, the output frequency from the voltage controlled oscillator (pin 4 of U2) will be 4.1666 Hz × 35 = 145.831 Hz. Referring back to the formula for determining code speed, we find that 145.831 × 2.4 = 350 wpm. A little fast for most of us, perhaps, but remember, we are going to divide this by ten shortly, which gets us back to 35 wpm.

If all this seems a bit confusing, the reader is invited to plug in the numbers which correspond to other code speeds to gain familiarity with the arithmetic involved. Work the formulas backwards a time or two and everything will fall into place.

This brings us to integrated circuit U5, a CMOS version of the ever-popular 7490 decade counter. The chip actually consists of a divide-by-five and a divide-by-two counter which, when cascaded, gives us the desired divide-by-ten function. It may appear unusual that the reference frequency was purposely chosen to be ten times the desired output and then divided later. It all comes clear, however, when one considers the needs of the actual keyer.

The original clock circuit in the Billboard is keyed. That is, it is only running during character generation. This is typical of most keyers and keyboards. For reasons beyond the scope of this paper, the synthesized clock must run continuously. It would, of course, be a simple matter to gate the output of the synthesizer on and off, but this would lead to intolerable and unpredictable time delays between a key-pressed command and actual character generation. By presetting U5 to zero (bringing pins two and three high) and holding it there, the output (pin twelve) is inhibited even though a string of clock pulses is present at the input. However, when the zero-reset line is brought low, the output is no longer inhibited and a string of perfectly symmetrical square waves at one-tenth the input frequency is presented to the keyboard circuitry. The delay between a key-pressed command and character generation is now insignificant, even at low speeds. At speeds in excess of ten words per minute, it is virtually identical to the keyed clock.

Only two connections need be made to the actual keyboard circuitry itself. Pin twelve of the 74C90 is connected in place of pin four (Q2A on the keyboard schematic) and pins two and three, the control lines, are connected to pin eight of Q3A, the CD4013 dual-D flip-flop.

Power for the synthesizer is taken from the same supply used to activate the keyboard. Current drain is in the vicinity of one to two milliamperes.

Construction

Once again, perfboard and point-to-point wiring were used to construct the unit. Miniature flea clips provide a convenient means of neatly terminating the wires which go off the board.

After the circuit was operating properly and calibrated, I coated both sides of the board with clear acrylic spray to prevent movement of the wires and provide a degree of protection from dirt and moisture. The synthesizer board was mounted with aluminum spacers and 6-32 hardware.

Calibration

Setting the timebase oscillator to precisely 4,266.6 Hz is most easily accomplished with the aid of a frequency counter. Initially, I attempted to measure the oscillator frequency directly at pin nine of U1. I found that the introduction of the frequency counter and probe to this sensitive part of the circuit caused the frequency to be pulled considerably. Instead, the thumbwheel switches were set to ninety-six wpm and the ten-turn calibration potentiometer was adjusted to show a frequency of exactly 400 Hz at pin one of the 74C90. If the builder does not have access to a counter, some other method of adjustment will have to be devised. Perhaps comparison of the synthesized signal to an accurately calibrated audio oscillator could do the job.

The long-term stability of the timebase and resultant accuracy of the synthesizer is nothing short of amazing. A calibration check was made six months after the initial adjustment and no change was necessary. Frequent on-the-air comparisons with others using sophisticated, microprocessor-controlled keyboards with programmable speed controls confirm the accuracy of this system.

Considering the minimal investment in both parts and labor involved, there is no longer a valid reason to have to guess at your code speed. Although no specific information is available, this design should be easily adaptable to other keyboards and regular keyers. I would be interested in hearing from others who have built this device and will respond to those who include an SASE.■

References

1. Jones, "A Digital Speed Readout For The Electronic Keyer," *QST*, July, 1978.
2. Wageman, "Accu-Keyer Speed Readout," *Ham Radio*, September, 1979.
3. Batie, "QRQ, QRS—By The Numbers," *73*, June, 1980.
4. Jones, "The Billboard Keyboard Keyer," *73*, July, 1983.

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PC Boards for Penny-Pinchers

Get picture-perfect circuit boards without buying a darkroom.

Some years ago, I rediscovered a technique for making printed circuit boards which was prevalent in the fledgling years of the industry. Called silk-screen printing, it is a very acceptable method of transferring a resist pattern to a clad board, is very inexpensive initially, will be successful even for a beginner, and, once mastered, will find many applications in the ham shack.

Briefly, the technique involves the pressing of ink through an open-weave fabric which has had portions of the weave rendered impervious to ink. It's as simple as it sounds!

Getting Started

As with anything, there is a modest cash outlay. However, this is tempered by the fact that at least 50% of your initial cost is non-recurring. Even the total cost, amortized over several projects, is much less than any other method.

Materials are readily available from local suppliers in almost any community and can be obtained in one Saturday morning.

From past experience, a 12″ × 12″ (inside opening) frame should be adequate to handle 90% of the boards you will want to make. We'll use that as a construction example. Of course, you can make larger frames by following these general instructions later.

Procuring the Materials

You may be able to find a lot of the materials for this project by scrounging around the house. Remember, nothing is very critical; your own wood, hinges, screws, and whatever probably will work. Assuming you find nothing at all, be prepared to spend about $25.00. Your first stop should be a lumber yard. Here is what you'll need from this source:

- 5 feet of 1″ × 1″ clear pine trim lumber. Almost anything will work here; the 1″ × 1″ is nominal anyway.
- 1 piece of ½″-thick "good one side" exterior-grade plywood about 18″ × 24″.
- 4 #6 × 2″ flathead wood screws.
- 4 small flat angles and screws.
- 2 small butt hinges, no wider than the pine trim lumber you bought.
- 1 small bottle of white glue.
- 1 small can of white shellac.
- 1 quart of benzene.
- 1 package of cheesecloth, preferably real cotton.
- 1 ½″ or ¾″ paint brush, throw-away type.

Now find any halfway good arts and crafts or artists' supply store. You'll need to purchase the following articles:

- ½ yard (about 18″ × 36″) of screen-printing silk. This is sufficient to make two 12″ × 12″ screens. The clerk may ask you what "mummy" silk you require. Explain that you'll be printing on metal. Ask for a fine or medium weave.
- 18″ × 36″ (a half sheet) of *water-soluble* printing film. You may have to buy a whole sheet—no problem if you store the balance carefully rolled in a cool dry place. Heat and moisture degrade the film in time.
- 1 squeegee, at least as long as the narrowest dimension of the pattern you wish to transfer. The author's squeegee is 7″ long

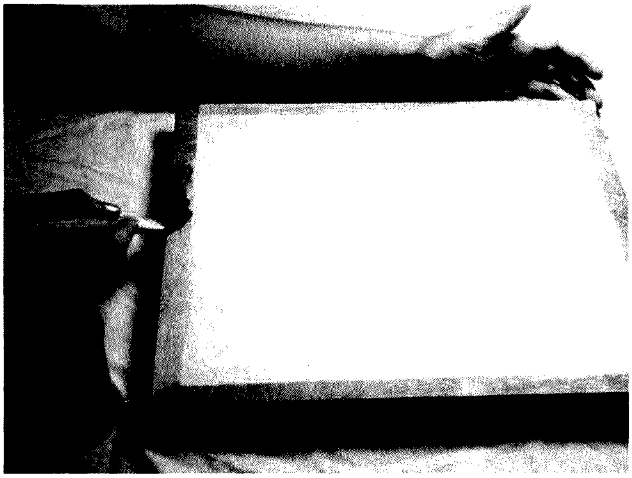

Photo A. Shellacking the screen to the frame.

Photo B. Newspaper/tape technique to block out open screen areas.

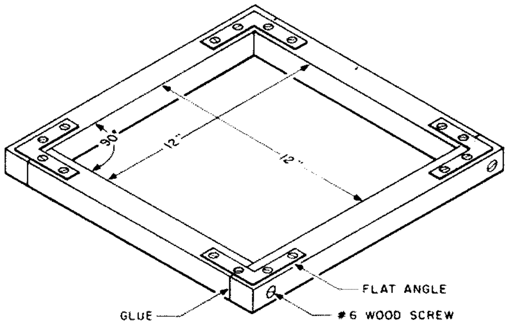

Fig. 1. Frame construction detail.

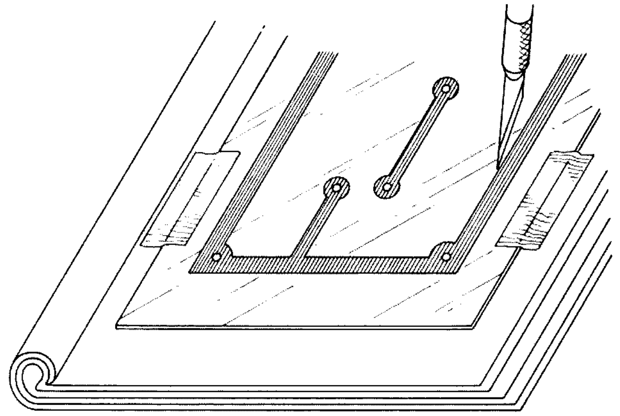

Fig. 2. Cutting out the circuit outline.

and suffices for 90% of the work done.

- 1 small can of screen-printing ink, any color that contrasts well with copper, suitable for printing on metal.
- 1 roll of 1"-wide drafting tape.
- 1 X-acto® knife and a package of #11 blades.

Make your last stop your neighborhood grocery. Purchase a bottle of *white* vinegar, a bottle of rubbing (isopropyl) alcohol, and a can of non-chlorinated scouring powder. You now own all the supplies you'll need to screen-print circuit patterns on copperclad.

Making the Frame

Sand the good surface and edges of the plywood to remove any slivers and give them a light coat of shellac. Clean your brush with a bit of the isopropyl alcohol.

Cut two pieces of wood 12" long, taking care to leave the ends as square as possible. If you have access to a miter box, it will simplify the task considerably. The squarer you build the frame, the more intricate the work you will be able to do with it.

Cut two pieces of wood 12" + twice the thickness of the wood you are using, again as square as possible.

Glue and screw the four pieces together as shown in Fig. 1. Predrilling the screw holes will help here. Try to make the joints as flush as possible. Wipe off excess glue with a damp sponge. Holding the frame square (against a square, how else?), assemble the four corner angles to it.

You should now have a neat, square frame measuring 12"×12" *inside*. Check the joints on the underside. They should be smooth. Any minor "step" should be sanded off. Shellac the frame with a thin even coat, and set aside to dry. Don't forget to clean the brush.

Preparing the Film

While you're waiting for the frame to dry, you can begin preparing the film from the artwork. Use drafting tape to secure your artwork to your work surface.

Cut a piece of film about 4" larger than the finished board size. Identify the emulsion side by gently scraping away at a tiny corner of the film with the X-acto knife. The green stuff that peels away is the emulsion. Tape the film, emulsion side up, over the artwork, centering it carefully.

Pay attention! This is the first area where you can seriously foul up and render your subsequent steps difficult and frustrating if not futile. You must now cut around the outline of the circuit pattern on the artwork (see Fig. 2). With the lightest touch possible, cut through the emulsion without creasing or badly scoring the mylar™ backing sheet. A little experimenting helps here. You'll soon develop a touch light enough to prevent scoring or creasing. Use a sharp blade and change often—usually at the first signs of snagging. If you crease or score the backing sheet, the film will curl up like a potato chip and render the subsequent steps very difficult or impossible.

Slip your X-acto blade carefully between the emulsion and backing sheet and lift off that emulsion representing the copper you want to stay behind (see Fig. 3). If you haven't quite cut through the emulsion, go back, cut loose the stubborn section, and continue peeling.

A couple of hints at this juncture: Use a thickness of wax paper under your palm to keep from sticking to the emulsion and transferring skin oils which will make the next steps harder. Use drafting tools such as straight edges, French curves, and circle and shape templates to guide the knife blade. This results in very neat work and allows you to hold some pretty amazing dimensional tolerances.

Another point: Unless you're making 1296-MHz striplines which require ultimate precision and strict adherence to the architecture, you can "square off" circuit pads and such in order to make life easier for yourself (see Fig. 4).

When you complete your film cutting, you should have a "negative" of your desired pattern. Untape it and turn it over. Rub your fingers lightly over the backing. You shouldn't be able to "read the pattern in braille." Don't score the backing sheet! Set the film aside between two sheets of wax paper and place it under a heavy book. This step is unnecessary if you are ready to adhere the film immediately.

Pick up the frame. It should be dry by now. A quick swipe with steel wool all over will smooth down the shellac and make the frame easier to clean later. Cut a piece of screen fabric four inches larger than the outside dimensions of the frame. Our design example requires a piece of fabric 18" × 18". See Fig. 5. Center the frame on the screen fabric. Fold a 1" hem on one edge as shown. Staple the hem against the side as shown. A stapler gun is nice for this. Keep your work neat. Repeat the same procedure on the *opposite* edge, pulling the fabric as taut as you can, anchoring the frame without damaging it.

Repeat the process on the other two edges, again pulling it taut on the last edge. You can do anything you want to tuck in the corners, as long as you don't turn them under the frame to create a lump on the screen side. The underside of the frame should be smooth.

If you're satisfied that the fabric is evenly and relatively taut on the bottom, you can now shrink the fabric. Gently, using running hot water, a generous sprinkling

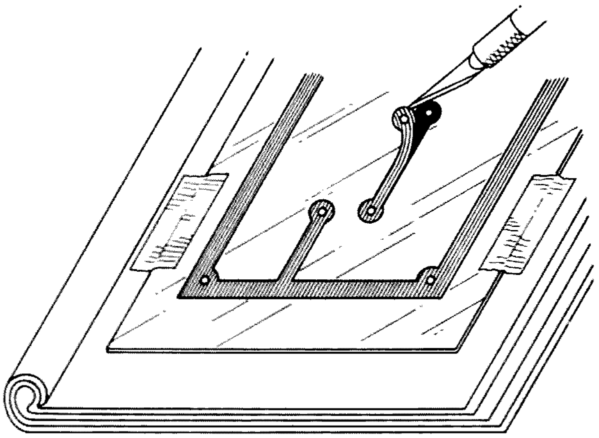

Fig. 3. Extracting the desired pattern.

of scouring powder, and your fingertips, scour the front and back of the fabric all over. Two or three scourings should do it. Rinse thoroughly with hot water. Inspect your work by holding it up to the light. Make sure that the weave is open and no areas are blocked by unremoved sizing or scouring powder. Once all traces of sizing and scouring powder have been removed, set the screen on edge to dry, turning it on a new edge frequently. Hot sunlight helps immensely to speed the process.

Meanwhile, procure four small pieces of copperclad board of the thickness you plan to use for your circuit board. Another hint: Cut your board with a pair of heavy tin shears, the kind sheet metal men call "bulldogs." It's much neater and easier than most home methods presently advocated.

Now examine your screen, making sure it's dry and quite taut. Thumping the screen with your finger should produce a satisfying "tunk" sound. As you can see, testing procedures are highly sophisticated. Once you are sure the screen and frame are absolutely dry, lay the screen bottom up on your bench. Carefully shellac the fabric which is in contact with the bottom of the frame (see Photo A). Do *not* shellac any other areas. Take extreme care not to dribble any shellac onto the screen except where it touches the wood. If you dribble shellac onto any other part of the screen, you will ruin it.

Place the now dry sheet of plywood, shellacked side up, on your table. Give the surface a quick swipe with fine steel wool. Center the screen frame, screen side down, on your piece of plywood. Slip a piece of the copperclad you prepared under each corner of the frame. Clamp the frame to the plywood taking care not to distort it (see Fig. 6). Neatly screw the two hinges to one side of the frame and to the plywood as shown.

You've just built a homebrewer's tool that will last you several years and, once you've been exposed to it, you'll wonder how you ever home-brewed without it.

You're already now to adhere the film to the silk. This is the second most vulnerable area, so extreme care must be taken. Swing your frame open and remove the copperclad shims. Place newspaper (enough sheets to equal or just exceed the thickness of the circuit-board stock you plan to use) onto the platen (plywood sheet). Make sure the frame closes flat without forcing it. Place your prepared film, emulsion side up, on the newspaper stack, centering it in the frame opening. Close the frame, ensuring that everything lies flat, more or less in contact with the silk. See why you weren't supposed to crease the film?

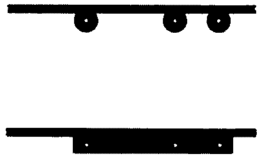

Fig. 4. "Squared-off" circuit pad.

Make a mixture of two parts white vinegar and one part isopropyl alcohol. About a cupful will do the job. Make two four-inch square pads using several thicknesses of cheesecloth and open the frame. Soak one cheesecloth pad in the mixture and sponge the screen thoroughly in its raised position using the vinegar/alcohol mixture. Wring out all excess moisture from the cheesecloth pad and close the frame over the film. Briskly rub the screen over the film surface with the dampened cheesecloth pad until the film underneath is thoroughly damp. Immediately use the dry cloth pad to blot up the moisture over the film. Use some pressure here. Don't rub—blot. This forces the threads of the weave into the softened emulsion. Areas that don't seem to be cooperating can be adhered by carefully reapplying the damp cloth and dry cloth in sequence. Take care not to over-soften and drag emulsion into "open" areas. Err on the side of caution until you get the hang of it.

Assuming your adhering job passes muster (uniform screen showing through the weave in all areas contacting the emulsion), let it sit for a while to harden. Open your frame. Starting at one corner, the one you scratched away to identify the emulsion side, gently peel off the mylar backing, watching all the while for areas that didn't quite stick to the screen. Go back and repeat the adhering process for those stubborn areas. By now, you should have a beautiful screen. Save the mylar; it makes a dandy dielectric for VHF work.

Now tear up a couple dozen strips of newspaper. Each should be about three inches by twelve inches. Run a 12-inch length of drafting tape along one long edge of a newspaper piece, overlapping the tape ½" over the paper. Starting ½" inside the film border, tape it down as shown in Photo B. Repeat for an adjacent edge. Continue around in a circle (square?).

When you have done four sides, continue around again, overlapping the tape over the previous tape strip until you have climbed up the inside of the frame and the entire inside of the frame is covered with what looks like solid tape. Why not use straight tape and forget the newspaper bit? You want as little as possible of the tape adhesive in contact with the screen. One, you want to prevent stressing the screen unduly when you remove the blockout when changing artwork; and two, you don't want to glob up any open screen with damn near insoluble hard-tape adhesive.

Whatever newspaper and tape is sticking up out of the frame you can trim flush with the top. Run a strip of tape around the inside of the frame and fold it over onto the top edge of the frame.

Cut a piece of circuit board as square as possible about a half inch larger than the finished board size you want. Run a file over the edges at a forty-five degree bevel to break off any sharp foil "zingers" that stick up. A barely perceptible piece of copper sticking up will slice up your screen or, worse yet, your thumb. Center the piece of copper under your screen image, leaving equal margins all around. Open the frame

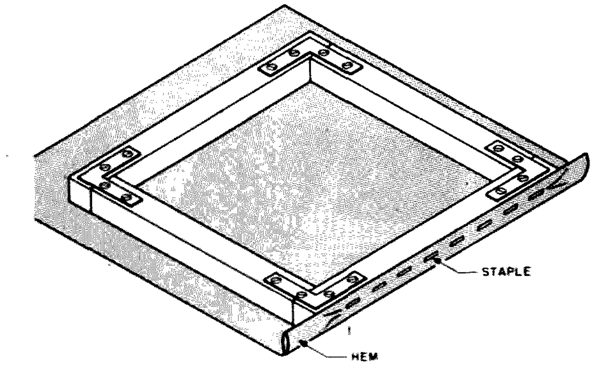

Fig. 5. Attaching the fabric to the outside edge of the frame.

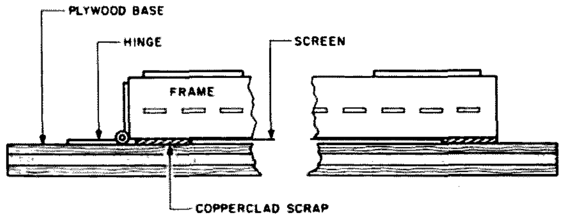

Fig. 6. Attachment of the frame to the plywood support.

without disturbing the copperclad. Take the four pieces of copperclad you used as spacers and securely tape one along each edge of the board to form a nest into which you can drop succeeding boards. Check to see that you didn't disturb anything and that your image still falls within the confines of the board. Remove the board and scour it shiny with the cleanser. Rinse in hot water and let it dry.

Open your ink can. The ink should be about the consistency of canned pudding. Stir it well with a tongue depressor or dull butter knife. Place the dry board in the nest. Close the frame over the board. Place about a 3/8" to 1/2" bead of ink on the screen along a short edge of the board about a half inch away from the border. Pick up your squeegee and with one slow, deliberate, firm stroke, drag the ink across the artwork past the opposite border. Put down the squeegee, open the frame, and gaze down on your perfect, ready-to-etch board. Carefully set your masterpiece aside to dry. Then make a few more boards, sell them to your friends, and charge plenty. Recoup your investment.

Thoroughly clean your screen and tools with benzene immediately after use. Use this stuff outside if you can; it's highly flammable. Make sure every trace of ink is removed from the clear areas of the screen if you plan to reuse it for this or any other project. Hold the screen up to the light; any blocked areas will show up soon enough. Etch your boards according to the etchant manufacturer's instructions. Clean the ink off the board with benzene or steel wool after you are done etching.

Want to print a different pattern? Simply peel off the newspaper blocking and dissolve away the old film with hot running water. Scour as before, adhere your new film, and repeat all other pertinent parts of the process. Several boards on the same screen? Why not? Simply block out the ones you don't want to print using tape and newspaper.

Is the underside of the screen gobbed up with ink or are you getting a fuzzy image during a longish printing run? Simply clean both sides of the screen thoroughly with benzene. Bad image on a board? Just wash the ink off with benzene and put the board back into rotation. Club projects? Ideal. While you're at it, why not print up some really neat club T-shirts or some really professional signs for the next flea market. QSLs? A cinch in any color, including rainbow.

Now what about those boards that are literally a can of worms and could not be cut by hand even if your life depended on it? These are still most economically done by the silk-screen process. Most large cities have companies which specialize in preparing printing screens photographically (see reference at end). Simply send them your artwork and frame and in a week or ten days they will return your absolutely flawless screen for less than the price of a full-size photographic transparency.

Double-sided boards? No problem. All double-sided boards have registration marks. Print your first side as described making sure to include the registration marks. Clear out your screen and adhere to the reverse side. Using a common pin, prick through the centers of the reverse side registration marks into the plywood platen. Drive two small brads into the plywood at the pinpricks so that just the heads protrude a little less than the thickness of the circuit board. On the now dry boards on which you just printed the first side, drill through the registration marks with a drill just large enough to clear the heads of the brads. Drop the boards over the brads, printed side down, print the other side, and etch the board.

What else can you do with this little marvel? How about front panels? Make up some scale artwork using Presstype or LeRoy lettering and ink. Have a photographic screen made, either positive or negative—your choice, just advise the screenmaker. Use your imagination. Using copperclad and a negative screen, etch away the lettering. Brightly polish the remaining copper and backlight the panel. The lettering will show up in a subdued green glow. Stunning! Using the positive and double-sided laminate, you will have copper letters and a green insulated panel. If you don't etch the backside, you'll have electrical integrity to boot.

Aluminum panel? Absolutely! Make your layout, screen print it on, and leave the ink on. Etch your panel with lye first as described in the *Radio Amateur's Handbook* or obtain a piece of brightly polished aluminum, screen print it, then etch the aluminum as above. Wash the ink off with benzene after etching and stare at the most strikingly beautiful panel you ever saw—polished raised letters on a satin background.

Once you develop skill with this technique, it will take you less time to produce things with this method than it did to read this article. You will soon be using this method in ways that would amaze even the author. For those of you who might feel that this technique is complex, I teach this technique routinely to Brownies and Cub Scouts who seem to have absolutely no problem making really cute stuff with screen printing.

Finally, I stand ready to answer any and all queries in exchange for an SASE. ■

For photographic preparation of silk screens, contact:
William R. Blount and Sons, Inc.
100 Dexter Street
Pawtucket RI 02860

Faultless SSTV Picture Preservation

The dynamic duo of computer and printer helps save those perfect moments. Just add this program.

David A. Gauger KF9X
3900 Bluebird Lane
Rolling Meadows IL 60008

Let's face it, ham radio is terrific—and even more so if you team it up with any of several allied fields in electronics. I'm not at all surprised by the large percentage of hams who also own personal computing equipment. If you're like me, you've dabbled in several allied fields including personal computing and

Program listing.

```
                  0000 ;>>>>>>  HARDCOPY PRINT OF SLOW SCAN VIDEO  <<<<<<<
                  0002 ;        WRITTEN FOR KIM-1 WITH PRINTER
                  0004 ;
                  0008 ;          BY - DAVID A. GAUGER
                  0008 ;
                  0020 START       .BA $2F00
                  0024 PAGE        .DE $0000
                  0026 LETTERS     .DE $3000
                  0028 PBDD        .DE $1703
                  0030 PBD.        .DE $1702
                  0032 PAD.        .DE $1700
                  0034 TIME1       .DE $1704
                  0036 TIME2       .DE $1705
                  0038 TIMEOUT     .DE $1707
                  0040 CRLF        .DE $1E2F
                  0042 PRINTCHAR   .DE $1EA0
                  0044 LINECOUNT   .DE $0003
                  0100 ;CLEAR ABOUT 12K OF MEMORY FOR STORAGE OF PIXEL INFO
                  0110 ;STORE ADDRESS OF FIRST PAGE IN $00.$01
2F00  A900        0120 CLEARMEMRY LDA $00
2F02  8D0000      0130            STA $00
2F05  A931        0140            LDA #31
2F07  8D0100      0150            STA $01
2F0A  A0FF        0160            LDY #FF
2F0C  A900        0170            LDA #00
2F0E  C8          0180 INC.Y      INY
2F0F  9100        0190            STA (PAGE).Y
2F11  C0FF        0200            CPY $FF
2F13  D0FB        0210            BNE INC.Y
2F15  EE0100      0220            INC $01
2F18  A960        0230            LDA #60
2F1A  CD0100      0240            CMP $01
2F1D  D0EF        0250            BNE INC.Y
                  0260 ;SETUP ADDRESS IN $00.$01
2F1F  A900        0270 SETADDR    LDA #00
2F21  8D0000      0280            STA $00
2F24  A931        0290            LDA $31
2F26  8D0100      0300            STA $01
2F29  A0FF        0310            LDY $FF
                  0320 ;SETUP PB2 AS OUTPUT TO STROBE A-D CONVERTER
2F2B  A904        0330 SETPORT    LDA #04
2F2D  8D0317      0340            STA PBDD
2F30  C8          0350 GETPIXEL   INY
2F31  A9FB        0360            LDA #FB
2F33  2D0217      0370            AND PBD.
2F36  8D0217      0380            STA PBD.
                  0390 ;USE TIMER TO WAIT FOR A-D TO FINISH CONVERSION
2F39  A910        0400            LDA #10
2F3B  8D0417      0410            STA TIME1
2F3E  AD0717      0420 WAIT       LDA TIMEOUT
2F41  F0FB        0430            BEQ WAIT
                  0440 ;GET DATA FROM A-D AND STORE IT AWAY
2F43  AD0017      0450            LDA PAD.
2F46  9100        0460            STA (PAGE).Y
                  0470 ;NOW BRING STROBE PIN OF A-D HIGH AGAIN
2F48  A904        0480            LDA $04
2F4A  0D0217      0490            ORA PBD.
2F4D  8D0217      0500            STA PBD.
                  0510 ;SINCE WE WANT ABOUT 125 PIXELS PER HOR. SWEEP
                  0520 ;WE MUST DELAY ABOUT 530 MICROSECONDS . WE USE
                  0530 ;THE TIMER AGAIN FOR THIS.
2F50  A942        0540            LDA #42
2F52  8D0517      0550            STA TIME2
2F55  AD0717      0560 WAITAGAIN  LDA TIMEOUT
2F58  F0FB        0570            BEQ WAITAGAIN
2F5A  C0FF        0580            CPY #FF
2F5C  D0D2        0590            BNE GETPIXEL
                  0600 ;INCREMENT STORAGE THROUGH SUCCEEDING PAGES
2F5E  EE0100      0610            INC $01
2F61  A960        0620            LDA #60
2F63  CD0100      0630            CMP $01
2F66  D0C8        0640            BNE GETPIXEL
                  0650 ;WE HAVE FINISHED GETTING DATA FROM CAMERA
                  0660 ;
                  0670 ;NOW PRINT THE PICTURE
2F68  202F1E      0680 BEGINPIX   JSR CRLF
2F6B  202F1E      0690            JSR CRLF
                  0700 ;SETUP $00.$01 ONCE AGAIN TO DEFINE STARTING PG. OF
                  0710 ;BRIGHTNESS LEVEL RETRIEVAL
2F6E  A900        0720            LDA #00
2F70  8D0000      0730            STA $00
2F73  A931        0740            LDA #31
2F75  8D0100      0750            STA $01
2F78  A000        0760            LDY #00
                  0770 ;WAIT FOR A SYNC PULSE BEFORE STARTING TO PRINT
2F7A  20AE2F      0780 WAIT4SYNC  JSR PIXEL ;GET A NBR
2F7D  C93C        0790            CMP #3C
2F7F  B0F9        0800            BCS WAIT4SYNC ;GREATER THAN 3C TOO HIGH
                  0810 ;WE FOUND SYNC PULSE - NOW WAIT FOR IT TO FINISH
2F81  20AE2F      0820 SYNCPULSE  JSR PIXEL
2F84  C93C        0830            CMP #3C
2F86  90F9        0840            BCC SYNCPULSE
2F88  8C0200      0850            STY $02
2F8B  202F1E      0860            JSR CRLF
2F8E  AC0200      0870            LDY $02
2F91  A974        0880            LDA $74
2F93  8D0300      0890 .          STA LINECOUNT
                  0900 ;
                  0910 ;WE RECALL THE STORED NUMBERS AND USE THEM AS AN OFFSET
                  0920 ;TO FIND WHICH ASCII VALUE TO PRINT - AS DEFINED IN THE
                  0930 ;LOOK-UP TABLE.
2F96  20AE2F      0940 PRINTONE   JSR PIXEL
2F99  AA          0950            TAX
2F9A  BD0030      0960            LDA LETTERS.X
2F9D  8C0200      0970            STY $02
2FA0  20A01E      0980            JSR PRINTCHAR
2FA3  AC0200      0990            LDY $02
                  1000 ;LINECOUNT COUNTS NBR OF CHARACTERS PRINTED IN EACH LINE
2FA6  CE0300      1010            DEC LINECOUNT
2FA9  D0EB        1020            BNE PRINTONE
                  1030 ;MUST BE DONE WITH THIS LINE
                  1040 ;GO WAIT FOR NEXT SYNC PULSE
2FAB  4C7A2F      1050            JMP WAIT4SYNC
2FAE  C8          1060 PIXEL      INY
2FAF  C000        1070            CPY #00
2FB1  D00A        1080            BNE LOADPIXEL
2FB3  EE0100      1090            INC $01
2FB6  A960        1100            LDA #60
2FB8  CD0100      1110            CMP $01
2FBB  F003        1120            BEQ STOP
2FBD  B100        1130 LOADPIXEL  LDA (PAGE).Y
2FBF  60          1140            RTS
```

SSTV. What follows is a simple means of obtaining hard-copy pictures from your SSTV camera, using a KIM-1 single-board microcomputer. The method should be adaptable to other micros using the 6502 microprocessor.

If you're still with me, I presume you have an SSTV camera and a computer with printer. The only other item needed is an 8-bit A/D (analog to digital) converter. You'll have to make a single tap into your camera to obtain the picture information. Incidentally, there is no reason why one could not obtain that signal from the SSTV monitor circuitry so that hard-copy pictures could be printed out from signals received over the air.

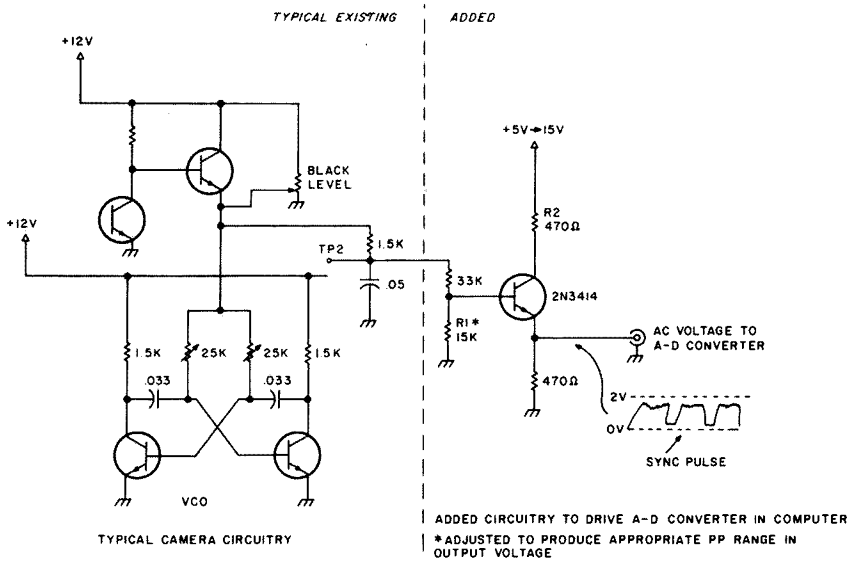

Fig. 1. Emitter-follower circuit used to drive A/D converter from SSTV camera. Alternate values for R1 and R2 are discussed in the text.

Hardware

First, let's talk printers. The typical garden-variety 80-column printer may not give you what you consider an adequate picture unless you can decrease the horizontal and vertical pitch. Pictures printed on a standard LA-36, for example, are not very impressive. I own an LA-34 which has programmable pitch. This is what gives the density and contrast necessary for a picture which is at least adequate. I've seen commercial setups in which the printer double-prints each line, overstriking each character to enhance its density. In the case of the LA-34 and other programmable printers, picture density and contrast can be enhanced by decreasing the horizontal and vertical pitch as much as is possible—in my case, 16.5 characters per

```
                  1150 ;SETUP FOR TAKING NEXT PICTURE
                  1160 ;BY LOADING PROPER ADDRESS IN $FA $FB
                  1170 ;AND JUMPING TO MONITOR.
2FC0  A900        1180 STOP         LDA #00
2FC2  8DFA00      1190              STA $FA
2FC5  A92F        1200              LDA #2F
2FC7  8DFB00      1210              STA $FB
2FCA  4C4F1C      1220              JMP $1C4F
                  1230 ;THIS IS THE LOOKUP TABLE WHICH DEFINES
                  1240 ;WHICH ASCII CHARACTER IS TO BE PRINTED
                  1250 ;FOR ANY GIVEN BRIGHTNESS LEVEL.
                  1260 CHARTABLE    .BA $3000
                  1270              .MC $6000
3000  202020      1280              .BY 20 20 20 20 20 20 20 20
3003  202020
3006  2020
3008  202020      1290              .BY 20 20 20 20 20 20 20 20
300B  202020
300E  2020
3010  202020      1300              .BY 20 20 20 20 20 20 20 20
3013  202020
3016  2020
3018  202020      1310              .BY 20 20 20 20 20 20 20 20
301B  202020
301E  2020
3020  202020      1320              .BY 20 20 20 20 20 20 20 20
3023  202020
3026  2020
3028  202020      1330              .BY 20 20 20 20 20 20 20 20
302B  202020
302E  2020
3030  202020      1340              .BY 20 20 20 20 20 20 20 20
3033  202020
3036  2020
3038  202020      1350              .BY 20 20 20 20 20 20 20 20
303B  202020
303E  2020
3040  204040      1360              .BY 20 40 40 40 40 40 40 40
3043  404040
3046  4040
3048  404040      1370              .BY 40 40 40 40 40 40 40 40
304B  404040
304E  4040
3050  404040      1380              .BY 40 40 40 40 40 40 40 40
3053  404040
3056  4040
3058  404040      1390              .BY 40 40 40 40 40 40 40 40
305B  404040
305E  4040
3060  404040      1400              .BY 40 40 40 40 40 40 40 40
3063  404040
3066  4040
3068  404040      1410              .BY 40 40 40 40 40 40 40 40
306B  404040
306E  4040
3070  4E4E4E      1420              .BY 4E 4E 4E 4E 4E 53 53 53
3073  4E4E53
3076  5353
3078  53536E      1430              .BY 53 53 6E 6E 6E 6E 6E 6F
307B  6E6E6E
307E  6E6F
3080  6F6F6F      1440              .BY 6F 6F 6F 6F 79 79 79 79
3083  6F7979
3086  7979
3088  79383B      1450              .BY 79 38 38 38 38 38 2E 2E
308B  38383B
308E  2E2E
3090  2E2E2E      1460              .BY 2E 2E 2E 27 27 27 27 27
3093  272727
3096  2727
3098  606060      1470              .BY 60 60 60 60 60 20 20 20
309B  606020
309E  2020
30A0  202020      1480              .BY 20 20 20 20 20 20 20 20
30A3  202020
30A6  2020
30A8  202020      1490              .BY 20 20 20 20 20 20 20 20
30AB  202020
30AE  2020
30B0  202020      1500              .BY 20 20 20 20 20 20 20 20
30B3  202020
30B6  2020
30B8  202020      1510              .BY 20 20 20 20 20 20 20 20
30BB  202020
30BE  2020
30C0  202020      1520              .BY 20 20 20 20 20 20 20 20
30C3  202020
30C6  2020
30C8  202020      1530              .BY 20 20 20 20 20 20 20 20
30CB  202020
30CE  2020
30D0  202020      1540              .BY 20 20 20 20 20 20 20 20
30D3  202020
30D6  2020
30D8  202020      1550              .BY 20 20 20 20 20 20 20 20
30DB  202020
30DE  2020
30E0  202020      1560              .BY 20 20 20 20 20 20 20 20
30E3  202020
30E6  2020
30E8  202020      1570              .BY 20 20 20 20 20 20 20 20
30EB  202020
30EE  2020
30F0  202020      1580              .BY 20 20 20 20 20 20 20 20
30F3  202020
30F6  2020
30F8  202020      1590              .BY 20 20 20 20 20 20 20 20
30FB  202020
30FE  2020
                  1600 END.         .EN

LABEL FILE:  [ / = EXTERNAL ]

START=2F00             /PAGE=0000             /LETTERS=3000
/PBDD=1703             /PBD.=1702             /PAD.=1700
/TIME1=1704            /TIME2=1705            /TIMEOUT=1707
/CRLF=1E2F             /PRINTCHAR=1EA0        /LINECOUNT=0003
CLEARMEMRY=2F00        INC.Y=2F0E             SETADDR=2F1F
SETPORT=2F2B           GETPIXEL=2F30          WAIT=2F3E
WAITAGAIN=2F55         BEGINPIX=2F88          WAIT4SYNC=2F7A
SYNCPULSE=2F81         PRINTONE=2F96          PIXEL=2FAE
LOADPIXEL=2F8D         STOP=2FC0              CHARTABLE=3000
END.=3100
//
0000
>
```

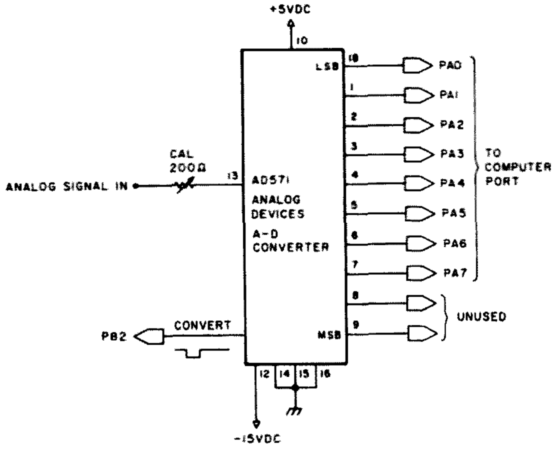

Fig. 2. A/D converter. PA0–PA7 and PB2 are input/output port connections on the KIM-1 microcomputer. The two most significant bits of the AD 571 A/D converter are not used.

Fig. 3. Hard-copy picture produced by dot-matrix printer set for 16.5 characters per inch horizontally and 12 lines per inch vertically.

inch horizontally and 12 lines per inch vertically.

The idea is quite simple. Somewhere in your camera there is likely to be a dc voltage which varies with brightness. In my case, I use an old Dage CCTV camera with a Hal Devices converter. There is a very convenient dc voltage which drives the vco (voltage controlled oscillator) in the Hal converter which I tapped for this purpose. As shown in Fig. 1, I used an emitter follower to provide for minimum loading of the converter and stiff drive. This voltage rises and falls in proportion to the brightness level as the camera circuitry sweeps the vidicon horizontally across the picture, and, indeed, even reflects the horizontal 5-millisecond sync pulses which trigger each new line. All we need to do is convert this voltage to a digital value by the use of an 8-bit A/D converter and store this information in memory.

I used the circuit of Fig. 2 to perform the conversion task. It contains a 10-bit A/D converter, but I used only the least significant 8 bits. This limits the voltage conversion range to 2.55 volts. Thus, the emitter-follower circuitry I use tailors the video signal so that it spans slightly less than 2.00 volts. There is no reason why a different voltage range could not be accommodated by slight modifications to the circuitry shown in Fig. 1. If you have an 8-bit converter available, you probably have a resolution of about 40 mV. You would want to change my emitter-follower circuit (Fig. 1) to provide a greater voltage swing fed to the A/D converter so as to preserve gray-scale resolution. Try increasing R1 and eliminating R12 and increasing B+ to 10–15 volts.

The AD571 converter which I use is relatively expensive but easy to use. The eight LSB outputs are connected to PA0–PA7, and the blank-and-convert pin is connected to PB2. The outputs on port A are tri-stated until PB2 is driven low, commanding the converter to do its thing. After 25 microseconds have elapsed, the data on Port A represents the analog input in digital form. The sequence is then (1) pull PB2 low, (2) wait for valid data, (3) read and store data on Port A, and (4) push PB2 high again.

Software

The software (see Listing 1) occupies less than one page (256 bytes) of KIM-1 memory plus one additional page for the character lookup table. The routines are straightforward and documented in the listing. The program consists of four sections: (1) clear memory, (2) acquire data and store in memory, and (3) recall data and print character from (4) the lookup table. I used pages $31–$5F to store data, but any 12K block can be used by making the appropriate changes in the software.

Since an SSTV picture is approximately 125 lines from top to bottom, it's logical to store about that same number of values across each line since little improvement in resolution can be had by increasing beyond 125. The KIM-1 onboard timer is used to space the video samplings by about 530 microseconds. Simple math reveals that 125 samplings of 530 microseconds each is a time duration of about 66,000 microseconds. At a horizontal sweep frequency of 15 Hz, each sweep takes about 66,000 microseconds, so our delay is about right.

The software simply samples the dc output of the camera each 530 microseconds until all 12K of memory is filled. It then proceeds to reset the pointers and read the values out sequentially.

```
1230  ;THIS IS THE LOOKUP TABLE WHICH DEFINES
1240  ;WHICH ASCII CHARACTER IS TO BE PRINTED
1250  ;FOR ANY GIVEN BRIGHTNESS LEVEL.
1260  CHARTABLE   .BA $3000
1270              .BY 20 20 20 20 20 20 20 20
1290              .BY 20 20 20 20 20 20 20 20
1300              .BY 20 20 20 20 20 20 20 20
1310              .BY 20 20 20 20 20 20 20 20
1320              .BY 20 20 20 20 20 20 20 20
1330              .BY 20 20 20 20 20 20 20 20
1340              .BY 20 20 20 20 20 20 20 20
1350              .BY 20 20 20 20 20 20 20 20
1360              .BY 20 40 40 40 40 40 40 40
1370              .BY 40 40 40 40 40 40 40 40
1380              .BY 40 40 40 40 40 40 40 40
1390              .BY 40 40 40 40 40 40 40 40
1400              .BY 40 40 40 40 40 40 40 40
1410              .BY 40 40 40 40 40 40 40 40
1420              .BY 4E 4E 4E 4E 4E 53 53 53
1430              .BY 53 53 6E 6E 6E 6E 6E 6F
1440              .BY 6F 6F 6F 6F 79 79 79 79
1450              .BY 79 38 38 38 38 38 2E 2E
1460              .BY 2E 2E 2E 27 27 27 27 27
1470              .BY 60 60 60 60 60 20 20 20
1480              .BY 20 20 20 20 20 20 20 20
1490              .BY 20 20 20 20 20 20 20 20
1500              .BY 20 20 20 20 20 20 20 20
1510              .BY 20 20 20 20 20 20 20 20
1520              .BY 20 20 20 20 20 20 20 20
1530              .BY 20 20 20 20 20 20 20 20
1540              .BY 20 20 20 20 20 20 20 20
1550              .BY 20 20 20 20 20 20 20 20
1560              .BY 20 20 20 20 20 20 20 20
1570              .BY 20 20 20 20 20 20 20 20
1580              .BY 20 20 20 20 20 20 20 20
1590              .BY 20 20 20 20 20 20 20 20
1600  END.        .EN
```

Lookup table.

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Operation

Once the hardware is connected and the program loaded, start the sequence at $2F00, but wait until the camera vertical sweep is at the top. In my case, I address $2F00 and watch the SSTV monitor, punching GO on the KIM-1 keypad as the vertical sweep begins a fresh sweep. After about 8 seconds have elapsed, the printer will print CR/LF several times and then begin printing line after line of the picture. At the conclusion, the computer reloads the starting address of the program and jumps to the KIM monitor.

My first few attempts at printing pictures immediately revealed that the aspect ratio was way off—that is, the picture was not square or even close. Happily enough, the error was almost exactly 2:1; the picture was twice as long as it should have been for its width. The solution was simple: print every other line. The program watches for a sync pulse (sync pulses in my camera deliver a voltage less than $3C), so it was simple to wait for a string of values less than $3C and then begin printing. In order to print every other line, one merely prints past the next sync pulse by loading a value in LINECOUNT which ensures this. The software waits for the "next" sync pulse before beginning to print again. This seems to work well. Incidentally, this threshold value will probably differ with each hardware setup, so be prepared to modify the value found in addresses $2F7E and $2F85 to be just a few counts larger than the digital value returned by your A/D converter for camera sync pulses.

Which character do we print? Early in the game I used my BASIC interpreter to print every ASCII character in 8 lines across the page. This printout was viewed from a distance and my subjective judgment selected the following characters, starting with the least dense and growing toward the most dense: $20 (space), $60 ('), $27 (,), $2E (.), $3B (;), $79 (y), $6F (o), $6E (n), $53 (S), $4E (N), and $40 (@).

These characters are placed across page $30 of memory. The hashing technique is used whereby the video value retrieved is used as the address in page $30. If, for instance, the A/D converter returned the value of $50, then the program looks at $3050 and prints the ASCII character stored at that address. The spacing and placement of the characters was done by experimentation and can be adjusted easily by the user to meet individual camera characteristics. Since my camera gives minimum voltage for black and sync and higher values for bright and white, the values in the table are arranged this way, with the (@) stored in the lower addresses and the (.) stored in the higher addresses. If a camera gives the reverse, namely, a lower voltage for a brighter level, reverse the order of the stored values in page $30.

It is unlikely that my placement of values in the lookup table will suffice for your camera, so let me suggest the following: Manually load the table with my suggested values, starting at $3000, loading 25 each of the ASCII characters until you reach the top of the page at $30FF.

Focus the camera on a photo having a nice range of grays and including full white and full black. Start the program at $2F00 and then look at the values stored in the 12K of RAM. Note the minimum and maximum values found. These represent the sync-through-white range of your camera. If sync is returned by your converter as, say, $20, and full white is returned as $61, then you know that all values converted will fall within this range. Your lookup table values will be evenly spread from $3020 to $3061, and addresses above and below this range may be loaded with $00 since, theoretically, they will never be used. Note that you may adjust the placement or dispersion of values across the range to account for individual camera characteristics. If, for instance, you want more contrast, then load fewer of the numbers for the center of the gray scale, namely, fewer $79s and $6Fs, making up for this decrease by increasing the occurrence of numbers near the ends of the range.

As with any such picture, it must be viewed from a distance to disallow the eye from reading the individual characters and enhancing the overall picture. The lighting of the subject is a very important consideration, and users should experiment. In general, use a hair light directly above the subject and light the face more from one side than the other. Avoid direct frontal lighting as this flat lighting tends to hide the features. Fig. 3 shows a typical printout.

I've had more fun than I anticipated, producing a hard-copy picture of a visitor and giving it to him to take home. People seem to deem this a reasonable justification for having a computer, and if you're anything like me you need every justification you can get to cover your expenditures of time and money.

I've just begun to experiment with this technique and no doubt many improvements will be made to what I've started here. I'd be most interested in hearing from others who have found ways to improve it. ■

Jerome T. Dijak W9JD/2
215 Tareyton Drive
Ithaca NY 14850

Save Your Signal with Forward Error-Correction

In a hostile signal environment, you need all the help you can get.

There have been several short articles on packet radio over the past few years, but this article will present some different ideas on using computers to obtain error-free transmission of digital data over poor-quality radio channels (see "Computers and HF," *73 Magazine*, January, 1981). The current efforts in setting up packet networks share several things in common. They all use rather large blocks (about 260 bytes), and they all use error-detecting codes with no forward error-correction capability. Since these systems are being set up to make use of the specialized integrated circuits that are being produced for the commercial market, this result is to be expected—the commercial market uses the telephone system for its long-haul communications, and these types of packets will probably work very well on a phone line or on a radio channel that acts like a phone line.

A good quality VHF radio channel, or a VHF repeater channel, behaves very much like a telephone channel when it comes to bandwidth, level stability, and noise bursts, so it is reasonable to expect these packet systems to work fairly well in these cases. Considerable effort has gone into commercial research on this topic, so it is probably smart to follow their recommendations—when our radio channels act like phone lines.

On the other hand, a normal HF radio channel does not act very much like a telephone channel. On a typical day one can expect noise bursts every few seconds, deep fading, and lots of interference from other signals. In short, the channel is much more "hostile" than a repeater channel, and many more transmission errors can be expected per unit time. This means that for a packet system to work, it will be forced to transmit only very short packets in order to get some passed error-free between noise bursts and interference. In this mode, the framing and control bits added to the data in a packet become a very significant overhead and greatly reduce system throughput.

Another problem with the packet approach as it stands is that only one packet at a time is sent to the receiving station, and the sending station must wait for an acknowledgement of correct receipt before sending the next packet. On a very long HF path, or especially on a satellite path, that requirement can add significant delays to the process. Under these circumstances it would be desirable to send several blocks of data in one transmission, and then allow the receiving station to selectively request retransmission of only those blocks that it received garbled.

I have been working on a different approach to the problem of sending digital data over poor-quality radio channels for the past year. It uses shorter blocks and a code which allows forward error-correction so that it can function effectively under the most severe conditions. I expect it to work much better than packets over HF and satellite paths.

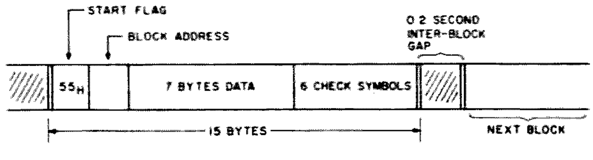

Fig. 1. Encoded block format.

Approach

This scheme has been set up primarily for the single-station-to-single-station mode of operation, as opposed to the multi-user, shared channel operation of a packet repeater. All coding and decoding is done in software, and standard asynchronous RTTY modulators and demodulators are used. The coding and block format would work just as well, however, if synchronous modulators and demodulators were used.

The system transmits 8-bit bytes as its data, allowing either computer machine code or ASCII text to be accommodated. The communications channel is assumed to be very noisy and prone to interference and fading (a typical HF channel under bad conditions). Since errors are assumed to occur very often, a system of forward error-correction is used.

As opposed to the cyclic redundancy check (CRC) used in packet schemes, where a packet must be retransmitted when one or more errors are detected in a block, a forward error-correction scheme uses several additional check symbols transmitted along with the data to allow it to detect and correct (up to a point) transmission errors within the data. Only when more errors occur than the code is capable of correcting must a block be retransmitted.

To allow the sending station to transmit several blocks before pausing to listen for acknowledgements, an "address" field is included in each block. This

```
U 146 MHzj¦0aY[          146 MHz
U Channel!]2=!]          Channel
U CascadeI<&p(;          Cascade
U Impulse,yvd%P          Impulse
U Signalshg4='<          Signals
U Samples3u3fS+          Samples
U Mixers ~[&0)a          Mixers
U 1.2.3.4j{)r+H          1.2.3.4
U DistortV$0K6a          Distort
U Phase I?y.r:<          Phase I
U Pattern)-4L05          Pattern
U Deviate>Xi. q          Deviate
U Pulses aER9H'          Pulses
U Initial01(,(r          Initial
U ClippedfTM^h]          Clipped
U ConnectihA.tl          Connect
U Cutoff :V_O$w          Cutoff
U 120 dB ,'QJYZ          120 dB
```

Fig. 2. Output under ideal conditions.

```
aY[U #hannel!]2          Channel
]?U#Ca3cadeI<&p          Cascade
5ImpulseLzvd%PU          Impulse
Miwn'lsHg49'-?U          iwn'lsH
Samples3u3fS+?U          Samples
Mixars!~[&0)aU           Mixers
g7{)r+HU Distor          Distor/
V$0K6aU Phase I          Phase I
e9p:<U Pattern)          Pattern
QL05U Deviate>X          Deviate
qU Pulses aER9H          Pulses
tial01(,(rU Cli          Initial
edfTM^h]U Conne          Con~ued
tihA.tlU Cutoff          Cedoff*
V_O$wU 120 dB ,          120 dB
QJYZ?U 146 MHzj          146 MHz
AaY[?U Channel!          Channel
]?U CascadeI<.p          Cascade
```

Fig. 3. Output under severely degraded conditions.

8-bit number is uniquely assigned by the transmitting station to each block to identify it. The receiving station then acknowledges receipt of a block by sending its address. Those blocks that are not acknowledged (their addresses are not received back at the transmitting station) are then retransmitted. This feature allows up to about 256 blocks to be transmitted in a single transmission before pausing to listen for acknowledgements from the receiving station. This way, the long transmission delays of a satellite channel will not be nearly as costly in throughput.

After some analysis and experimentation, a twice-interleaved Reed-Solomon code of length 15 was chosen to encode each block of data. This code takes 9 bytes of data, computes 6 unique check symbols, and transmits them together as a block of 15 bytes. As shown in Fig. 1, each block begins with a start flag (55H), a block address byte, and 7 data bytes. The final 6 bytes of the block are the check symbols used by the decoding software for error-detection and -correction. The use of 6 check symbols allows the *correction* of up to 3 errors anywhere within the 15 bytes of the block, and *detection* of a garbled block when more than 3 errors occur. To give the decoding software ample time to correct a garbled block, a 0.2-second steady mark is transmitted between blocks.

Block transmission times (including the 0.2-second inter-block gap) are about 1.7 seconds at 110 bps, 0.7 seconds at 300 bps, and 0.32 seconds at 1200 bps. If the transmitting station chose to transmit a full 256 blocks before its pause to listen for acknowledgements, the maximum time per transmission would be about 7 minutes at 110 bps, 3 minutes at 300 bps, and 1-1/2 minutes at 1200 bps. These are all convenient transmission lengths to avoid abusing transmit/receive relays in the transmitters.

By using comparatively short blocks and incorporating forward error-correction, this system has the ability to function effectively under conditions much worse than those which can be tolerated by a normal packet system. Since 3 out of every 15 characters in a block can be garbled and still allow the block to be corrected to full accuracy, no blocks need to be retransmitted if the channel error rate is always 20% or less. In contrast, the packet system will require a retransmission whenever even a single error is experienced in a block. The net effect is that many fewer block retransmissions will be required for this scheme under poor conditions.

In exchange for this added capability, one must realize that even under the best conditions, only 7 out of every 15 characters are real data, and one now also needs additional coding and decoding software to use the system.

Example Decode

A program was developed to test the encoding and decoding functions, and sample output from this program is shown in Figs. 2 and 3. The test program takes a prepared list of 6 and 7 character words or easily recognizable sequences, encodes these using the proper format, and sends them to the local transmitter as an FSK signal. The transmitter is operated with its oscillator only, and the local receiver is tuned to demodulate the test signal. This signal is then recorded on tape and represents a noise-free example of a sequence of properly-encoded data blocks.

To test the decoder function, the tape is replayed, but the recorder output is mixed in with noise from the same receiver tuned to an unused area of an HF band. The noise level from the receiver is then adjusted until the demodulator is producing garbled output much of the time. The test program prints out the raw received data block, and also the data after it has been processed by the decoder. Often the decoder can be observed to have successfully corrected a badly garbled block.

Fig. 2 is an example of program output under ideal, no-noise conditions. The left column is the raw received 15-character data block, including the start flag (it prints as a "U"), the address field (prints as a blank), the 7 data characters, and the 6

check symbols. The check symbols look like random garbage, but rest assured that they have meaning to the decoder! The right column is the character sequence that is output from the decoder. In this no-noise case, every block is correctly decoded, of course, and, indeed, even the raw data is error-free.

The output shown in Fig. 3, however, is after the noise level has been increased enough to cause all blocks to sustain several errors. (At this noise level there were also several blocks where more than the allowable number of errors occurred and, as expected, the decoder was not able to correct the data in these cases.) By comparing the raw data block, with errors, to the decoder output and to the known correct block in Fig. 2, one can see that the decoder is often able to correct the blocks. (Not shown in this listing, but extremely important, is the decoder flag that indicates when it has detected a bad block that it could not correct. Each of the blocks that were not successfully decoded would have had this flag set.)

Fig. 3 also illustrates that the decoder can not only correct several errors in a block, but also it can often correct a block when the start flag was so corrupted by noise that the received data is not in the proper position within the block.

Networks

This system is optimized for station-to-station links and HF channels, while packet systems are optimized for VHF repeater and multi-user channels. This does not mean, however, that the two cannot be mutually beneficial. For local networks, using high-quality repeater channels, the packet scheme alone would be used. But for those HF or satellite links where data is being passed between isolated packet networks, packets could be transferred by breaking them up into the smaller blocks required for the forward error-correcting scheme and sending them to the receiving station as a series of these smaller blocks. At the receiving station (a "gateway" into the receiving network), the blocks would be properly assembled to restore the packet, and the packet would be introduced into the local network like any other. Unless one is blessed with a very good HF channel, this approach will probably be more successful than attempting to transmit the packet, intact, over the HF or satellite link.

Conclusions

A complete software system incorporating this error-correction scheme has been completed for amateur digital communications and has been in use (on the air) for almost a year by the time this is printed. While it is still undergoing changes and enhancements, it is already a very viable system and provides greatly improved communications over standard RTTY.

The existing software is written for Digital Group Z-80 computers and requires a minimum of 26K memory. It requires only conventional RTTY interface hardware and is available from the author.

Further refinements are planned for the system, including incorporation of a hardware interface board to simplify the software and allow higher speed operation (up to 9600 bps) while making it easier for people operating other computer systems to use the system. ■

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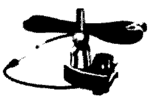

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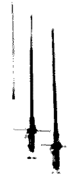

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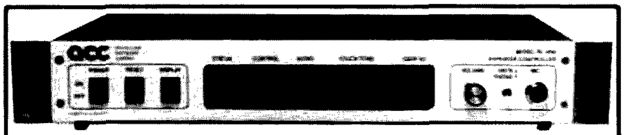

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A battery monitor should tell you when your battery is in trouble, but it shouldn't make trouble for your battery. The ideal device (all the books start with the ideal device, don't they?) draws no current when the voltage is good and draws as little as possible to warn you when the voltage is low. This circuit approaches the ideal, drawing less than 30 uA in normal operation and about 3 mA when flashing the LED.

A big factor in the low power consumption of this circuit is the 3909 flasher chip. An LED can be a heavy load for a small battery, but a flashing LED draws less power and more attention. The 3909 is designed to be an LED flasher, to operate on voltages as low as 1.5, and to draw minimum current. It is also usable as an oscillator, an amplifier, and who knows what else (it's one of those!). So check the National Semiconductor *Linear Applications* and enjoy yourself, but this time (surprise) we are using it as the designer seems to have intended.

The circuit is straightforward, and values are not critical. I used 2N3904 transistors throughout, but I suspect any low leakage silicon NPNs would work. The capacitor sees a voltage reversal of 1.5 V each cycle and probably should be rated for it, but I used an ordinary electrolytic and it's been working fine for some time.

Voltage from the divider, R1 and R2, normally holds Q1 on, which sinks the current through R4 to ground, holding the Darlington (Q2 and Q3) off. When the battery gets tired, the voltage to the base of Q1 falls too low to hold it on. The current through R4 is thus available to turn on the Darlington. Pin 4 of the IC is pulled down to ground, and the LED (any LED) begins to flash. The value of R5 should be large enough that pin 2 does not go more than 7 V above pin 4 with the input voltage you are using. R5 controls flash rate and current drain.

My monitor keeps watch on a 9-V battery and seems to work quite well at 12 V, but for higher voltages, R1, R4, and R5 can be increased in value. R2 sets the limit voltage, and it is a bit tricky to adjust. It is much easier if you use an adjustable power supply rather than a voltage divider to get the source voltage, since the difference in current from on to off can change the output of a voltage divider enough to make you think you'll never get it right. Never mind how I know. ■

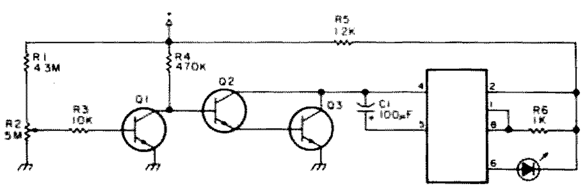

Fig. 1. Battery monitor.

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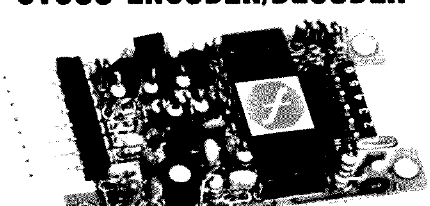

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The Totally-Modified 2000

Take Azden's popular 2-meter rig and add all the extras you ever wanted.

The PCS-2000, Azden's first radio on the US amateur market, is an extremely popular 2-meter FM rig. There have been numerous modifications for this transceiver—adaptations for various specialized situations—and this article is a compilation of them. Amateur-Wholesale Electronics receives a lot of inquiries about PCS-2000 mods. Here they are.

The modifications described here include PL™-tone installation information, a full-band-scan mod (in case you want to scan across 144-148 MHz in one sweep instead of in separate 1-MHz sweeps), a nicad memory backup mod, and CAP/MARS mods. Other modifications have been done; the Up, Down, and M1 Call buttons on the microphone, for example, may be rewired to perform other functions. Here, we will give details only for the aforementioned four modifications of the PCS-2000, since they are by far the most common and most asked-for.

PL-Tone Installation

The PCS-2000 needs an external tone oscillator for PL use. Any PL-tone generator may be used. Tone injection is done on the PLL board, which is on the top of the rear section, toward the front. (The board number is 50-30160.)

Look near the center of this board and locate the space for R159—it is vacant. Install a resistor of 22k to 47k Ohms in this space. Near R159, there are two holes with white circles around them. One of these holes is next to R124 and R127—this is ground. The other hole is for PL-tone injection.

Full Band Scanning

The PCS-2000 microcomputer is programmed to autoscan in steps of 10 kHz, within one of these four ranges: 144-145, 145-146, 146-147, or 147-148 MHz. Depending on the MHz digit at the time scanning is begun, the PCS-2000 will remain inside one of these ranges. This is convenient, since it allows the receiver to cross a given frequency four times as often as would be the case if the scan range were a full 4 MHz. Thus it is less likely that a short transmission will be missed entirely. This narrow-scan feature also reduces the number of unwanted channels that are scanned.

However, sometimes it is desirable to scan the entire 2-meter band, perhaps because the local repeaters are on widely separated frequencies, or because you may not know where they are (on an extended trip). This can be done manually by hitting the MHz Up key just as the microcomputer gets to the top of its 1-MHz scan range. (It takes good timing!) But we can easily get a couple of ICs to do this for us. The circuit is given in Fig. 1.

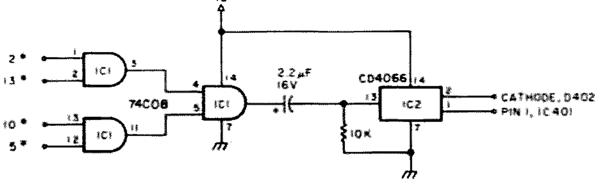

Fig. 1. Full-band-scan modification for the PCS-2000. The circuit is wired to the control board, which is the circuit board on top of the control head. External connections marked with an asterisk (*) are pin numbers for IC402. IC1—74C08; IC2—CD4066.

This circuit is connected to IC401, IC402, and associated circuitry on the control board, which is located on top of the control-head section of the PCS-2000. External connections should, of course, be made to the underside of the board; the board is easily removed for this purpose. Ground connections should be made to the common bus on the board. This entire circuit can be built on a piece of perfboard about 1 inch square. The best place for the completed circuit is right behind the Offset/Scan switch PC board. Proper insulation measures should be taken to avoid short circuits between circuit boards.

When this modification has been installed, the Autoscan key will cause the PCS-2000 to scan across the range 144.000-147.990 MHz in increments of 10 kHz. If the 5k Up button is activated, the range becomes 144.005-147.995 MHz, again in steps of 10 kHz.

Nicad Memory Backup

Failure of any of the three little silver-oxide memory backup cells can give the illusion of a rig in need of drastic repair service. The most common symptom is activation of the memory-scan function after a transmission; there also may be false or strange readings on the frequency display. Removing the memory backup cells will eliminate these horrible manifestations, but of course you have to re-

place the cells if you want the memories retained while the radio is off. The silver-oxide cells (type 76) can be found in most camera shops; however, there's an easier way to replace them—easier in the long run, because you shouldn't have to tamper with them again for several years.

A special nicad battery is available from Amateur-Wholesale Electronics. It is used in the PCS-3000 unit, but will fit into the PCS-2000 without much trouble. It is moderately priced (less than three new silver-oxide cells). You'll also need a 1000-Ohm resistor, available at Radio Shack stores for a few cents.

To perform this mod, remove the three silver-oxide cells from their holder and solder the leads of the nicad battery to the terminals of the silver-oxide cell holder. (Be sure to observe the proper polarity. Remember Murphy's Law—the chances of getting the polarity correct if you guess are *considerably* less than 50-50.) It is best to solder on the underside of the board.

Locate D408, adjacent to the cell holder. Solder the 1000-Ohm resistor across D408 on the underside of the board. This causes the nicad to be trickle-charged while the radio is on, at the rate of about 1.5 mA. It is recommended that the nicad from the PCS-3000 be used, since it is just the right size, physically and electrically, for this application. If another nicad is used, it should have a capacity of at least 50 mAh.

CAP/MARS Mods

Some confusion exists concerning the modifications for extended frequency coverage for the PCS-2000. There are two different modifications; which one you need depends on whether the transmitting and receiving frequencies are both on one side of the 2-meter band, or whether they are on opposite sides of the band. For Air Force and Navy MARS, both frequencies are generally on the same side of the band (for example, RX 143.460, TX 142.155). For CAP and Army MARS, the frequencies usually straddle the band (for example, RX 148.150, TX 143.900). This is shown in Fig. 2.

The PCS-2000 can be modified to reach frequencies as low as 142.000 MHz and as high as 149.995 MHz. (At the extremes of this range, there is some reduction in receiver sensitivity and transmitter output power.) When pin 13 of the TC9122 programmable divider is pulled low, the actual operating frequency goes either up or down by exactly 4.000 MHz, although the display reading does not change. If the display shows a frequency between 144.000 and 145.995 MHz, the new frequency is 4.000 MHz *above* the indication on the display; if the display shows 146.000 to 147.995, the actual frequency is 4.000 MHz *below* this indication.

Same-Side Splits: Air Force and Navy MARS

Cut the gray wire from pin 4 of connector L on the receiver board and solder it to pin 13 of the TC9122. Connect the three diodes as shown in Fig. 3 and run a wire from the anodes of D2 and D3 to the point marked "UL" on the control board (the top board in the control head). Cut the foil on the Offset/Scan switch PC board as shown.

Once these changes have been made, the radio will still work normally when the Offset/Scan switch is set to F, B, or V on the right-hand side, but on the left-hand side, pin 13 of the TC9122 is low, and the frequencies differ by 4.000 MHz from the display as previously described.

Position V on the left side

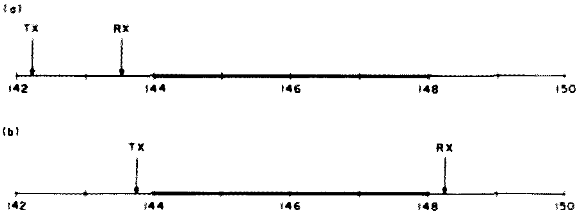

Fig. 2. Examples of same-side splits (a) and straddle spilts (b). The amateur band is shown by the heavy line. When modifying the PCS-2000 for CAP/MARS operation via repeaters, same-side splits and straddle splits require somewhat different circuits, as discussed in the text.

of the Offset/Scan switch will provide simplex operation. Positions B and F allow repeater operation when the proper offset crystal has been installed. (The display will not follow crystal-controlled offsets.) To obtain the proper offset, the original 17.9-MHz crystal, which gives an offset of +1.000 MHz, must be replaced. This crystal is located on the transmitter board, the larger board on the underside of the rear unit.

To determine the frequency for the new crystal, first determine the value of the offset, and whether it is positive (TX frequency higher than RX) or negative (TX lower than RX). Use the formulas: offset freq = TX freq − RX freq; crystal freq (MHz) = 16.900 + offset (MHz). For example, suppose you want to receive on 143.460 and transmit on 142.155. This is an offset of −1.305 MHz: offset freq = 142.155 MHz − 143.460 MHz = −1.305 MHz. Therefore, the crystal frequency must be: crystal freq = 16.900 MHz − 1.305 MHz = 15.595 MHz.

If the transmitting frequency is very far from the edge of the 2-meter band, the transmitter output power may be reduced. This is normal, since the circuit is tuned for the range of 144 to 148 MHz. Some transmitter retuning will increase the output at out-of-band frequencies. With the radio upside down and the front panel toward you, locate T107 and T108, just to the left of

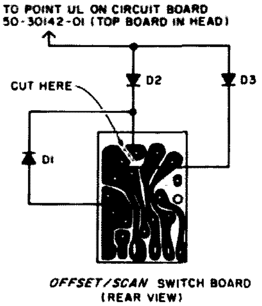

Fig. 3. Modification to the circuit board behind the Offset/Scan switch for same-side CAP/MARS repeater operation. Care should be exercised to be sure that the circuit-board foil is cut in the right place (it's easy to do it wrong) and that the cut is clean.

the 16.900-MHz crystal. These transformers may be adjusted with a small screwdriver to obtain somewhat more output. You can use the digital S/rf meter on the front panel of the PCS-2000, but it is better to use a wattmeter.

When retuning the transmitter in this manner, be careful to note the original positions of the transformer cores, in case you want to return the unit to normal. Also, do not over-adjust the transformers, since this will seriously degrade the power output in the amateur band.

If the offset required is more than 3.000 MHz either way, a different modification is needed.

Straddle Splits: CAP and Army MARS

To get larger splits, perform the modifications

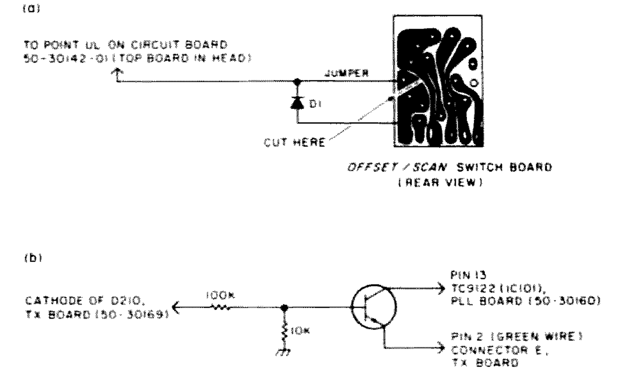

Fig. 4. Modifications for CAP/MARS straddle splits. At (a), changes to the circuit board behind the Offset/Scan switch; at (b), additional circuit to be installed. (The NPN switching transistor may be any common transistor suitable for digital or low-frequency applications.)

shown in Fig. 4. (Note that the change to the Offset/Scan switch PC board is different than for same-side splits.)

Once these modifications are done, the PCS-2000 will function normally when the Offset/Scan switch is in either B or V on the right-hand side. When the switch is in the F position on the right, CAP/MARS simplex is provided, on frequencies either up or down 4.000 MHz from the display frequency (as previously described).

Positions B, V, and F on the left-hand side of the Offset/Scan switch will provide CAP and MARS repeater operation with straddle splits, once the 17.9-MHz crystal has been replaced by one having the proper frequency.

To determine the new crystal frequency, use the following formulas: offset freq = TX freq − RX freq; crystal freq = 20.900 + offset (MHz), if offset is negative; crystal freq = 12.900 + offset (MHz), if offset is positive. For example, suppose you want to receive on 148.150 and transmit on 143.900. This is an offset of −4.250 MHz: offset freq = 143.900 MHz − 148.150 MHz = −4.250 MHz. Since this is a negative offset value, crystal freq = 20.900 MHz − 4.250 MHz = 16.650 MHz.

To operate on these frequencies, set the display to 144.150 with the Offset/Scan switch to the left of center. Then your receiving frequency is 148.150 MHz, and the correct offset (−4.250 MHz) will occur during transmission periods.

The arithmetic here is a little bit confusing, but following these instructions carefully should yield the desired results.

The NPN transistor and the resistors shown in Fig. 4 may be obtained at Radio Shack or any local parts supplier. The crystal should be parallel-resonant, 32-pF, with HC-25/U holder; they may be obtained from any crystal manufacturer. Frequency should be specified to within about 3 kHz, preferably to the nearest 1 kHz.

Conclusion

It is hoped that this information will enable owners of the PCS-2000 to derive more operating convenience from their rigs. Of course, there are many other possible modifications. These four, however, are frequently asked for.

I would like to thank Mark Thomas at Amateur-Wholesale Electronics for his assistance in compiling this information. ■

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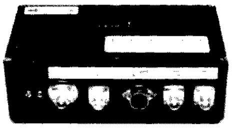

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TEXT BUFFER: Allows you to type ahead while receiving. Text entered into the buffer is visible above the split-screen line for correction before sending.

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W R U (Who Are You?): Automatically responds with your call sign when a user programmable sequence up to 15 characters is received.

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FULL SPEED OPERATION: Transmit and receive Morse — 5 to 199 WPM, Baudot — 60, 66, 75, 100, 132 WPM, ASCII — 100 & 300 baud.

MORSE SPEED TRACKING: Automatic and speed lock modes, keyboard selectable.

VIDEO DISPLAY: Color keyed display makes optimum use of the computer's color capability. Uses standard VIC format of 23 lines of 22 characters.

SPLIT-SCREEN: Displays text buffer input above and receive/real-time transmit text below the split line.

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TEST MESSAGES: Quick brown fox and RYRY's in Baudot, U*U* in ASCII, and VVV in Morse.

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OUTPUT MODES: CHAR — outputs each character as typed. WORD — outputs full word when spacebar is typed. LINE — outputs full line when carriage return is typed. BUFFER — outputs full buffer, on command.

REAL-TIME CLOCK: Uses the VIC's internal clock for constant on screen display of time which can be inserted into text buffer on keyboard command.

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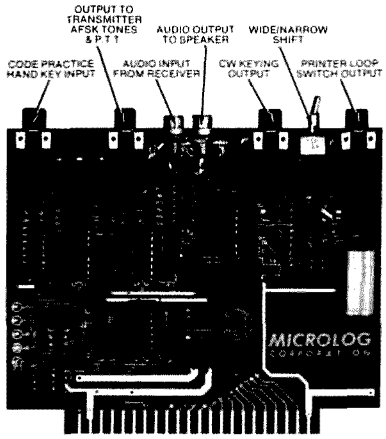

RTTY DEMODULATOR: True dual tone computer enhanced demodulator circuit on standard 2125/2295 Hz tone pair compatible with HF RTTY and VHF FM operation. Switch selected wide and narrow shift.

CODE PRACTICE: Random five character code group generator sends at any speed you set via the keyboard. Hand key input for sending practice and manual morse transmission.

CW ID & NORMAL ID: Two independent 16 character memories for either 2 calls or one normal and one with auto-CW ID for RTTY.

MECHANICAL: Printed circuit board is G-10 epoxy, double sided with plated thru holes. Board is solder masked and silk-screened with parts locations for easy troubleshooting. Size is 5¾" wide by 4½" deep by ¾" high. Fits directly into VIC expansion port and is compatible with popular expander boards in use.

NO EXTERNAL POWER REQUIRED: Unit is completely powered by host computer, eliminating the need for outboard power supply. (Entire system; VIC, Microlog AIR-1, & video monitor can easily run from 12 VDC power for remote or emergency battery operation.)

CONNECTIONS: All inputs/outputs are convenient ¼" 3 circuit phone or RCA phono types. Mating plugs are all provided.

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Send Your TR-7800 to Obedience School

This Kenwood rig has some interesting habits — such as a slow scan rate. Can you retrain it in one easy session?

I was quite happy with my Kenwood TR-7800 transceiver until the day I happened to compare it with a Bearcat 210 scanner. I first noticed that the Bearcat 210 was scanning much more rapidly than the TR-7800. Since the TR-7800 scanning is completely controlled by the microprocessor, the only way to increase the scan speed is to make the microprocessor run faster.

The microprocessor clock rate can be adjusted by L1 on the control board. It is normally set for a frequency of 346 kHz. By removing the slug completely, I was able to get the clock frequency above 600 kHz. And sure enough, the scan speed had also nearly doubled, with no noticeable compromise in performance.

Another Bearcat 210 feature stops the scanning once a signal is detected and then automatically resumes scanning after the signal drops out. In contrast, the TR-7800 only stops for a short time when it finds a signal. Then the scan is restarted even though the signal remains. This was interesting, to say the least.

Since scanning can be manually started or stopped from the switches on the front panel, it is possible to electronically actuate these switches to change the scan characteristics. A circuit to do this is shown in Fig. 1. It consists of three one-shot pulse generators and two FET switches. Assume the squelch line (SS) goes high indicating the presence of a signal. This causes one-shot U2-B to turn on switch U3-B and close the path between E0 and B3 for about 100 milliseconds, turning the scanning off. When SS returns to a low level, U1 generates a two-second delay pulse which then triggers one-shot U2-A and closes switch U3-A between E3 and B0 and restarts the scanning. The rescan delay may be adjusted by changing the value of C1 or making R2 adjustable.

Since the tone switch was not being used for anything, I removed and taped the two wires going to it and then connected the switch to the scan-control circuit. When the switch is off, all the standard scan features are still functional.

The components will fit easily on a 1.2″ × 1.8″ circuit board and can be tucked into an open area behind the tone switch. Fig. 2 indicates where the lines may be attached and the color coding of the TR-7800 wiring. I found that a lead clipped from a ¼-Watt resistor could be pushed in-

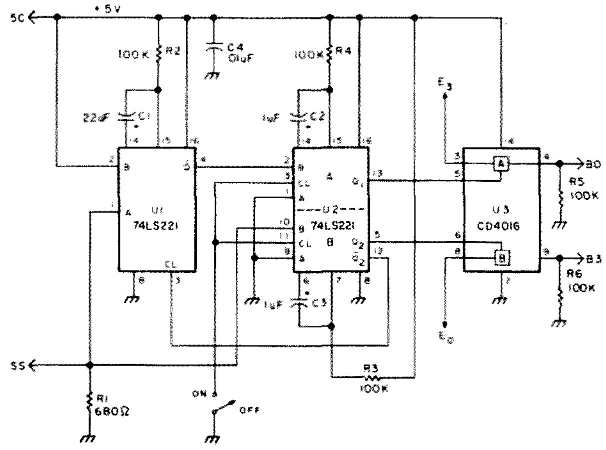

Fig. 1. Scan-control circuit.

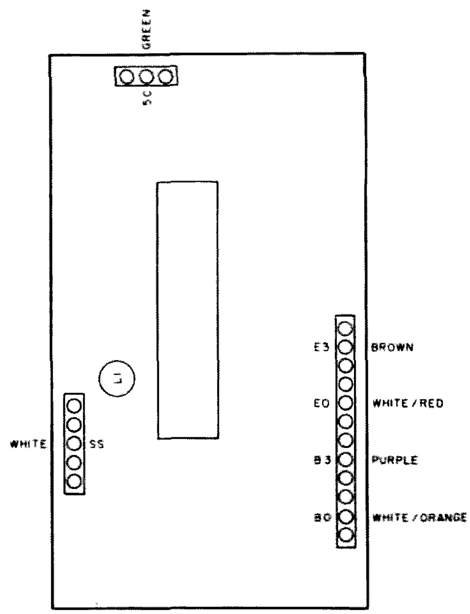

Fig. 2. Control board layout.

Fig. 3. S-meter circuit.

to the gap between the connector shell and the pin. This provides an easy way to tap into a signal line without cutting into the wiring.

An additional problem is that the five-LED S-meter does not give enough resolution for applications such as hidden transmitter hunting or antenna tuning. Fig. 3 shows a simple meter circuit which connects to TP3 on the receiver board. A calibration of the meter reading vs. input signal is given in Fig. 4. Signals greater than 100 microvolts cause no further increase in meter reading.

These modifications have made my TR-7800 more convenient and fun to use. These same changes should also work on the new TR-7850. ■

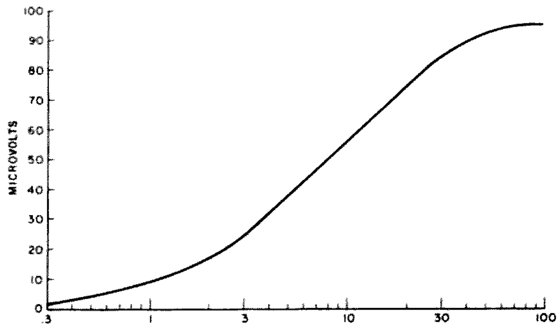

Fig. 4. S-meter reading vs. microvolts.

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We hams will put up a new antenna for DX and then spend hours on the air trying to see how well it works. If it's a success, we're happy. If not, we may take it down and try something else. How many of us really know whether the directivity of our new sloper or single-loop quad is doing what we think it should? How many of us keep some record of an installation to compare one antenna's performance with another's?

Antenna pattern measurements of a rotary beam are easy to do. Set up a field-strength meter at your own or a friend's station, rotate the antenna, take measurements, and plot the results.

If it's a fixed antenna at the higher frequencies, 14 MHz and up, pattern measurements may be taken by walking around the antenna keeping several wavelengths from it. If measurements are taken too close to the antenna, the static field and the induction field will cause major errors in the desired radiation field measurements.

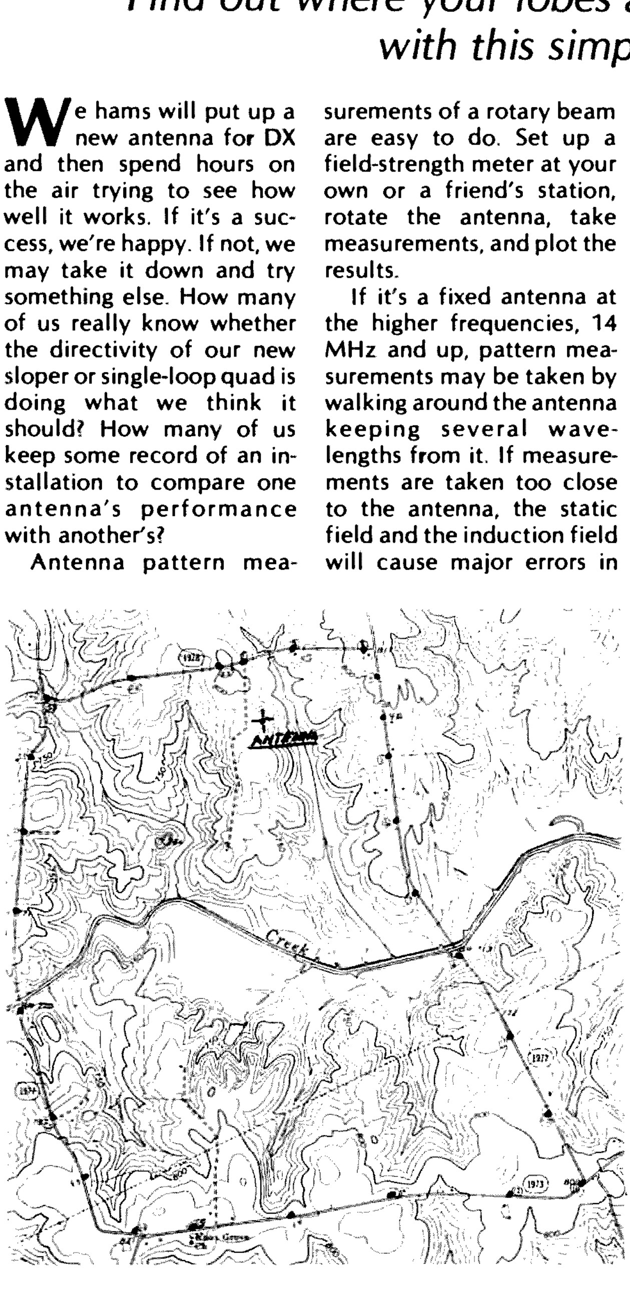

Fig. 1. Survey map showing antenna location and points where measurements were taken.

Several wavelengths at 80 meters, however, is approximately 700 feet, and there is a better way to get field-strength measurements than walking—and not many beams are rotatable on the 80-meter band.

Relative Antenna Patterns

The measurements to be discussed are of a relative nature and are not rigorous field-strength measurements. This statement is made early in the article so that qualified radio engineers will not be misled as to its technical thoroughness of field-strength measurements.

The IRE "Standards of Radio Wave Propagation—Measuring Methods, 1942"[1] states two basic methods of measuring radio-field intensities. These are mentioned to indicate what a technical field-strength measurement would be.

One method consists of measuring the voltage produced in a standard antenna by the field to be measured and computing the radio-field intensity from the measured voltage and the dimensions and form of the standard antenna. The other consists of comparing voltages produced in an antenna by the field to be measured and by a standard field.

In no way am I going to that trouble to determine a relative antenna pattern compared to another antenna configuration. If you are interested in absolute measurements, get the IRE publication; it's excellent. A comprehensive book, *The Complete Broadcast Antenna Handbook*,[2] has a chapter on carrying out field-strength measurements. Closer at hand, your own library probably, is W2YE's *Ham Radio* article[3] on the subject, or W2IMU's in *QST*.[4]

Read some of the above for background information. What will be discussed herein is a practical, unscientific method of determining a radiation pattern around your antenna. It is a repeatable measurement, and the technique can be used to compare other configurations of the same antenna or different ones. Nothing new is claimed for this method, but it has been a long time since such a detailed article on the subject has been published.

Let me (1) describe what was done, (2) discuss the results, and (3) conclude with the effectiveness of this method.

Tools Required for Measurements

The necessary tools to develop a 360° pattern of

your antenna's radiation are: (1) a map of the route around the area encompassing your antenna; (2) a receiver with a signal-strength meter tunable to the frequency at which measurements are to be made, and operable in an automobile; (3) a short vertical antenna which can be mounted on the roof of an automobile; (4) a power source isolated from the automobile power system (desirable, but not mandatory), and (5) an automobile or other means of carrying the equipment.

Location No.	Location Description	Distance from Ant. (Feet)	Bearing from North (Degrees)	dB above 1 uV	Micro-volts	Corrected microvolt (x 10,000)
0	Farm road & Rary Road	1200	0	38	80	9.6
1	Tonn Farm House	1450	24	41	120	17.4
2	Driveway, abandoned farm	2250	57	30	32	7.2
3	Chenault Rd., .1 mile south of Rary Rd.	2250	70	32	40	9.0
Etc.						

Table 1. Tabulation of measurement data.

Survey Map

A map must be used which has sufficient detail to show the roads and/or streets in your area. The Geological Survey charts[5] are excellent for this study. Lay out a route on the map which will circle the antenna site staying at least ¼ mile from the antenna for the 80-meter band and no more than 7 miles maximum. Wherever possible, stay within two miles, as the signal strength drops off fast as the distance from the antenna increases. Then lay out points on the map equally spaced around the area to be driven. Draw a line on the map from the antenna to the first point, and record 0 degrees and the distance from the antenna to that point. For every other point, with a protractor, determine its angle from the 0° point and measure distance from the antenna to that point. From the map scale, the distance should be in feet or meters. Twenty-six locations were used in the study for this article; see Fig. 1. A table (Table 1) was drawn up to indicate location number, a description of the location, and its distance and bearing from the antenna, as well as data to be recorded.

Receiver

The receiver may be anything that has a signal-strength meter, can work from a portable power supply, and is tunable to the antenna operating frequency. I could have used my TS-520 transceiver, but I used my HRO-500 receiver instead. It operates from 12 volts dc, is very stable, has a signal-strength meter calibrated in S-units up to S9, and a dB scale up to 40 dB. In addition, it has a dB scale calibrated in dB above 1 microvolt; 0 dB is the same as S1.

The dB scale has an advantage over the S-unit scale as it can be used more easily to determine microvolts, whose numbers are nonlinear as they increase relative to the dB scale. Each S-unit represents a certain number of dBs above some reference level, usually 1 microvolt. If you know how many dBs per S-unit for your particular receiver, you can calculate microvolts. If you use S-units for pattern plotting, you lose a certain amount of plotting sensitivity.

For example, using the S-meter gives nine points on the meter which are linearly spaced. Changing to dBs and thence to microvolts gives you a range from 1 microvolt to 100 microvolts for S1 to S9. Going from S8 to S9 is one division, but is equivalent to going from 56 to 100 microvolts. The plotted pattern is more sensitive to a microvolt scale than an S-unit scale. All patterns plotted herein are in microvolts vs. bearing angle.

Another example of S-units, dBs, and microvolts is shown in Table 2.

S-Reading	dB above 1 Microvolt	Microvolts
0	− 5	.56
1	0	1.0
2	5	1.7
3	10	3.4
4	15	5.6
5	20	10.0
6	25	18.0
7	30	32.0
8	35	57.0
9	40	100.0

Table 2. Comparison of S-readings, dBs, and microvolts.

Receiving Antenna

A vertical antenna mounted in the center of the automobile's roof is desirable. I used my 2-meter 5/8-wave vertical, which has a magnetic mount, until I found it had an intermittent in it. I then switched to a ¼-wave two-meter antenna mounted on the car roof-gutter which seemed to work just as well. The antenna was mounted on the side of the car facing the antenna under test. As the car went around the circle, it always presented the same configuration to the test antenna. It is thus believed that any directional characteristic of the automobile antenna system is a constant.

Isolated Power Source

Early measurements of the antenna under test were made with the receiver plugged into the cigarette lighter receptacle of the car. Because auto ignition noise produced an S1 to S2 signal, the ignition was turned off for each reading. As was my practice, the 0° first reading was repeated as the last reading. It was found that the reading read higher than when it was first read.

The complete run is 6.7 miles and takes about 30 minutes to complete. It is believed that the car battery voltage was lower at the beginning of the run and that the charging of the battery during the run produced a higher voltage at the end of the run. Perhaps this changed the sensitivity of the receiver; no other explanation was determined.

After connecting the receiver to its own 12-volt battery, it was found that ignition interference was eliminated and readings could be taken with the engine running. That saved wear on the starter in the car.

Another advantage of having the receiver continuously operating is the ability to maneuver the car to a proper stop point. It may be necessary to move forward or back up while watching

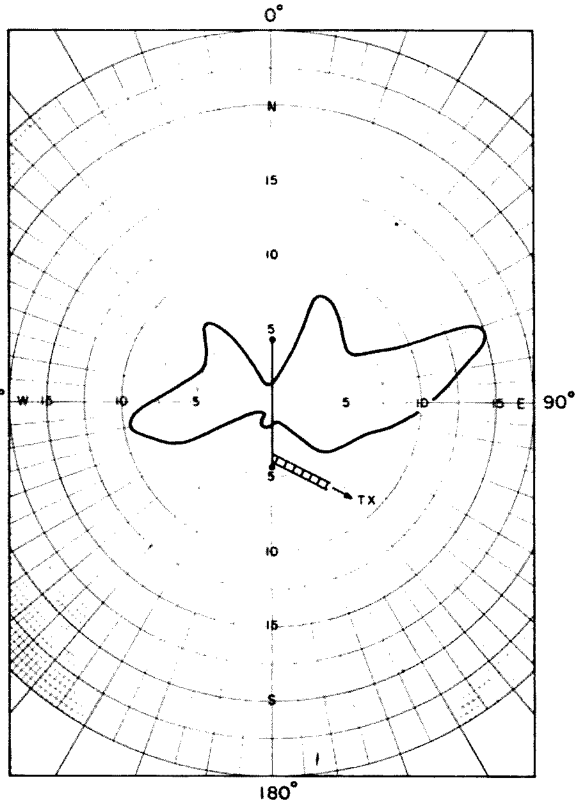

Fig. 2. Actual field pattern of an 80-meter full-wave Zepp antenna fed as shown, radiating over undulating land.

the signal-strength meter to prevent stopping at a point influenced by local wires. There will be a pronounced drop in signal strength if you stop beneath an overhead wire, for example. Even a utility-pole guy wire may cause amplitude interference to the test signal. Stop in an area where signal strength remains constant.

Solo or with Partner?

Do you run the test by yourself or with another ham? It would be desirable to have a friend at the transmitter operating site who would turn the transmitter on and off at your request. You could communicate using the transceiver in the car or by using a 2-meter setup.

Living in the country and being retired, I did it by myself. Fortunately, the 80-meter band between 9 am and 3 pm during the work week is lightly populated because of propagation conditions and normal work hours. I could put the transmitter on 3.8 MHz and run my test with no one knowing it. In crowded areas, a helper may be necessary.

The Transmitter

The transmitter used for the test was a Heathkit SB-100. It was desired to keep the signal output at a modest level since the transmitter would be on continuously for 30 minutes at a time. For ease of setting power input and monitoring it, 100-mA plate current was used. After adjusting the antenna tuner for minimum swr between the SB-100 and tuner, when used, plate current was adjusted by varying the grid drive. It was noted while on dummy load that initially the plate current would drop to about 95 mA after a few minutes operation. Grid drive would then be increased to give 100 mA and the plate current would remain there. The transmitter would then be switched back to the antenna to be tested and measurements made in the automobile.

Zepp Antenna Measurements

The first antenna to be studied was a full-wave Zepp antenna 240 feet long which runs on a north-south line. It is about 60 feet high at the northern end and about 50 feet high at its southern end. That antenna is used for communications on 80 meters and 40 meters. It is fed by a 600-Ohm open-wire line at the southern end. Theoretical field patterns state that so feeding it would produce four major lobes, a skewed cloverleaf with respect to the wire. The two northern lobes would be stronger than the two southern lobes. The desire for stronger lobes into the northeast was the reason for feeding the southern end.

The theoretical pattern is based on level ground beneath the antenna and a perfectly conducting one. The actual ground, especially to the east, is far from level; the ground drops from 800 feet to 750 feet and rises again to 800 feet in a horizontal distance of 1000 feet.

It had been possible to get S9 signals at close range with a vertical antenna used in preliminary tests with the SB-100 running at 75 Watts input. However, it was necessary to use about 600 Watts input with the Zepp to get comparable signals; a linear was added to the SB-100 output. Such is the difference between a horizontally-polarized and a vertically-polarized antenna with the receiving setup used.

Fig. 2 shows the results on the full-wave Zepp. It has four major lobes with the supposedly southern lobe horribly skewed.

Ground-Wave Attenuation

The data used to plot Fig. 2 was not the raw data obtained from the signal-strength meter. Using such data would provide a grossly distorted picture of the field pattern. Some sort of a signal attenuation factor must be considered, especially at the greater distances.

Reference 6 has an excellent chapter on ground-wave propagation. It points out that energy is abstracted from the surface wave to supply losses in the ground. So the attenuation of this wave is directly affected by ground conductivity and the Earth's dielectric constant.

The information in reference 6 is detailed enough to permit you to calculate the attenuation vs. distance relation. If you know your local ground conductivity and dielectric constant, you can be reasonably accurate on the attenuation factor.

Another approach is to recognize the additional error accrued by ignoring the above and saying, "Attenuation varies inversely as the distance."

Example: The signal strength at 1000 feet is 4.5 microvolts. What is the signal strength if no attenuation existed?

Solution: $S_c = S_a D$, where S_c = corrected signal strength (microvolts), S_a = actual signal strength (microvolts), D = distance (feet or meters); therefore, $S_c = 4.5 \times 1000 = 4500$ microvolts.

This was the method used to facilitate changing the raw data to plotting data. The rationalization to do this was that relative differences between configurations were desired, not absolute differences.

W2LL Antenna Measurements—Tower 1

In 1961, Gene Black, now W2LL, hit upon an odd antenna system for 80 meters which he had been using on and off and suggesting to friends. In 1972, he talked me into trying it. After getting my 100 countries on 80

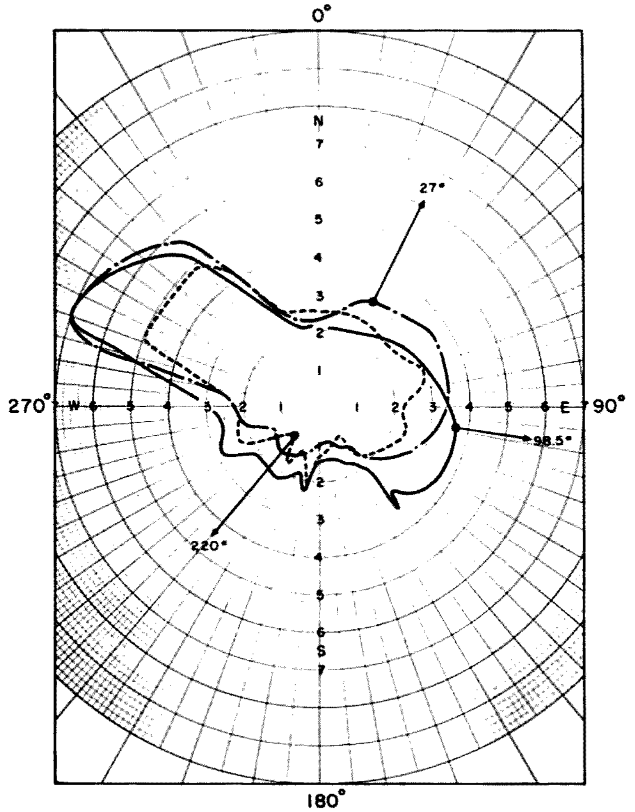

Fig. 3. Radiation pattern of W2LL antenna on number 1 tower which has multiple guy wires.

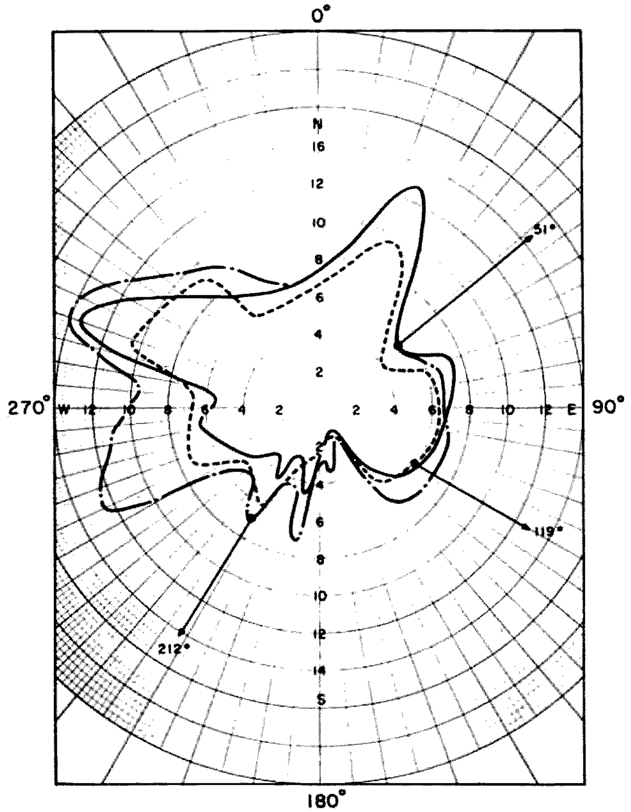

Fig. 4. Radiation pattern of W2LL antenna on number 2 tower which is free-standing.

meters as W2MB in NJ with it, it has been my favorite for that band. The antenna uses your high frequency tower and beam with an 80-meter quarter-wave horizontal or sloping wire. That wire is excited from the center wire of a coax line with the shield connected to the tower. It has currently become popularized by others and is called a quarter-wave sloper. Since that title imparts no real description of this antenna, and since I've always known it as "the W2LL antenna," I will so refer to it that way herein.

Incidentally, the secret for those who have weird loading problems and "it does not work" is to isolate the coax transmission line from the antenna system by use of a balun. One lead of the balun output goes to the quarter-wave wire, and the other is grounded to the tower. It will always work that way!

One characteristic of the W2LL antenna is an apparent directivity in line with the horizontal wire for systems that are electrically greater than a quarter wave. W2LL has noted, when using the system on 160 meters where it looks less than a quarter wave with his tower, that directivity is opposite to the direction the horizontal wire is pointed.

Since a new W2LL antenna was being put in at my new North Carolina residence, I wanted to see how the 80-meter directivity followed the changing of the direction that the horizontal wire was pointing. Also, would I be better by having two or more horizontal wires connected simultaneously? Hence these measurements.

The tower used is 50 feet high and has a steel pole extended above the tower to place the TH6DXX tribander beam at 60 feet above ground. The tower is guyed by three lines from the 30-foot level which are spaced 120° apart. Two guy wires approach the ground at 45° and connect directly to anchor pipes which are driven into the ground. The third guy wire runs horizontally for about 50 feet to a pulley, and then down to a winch used to permit foldover and erection of the tower. That guy is insulated from ground by the tree. The whole system is excited from the balun output which connects to the tower and quarter-wave horizontal wire at the 50-foot level.

Pattern runs were made with the horizontal wire pointed in three directions from north: 27°, 98.5°, and 220°. There was no suitable tie point to have a direction in the fourth quadrant.

After massaging the raw data with the attenuation factor, it was plotted and is shown in Fig. 3.

The plots of all three curves on one sheet indicate that there is really not much effort in positioning the horizontal wire in different directions. That result is in contradiction to my previous experience. The only explanation that occurs to me is that the profusion of guy wires has already established a radiation pattern and the effect of the single wire is negligible. With that tower, a quarter-wave wire in any direction is satisfactory.

W2LL Antenna Measurements—Tower 2

Fortunately, I have a second tower, which is free-standing, no guy wires, and has a TH6DXX tribander at the 50-foot level. Runs were made on that antenna with the horizontal wire at 51°, 119°, and 212°. A plot of the radiation runs on the second tower are shown in Fig. 4.

A change in directivity

definitely can be noted although a skewing effect can be seen; the lobes are not in direct line with the quarter-wave wire direction.

Finally, three horizontal wires were connected together using the above directions for each. The effect was to compress the maximum excursions of the individual patterns. The results using the horizontal wire pointing in the 212° direction give the best overall results and was the final selection. There is nothing to be gained by switching from one wire to another to give controlled directivity; the 212° position is the best in all directions.

One thing not expected was the lack of distinct directivity along the 119° direction. I have no explanation except to point out that the first tower was used as the support for the 119° horizontal wire direction. Also, the distance between the two towers is 130 feet! There unquestionably is an interaction between the two towers.

With a free-standing tower, erected far from interfering bodies, a definite advantage may be derived by switching separate horizontal wires for controlled directivity. You must determine that yourself experimentally. I would be very interested in hearing from someone with that situation.

Conclusions

OK, what have I accomplished by doing all this? Let me list what can be concluded *for my setup*.

(1) I had a lot of fun learning about my antennas.

(2) The Zepp is putting a major lobe into the northeast.

(3) Unusual terrain causes drastic pattern changes to the Zepp pattern.

(4) The 60-foot number 1 tower has a non-programmable radiation pattern. Isolation of the guys from the tower with insulators would probably alleviate that characteristic. It is still a pileup buster as is!

(5) The 50-foot number 2 tower is programmable by switching in horizontal wires pointing in different directions. However, in my case, why bother? A wire in the 212° direction is best of all.

(6) There appears to be definite cross-talk between the two towers.

(7) Tying in two or more horizontal wires will tend to make the pattern omnidirectional, but at the expense of stronger lobes.

These tests have shown me graphically the difference between classical radiation patterns and what I am actually getting. Variations in the terrain surrounding the antenna and the interference of large metal structures are two things which have disrupted ideal conditions. Now I know what is happening and don't have that nagging doubt in my mind, "Where is the signal going?" Do you know where yours is going?■

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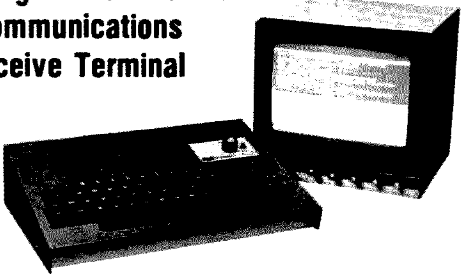

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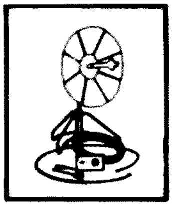

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James R. Harden AG9D
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You don't have to be stingy, as I am, to build The Scotchman. If you own a radio that will work with Icom's RM-2 but you can't justify the cost, this may be for you. In my own case, I didn't need all the features of the RM-2. All I really wanted was a machine to scan my IC-701 around the frequency where a scheduled contact would be. As the project evolved, I learned that for another couple of bucks, and with the addition of a manual switch, the machine will start any place I choose and scan up or down until stopped.

Many projects tell you to hold down the cost by going to your junk box. If yours has what you need, fine. Mine never does. Almost everything I used was new from Radio Shack. You can include all the options, use a prettier box, go top dollar all the way, and still get by for less than $35 plus tax.

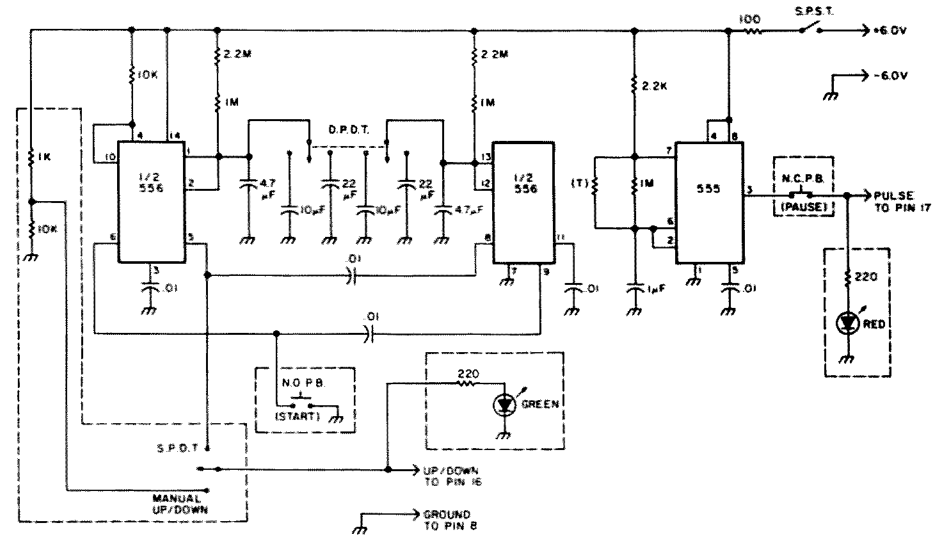

Fig. 1. Schematic diagram. Components inside dotted lines are optional features. If optional components are omitted the unit will work, but with less control.

How It Works

An inspection of the book that comes with the 701, 245, or 211 will show that a pulse applied to pin 17 of the accessory socket will step the frequency one unit either way. The direction it steps is determined by voltage or no voltage (microprocessor logic high or low) on pin 16. Pins 16 and 17 are referenced to ground on pin 8. The book warns: "Care should be taken not to apply voltages other than −0.5 V to +5.0 V to terminals between no. 14 and no. 24, as they are connected to the CMOS IC." It's written in Japanese-style English, but the message comes through loud and clear! Keep the voltage low!

I want to thank Robert Johnson W9TKR for sending pinout information on the Icom 245 and 211.

These units do use pins 16 and 17 for frequency control. Other Icoms may bring connection to the CMOS IC out to a different place.

The simplest pulse generator I know is a 555 IC working in the astable mode. With two external resistors and two capacitors, a 555 will generate regularly-spaced pulses as long as voltage is applied. L. B. Cebik W4RNL wrote a very good explanation of how the 555 series of ICs work in the September, 1980, *QST*.

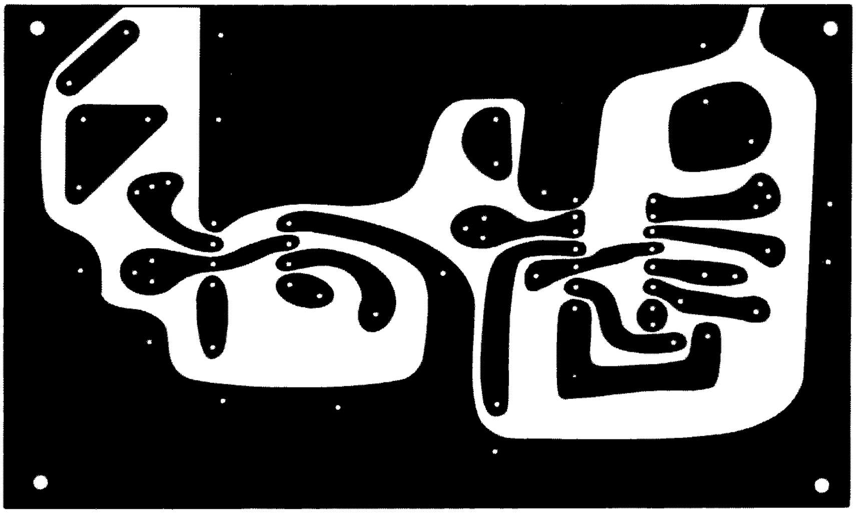

Fig. 2. Printed circuit board (foil side).

The values of resistance and capacitance I used with the 555 give pulses at approximately 1 Hz. I put a tailoring resistor in parallel with the one-megohm resistor between pins 6 and 7. You may find a single resistor that will give the right pulse rate, or you could use a potentiometer. By tailoring, I got a pulse rate of about 1.2 Hz. This is fast enough to cover the band in a reasonable time. It's still slow enough for a few clear words to come through as the radio scans across each station. I can recognize a voice or identify a callsign.

The up/down function is controlled automatically by a 556 IC. The 556 is two 555s in one case. The two timers are operated in the monostable mode and connected so that each starts the other. If equal values of resistance and capacitance are used in each timer, the on and off times at pin 5 will be close to equal. I wanted to be able to vary sweep time by changing resistance, but I couldn't make it work. Selecting capacitance with the double-pole, double-throw, center-off switch gives the three different sweep times.

Optional Features

The first two options give additional control. A normally closed push-button in the pulse line works as a pause control. I use it when I want to hear a bit more of a station or when the scan goes too far in one direction. A normally open push-button between pin 6 of the 556 and ground gives a positive start and control of beginning sweep direction.

A third option is the manual up/down control. It is a two-resistor voltage divider and a single-pole, double-throw, center-off switch. Voltage from the divider is connected to one switch terminal for a logic high.

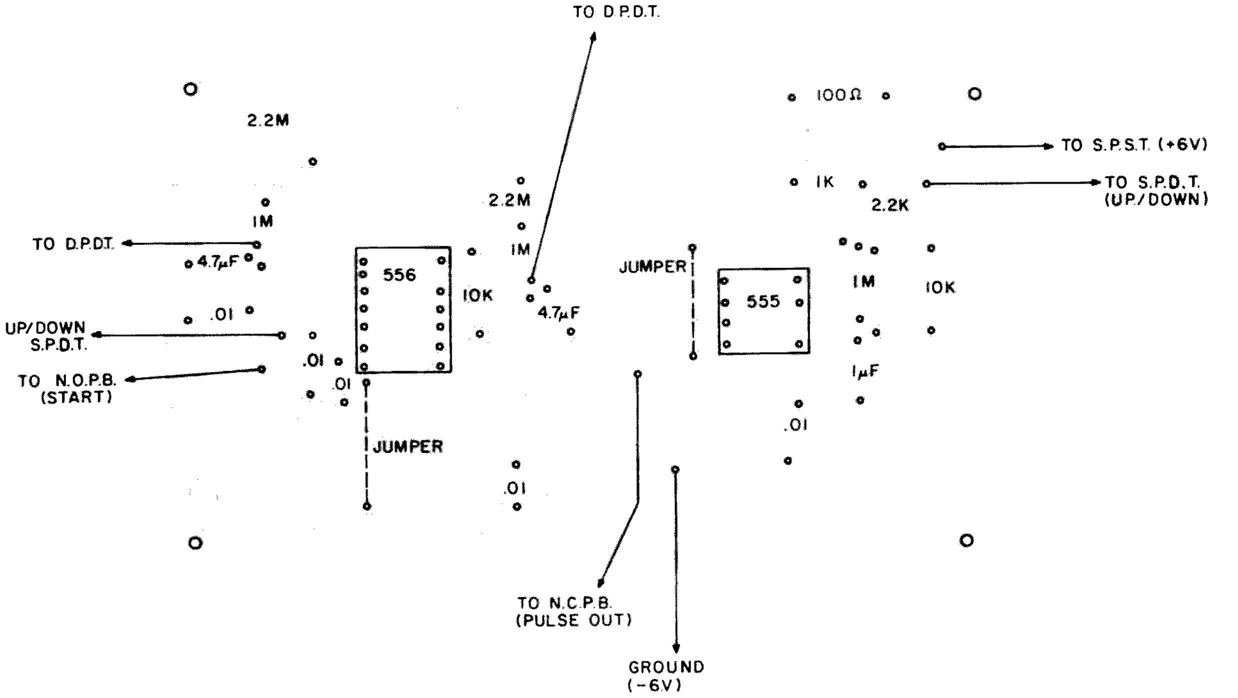

Fig. 3. Printed circuit board (component side).

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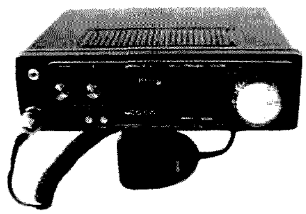

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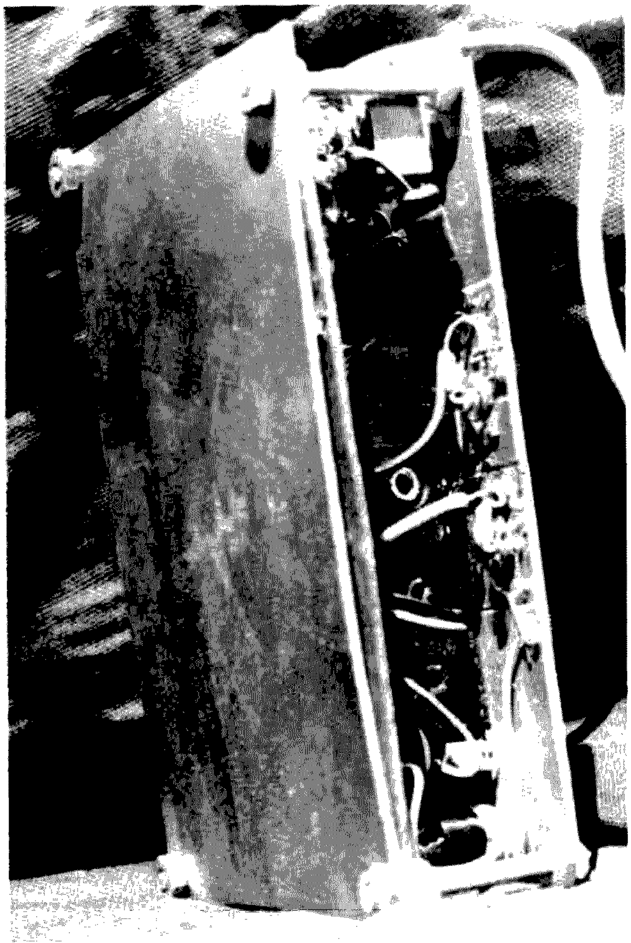


Side view shows battery case cemented to underside of front panel. Places where I cut foil with a file to make connector pads for LEDs and resistors can be seen.

Center off gives logic low. The other terminal connects pin 5 of the 556 for automatic operation.

The last options are the red and green LEDs. They monitor operation and let you check the unit without it being connected to your radio.

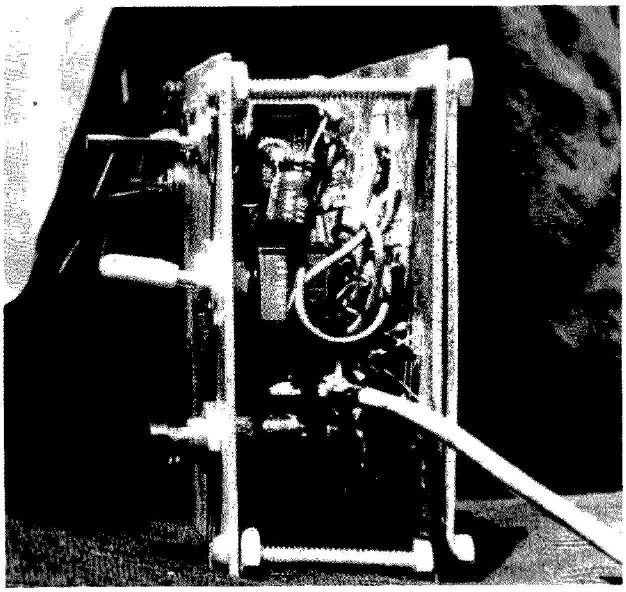
Power Supply

To power the unit, there are several ways you can go. If you elect to build an ac supply, I think you should use a voltage regulator. You could get power from pin 2 of the accessory socket, but it's +13.5 V and you'd have to divide it down and still use a regulator. Remember that +5.0-V limit! For mine, I preferred a battery supply. Batteries never go high. Four AA cells, in a holder glued to the underside of the front panel, do very well.

Construction

Since there isn't any critical circuitry, use any construction method you like. If you use the printed board layout, there is only room for the smallest capacitor pair in the up/down timers. The others must be mounted on the switch.

I used an unconventional packaging method. The one thing I do have in my junk box is lots of single-sided copperclad board. I cut three pieces 3" × 5". I drilled mounting holes in the corners and then etched one for the circuit board. I drilled another for the front panel and used the last under the circuit board as an insulator. It would have been prettier if I'd used just one board and a nice box. My unconventional method does give a low profile and it saved a couple of dollars. I'm stingy, remember? ■



End view of the unit shows details of my unconventional packaging method. The timing capacitor mounted on the switch is visible.

73 INTERNATIONAL

Each month, 73 brings you amateur radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

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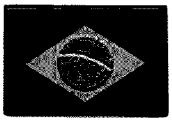

BRAZIL

Gerson Rissin PY1APS
PO Box 12178, Copacabana
20000 Rio de Janeiro, RJ
Brazil

VHF-DX ACTIVITY

Lauro PY3BZM is located in the city of Sao Sebastiao do Cai in Rio Grande do Sul State, South Brazil. He is listening almost every day on 144.3 MHz SSB or FM from 2300 to 0200 UTC, trying for QSOs with Central and North America. Lauro uses a Yaesu FTV-901 transverter with a Brazilian Mac VS 100 linear amplifier excited by an FT-902 DM transceiver. The antenna is a 15-element yagi polarized on 45 degrees.

Lauro has already worked FM7CS, J88AR, J73CS, and J73PD and received all of their QSL cards, except from J73CS. Remy FM7CS used only 3 Watts and a 2 × 9 element beam. Robert J88AR also used low power, 10 Watts, and a 2 × 12 element antenna.

The distances Lauro worked are: J73PD, Roseau, Dominica Island—5108 km; FM7CS, Fort de France, Martinica—5015 km, and J88AR, Kingstown, St. Vincent Windward Islands—4862 km.

For skeds, please contact Lauro Muller PY3BZM, Rua Tiradentes 978, 95760 Sao Sebastiao do Cai, RS, Brazil.

CW GROUP

On October 7, 1982, a few of the CW operators in the city of Santo Andre, an important industrial city in the State of Sao Paulo, established the CW Group of Santo Andre (CWSA). First elected president: Marcos Andre PY2NBI, vice-president: Clovis Crauchi PY2ORW, members of the directory: Alfredo PY2WUK, Ikeda PY2NG, Clovis PY2IBE, Luiz PY2FK, and Oity PY2TNX. They will sponsor the CWSA Award, rules for which we will publish soon.

GCWA AWARD

Sponsored by the Araras Group of CW, the GCWA Award is available to all licensed amateurs for confirmed contacts with 15 different PY2 stations and 3 GCWA members.

Contacts must have been made after January 19, 1981, on any amateur band. Only two-way CW mode. Send to the address below, GCR log of stations worked (call, date, time, band, mode, and report), your personal QSL, copy of the GCWA member's QSL, and 15 IRCs for mailing expenses. There are no special endorsements for the GCWA Award. SWL: Same rules. Apply to GCWA Award, PO Box 15, 13600 Araras, SP, Brazil.

GCWA 60 AWARD

Available to the amateur or SWL who has obtained the GCWA Award and has contacted 60 PY2 stations and 3 other GCWA members. Send GCR log of stations worked (call, date, time, band, mode, and report), your personal QSL, copy of the GCWA member's QSL, and 15 IRCs for mailing expenses to the same address as above.

There are no special endorsements for the GCWA 60 Award. GCWA members: PY1BGJ, PY1BVY, PY1CC, PY1DFF, PY1EWN, PY2AAU, PY2CMS, PY2DCP, PY2DHP, PY2DV, PY2GMN, PY2GOT, PY2IBD, PY2IBN, PY2JN, PY2VFY, PY2XIO, PY2WR, PY2RFC, PY2OIN, PY2IER, PY2ORF, PY2OIL, PY4CAX, PY5CL, PY5FI, PP5WUO.

CANADA

Cary Honeywell VE3ARS
PO Box 2610, Station D
Ottawa, Ontario
Canada K1P 5W7

Just over two years ago, Canadian amateurs had the opportunity of advising the Canadian Department of Communications in Ottawa on the matter of TRC24. TRC24 is the designation for a circular put out by the DOC which details the requirements for the amateur license. Examinations for the amateur license are based on TRC24. The Canadian Amateur Radio Federation (CARF), with the assistance of other organizations, undertook to represent amateurs in these discussions.

Under the direction of W. J. (Bill) Wilson VE3NR, former Director General of the Telecommunications Regulatory Branch, the Federation studied the old requirements and came up with a proposal that seemed to fulfill the needs of the DOC and would ease the burden on prospective amateurs. This proposal was the result of many discussions with DOC officials and comments received from amateurs across the country as part of the CARF National Symposiums.

The outlook for amateur radio was very positive. Favorable comments on the amateur effort were received by the Federation from DOC officials, and letters of appreciation were received from many Canadian amateur instructors who had followed the events as they were reported in *TCA* (*The Canadian Amateur* magazine). Our optimism was short-lived.

Several weeks ago, the new draft of TRC24 was unveiled by DOC. With shock and dismay, amateurs learned that despite all the effort that was put into the amateur proposal and despite the enthusiasm by DOC officials that greeted the effort, not one item of an amateur proposal was used. Needless to say, the Federation pursued the matter with the men in charge, but at this writing, no one as yet knows what happened.

From conversations with Bill Wilson and A. P. (Art) Stark VE3ZS, the two men most responsible for the amateur submission, and after having examined all the correspondence between DOC and the Federation on the matter, I discovered one interesting thing: Almost all of the DOC personnel who had participated in the discussions with CARF had been either transferred or retired before TRC24 was formulated. It almost seems as though the amateurs were forgotten in the rush to leave. It might be noted that TRC24 was circulated just prior to the government's fiscal end-of-year, and this leads me to conclude that someone was anxious to use up a budget before the money was lost and took any old copy of TRC24 that they could find or make up for printing. Prior to this, DOC had informed a CARF official that there were few funds in the budget to do this.

Recently, CARF took this matter up with the new Director General who indicated that he was unaware of the problem but would look into it. As he only recently attained his position in DOC, it was not expected that he would appreciate the efforts that amateurs put into the submissions. However, CARF officials were pleasantly surprised to find that he was indeed interested in determining what had transpired and why the efforts of both amateurs and government officials had resulted in such a debacle. We are confident that a solution will be found.

In the May issue of *73*, mention was made of the question of Canadian amateur participation in examinations. The response to this question was far from favorable. The majority of letters I received (as editor of *TCA*) indicated that the exams were best left to the DOC. Some amateurs suggested that since the quality of the code sending was so poor as to result in only a 50% pass rate, amateurs should be permitted to participate in the code portion alone. Comments are still coming in.

Speaking of *TCA*, some of you may not know that Canada has its own amateur radio magazine. *The Canadian Amateur* celebrated its tenth anniversary in January of this year with a special issue devoted to the history of the magazine. Sponsored by CARF, *TCA* caters to the Canadian amateur with stories and news items that have a Canadian flair. It is not in competition with magazines like *73* as it is obtained only through membership in CARF. Information about CARF can be obtained by writing to The Canadian Amateur Radio Federation, PO Box 356, Kingston, Ontario, Canada K7L 4W2, or by calling (613)-544-6161.

FRANCE

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REGULATION

In 1983, the French administration (PTT) began using a new amateur examination. Nevertheless, the license characteristics are unchanged: F1—(codeless) radiotelephony for frequencies above 144 MHz, and F6—radiotelephony and radiotelegraphy for all frequencies allowed (F8, 9, 2, 3, 5 are the former F6).

Instead of taking the examination at home or at a radio club, the candidate has to go to one of the nine centers (except for handicapped or 65-year-old persons). Two or three sessions are scheduled for this year. The exam consists of the following parts:

Radiotelephony. (A) procedure, regulations—10 questions; (B) technical—30 questions. The score in (A) must be at least 15/30 points, in (B) at least 36/90 points, and in (A + B), 60/120 points.

No answer gives 0 points, a right answer scores 3 points, and a wrong answer scores −1 point.

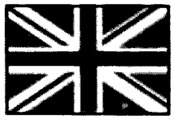
This type of examination (audio-visual) is also used for driving licenses.

Radiotelegraphy. 10 words/minute—26 letters, 10 numbers, 8 signs, and 40 Q-signals. The examination is done in three parts: 30 groups (5 letters, numbers, signs), 30 words in text, and a test on Q-signals.

According to the administration, 50% of the candidates succeed.

ARIANE STORY

According to the official commission of investigation created after the last failure (September 10th, 1982), a lubrication defect in the gear of the turbo-pump feeding the cryogenic motor was responsible for the plummet into the Atlantic.



GIBRALTAR

Jimmy Bruzon ZB2BL
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Gibraltar

AMATEUR RADIO IN GIBRALTAR

I am sure many of you have, at one time or another, worked Gibraltar. However, on numerous occasions I have come across some amateurs on the HF bands who have returned my call with "It's the first time I've worked a ZB2 after 25 years of hamming."

Gibraltar, with a population of about 30,000 inhabitants, all living within an area of two and a quarter square miles, has only a handful of active amateurs. At present, the most active stations are ZB2EO, ZB2GR, ZB2HM, ZB2HO, ZB2J, and ZB2HC. They are active on the HF bands most evenings, but there are a number of others like myself who don't show up so frequently. In future columns I will be including more information on the operating habits of all the ZB2s, as I am sure it will be welcome, especially by those of you who have not as yet worked The Rock.

Licensing requirements in Gibraltar are similar to those of the United Kingdom with some minor modifications, the most upsetting one being the non-existence of a Class-B license. This means that to obtain an amateur radio license one has to pass the City and Guild's Radio Amateurs Examination and the CW test before applying. We do, however, enjoy the privilege of being able to operate on the 50-MHz and 70-MHz amateur bands.

As far as reciprocal licensing is concerned, this is quite simple; any amateur whose country has reciprocal licensing arrangements with the UK can apply for a reciprocal license in Gibraltar. The callsign issued usually consists of the home call/ZB2. This form of license, known as a temporary license, is issued free of charge. Applications for amateur radio

licenses should be made to The Wireless Officer, Post Office, 104 Main Street, Gibraltar.

Quite often we hear from amateurs wanting to come over and do some operating from Gib. There are a number of hotels quite willing to allow you to hoist up antennas on the roof, and I will be providing more detailed information in the future. However, bear in mind that The Rock is a very efficient rf screen, so if the idea is to be able to work west into the US, a hotel on the *west* side of The Rock must be chosen, and the same rules apply when you want to work toward the *east*.

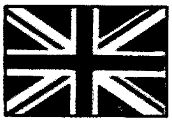
Omnidirectional coverage is very difficult to achieve unless one is willing to sit and operate from the top of The Rock, and that is one thing I would not recommend. Previous experience has proved that it is far easier to create a pileup whilst operating from either the eastern or western sides of Gibraltar than doing it from the top. Apparently the fact that The Rock is a very poor conductor seems to be the cause of the very poor results which have been experienced on various occasions when operating from its top. However, the fact that ground-place antennas have also been tried seems to dispel this assumption.

In the not too distant future, a group of ZB2s will be setting up a station on the top. The exact date has yet to be decided, but I will be giving you information on the event well in advance so that those stations who have not yet worked Gibraltar get the chance to do so, and certificate hunters will get the chance to obtain the ZB2BU Award.

The ZB2BU Award and the ZB2 Award are issued by the Gibraltar Amateur Radio Society, and both awards are available to hams and SWLs. To obtain the ZB2BU Award, all that is required is a log copy proving that ZB2BU has been worked on three different bands. The processing fee is three dollars. The ZB2 Award requirement is proof (log copy) of having worked five different ZB2 stations on any band(s), and the processing fee for this award also is three dollars. Applications should be mailed to The Awards Manager, GARS, PO Box 292, Gibraltar.

Well, that's about all from me for this month. When I write about the operating habits of ZB2s, I will start with Gordon Black ZB2J, who is the oldest licensed resident amateur on The Rock.

73 for now es CU next month.



GREAT BRITAIN

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THE UK SCENE

Just about every household in the United Kingdom is now within range of 625-line UHF television transmissions (for the four main networks). Nevertheless, the old Band 1 405-line VHF transmissions continue although notice has been given that these will be phased out over the next few years.

The continued use of frequencies in Band 1 for television has been the main reason for the lack of any 50-MHz (6-meter) allocation in the UK. (It should be noted that 50 MHz is not an ITU-allocated amateur band in IARU Region 1.)

The imminent demise of 405-line VHF TV transmissions has not escaped the RSGB (Radio Society of Great Britain) which has been pressing the Home Office (the regulatory authority) for an allocation. The RSGB has been keen to point out that 50 MHz is an important region of the radio spectrum where there is much work to be done in relation to propagation.

The first breakthrough came when the Home Office licensed a beacon in the 6-meter band although operation was initially confined to hours outside those of television broadcasting. This has recently been changed to 24-hour operation. The beacon, callsign GB3SIX, is located on the Isle of Anglesey in North Wales and transmits 100 W erp on 50.020 MHz. GB3SIX beams westward (290°) towards the US, and recent reception reports have included one from Hartford, Connecticut.

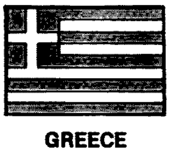
The early part of 1983 saw a much more important breakthrough for UK 6-meter operation when the Home Office agreed to issue forty special research licenses for 50 MHz. Anticipating a great deal of interest, the RSGB invited applications for these licenses and, of some 200 initial enquirers, a few over 100 completed application forms. The lucky 40 were chosen by the Home Office to give a good geographic spread. All UK prefixes are represented in the forty and all holders have Class-A licenses which provide for the CW working. Transmissions may take place only outside television broadcasting hours (which are approximately 0600-0900 and 1200-2400 local time).

During television broadcasting hours or to make a 6-meter contact with another UK ham still requires a crossband (28-MHz/50-MHz) QSO.

Needless to say, our Oriental colleagues have not been slow to spot another chance to increase their UK profits. At the time of writing, the RSGB magazine, *Radio Communication*, contains advertisements for a 6-meter option on the FT-726 and for a self-contained 6-meter rig, the FT-690R. This latter is not described in detail but presumably is a close relative of the multimode 2m and 70-cm rigs, the FT-290 and the FT-790, respectively.

The chance of any home-grown commercial rigs for 6m (or any other, for that matter) are so close to zero as to make no difference. Jaybeam has at least produced a 2-element 6m antenna for vertical or horizontal mounting. Some other 6m enthusiasts have already turned their minds to antennas. Discussions have taken place between G4BPY AND G4GLT on the feasibility of stacking yagis and even of producing a 6 over 6.

Although quite restricted at the moment, the 6m licenses represent a major step forward for UK amateurs, and the RSGB is to be congratulated for its efforts in securing the concession. It is to be hoped that the band will be made available for wider use within a very short time.



GREECE

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Athens, Greece

At the beginning of this column, I would like to thank the editors of *73* for their idea of bringing news from amateurs all over the world to the readers of the magazine.

First of all, let's make a short flashback to Greek amateur radio history, which started out in 1958. There was some radio activity before then, but not on a constant basis. A few Greek people and some British were operating from 1933 up to 1948, except during World War II, of course.

In 1958, there was some recognition from the Greek government of the amateur service, and the Radio Amateur Association of Greece was born. After that, people interested in getting an amateur radio operator license were taking examinations at RAAG headquarters; if they passed (not so easy as it sounds), they were rewarded with a conditional license. I use the term "conditional" because at that time there was no law covering the amateur radio service and the government could recall the license at any time and for any reason.

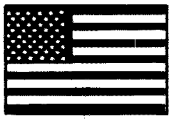
Because of this situation, Greece had only about 200 licensed radio operators up to 1967.

In 1967, with the dictatorship in power, this licensing procedure stopped. A law was made for radio amateurs in 1972 but did not become effective until 1974, just after the end of dictatorship in Greece. From then on, the way was wide open to everybody.

Examinations established by the Ministry of Post and Telecommunications take place twice per year on a regular basis. Today, the Greek amateur population consists of 500 amateurs, and anybody can consider this a big difference. A lot of things have changed from the time that a few pioneers started back in 1933.

Finally, RAAG's latest goal was to obtain the privilege of mobile operation, which was not permitted until 1980. It took about 5 years for the law to be changed so that radio operators could use their gear from cars, boats, etc.

In my next column, we will talk about the Greek amateur community itself and its organization.



GUAM

James T. Pogue KH2AR
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THE VIEW FROM GUAM

Guam's hams and would-be hams have cause to celebrate! Amateur as well as commercial radio exams will once again be offered here on a regular and continuing basis. No exams have been given on Guam since June, 1982.

Prior to this time, the Guam Civil Service Commission had done all radio license testing on behalf of the FCC, mailing completed exams, code tests, and all other information back to the Honolulu District Office for scoring. Turnaround time for this procedure was quite good, and everyone seemed pleased.

In early 1982, however, the Commission announced that due to budgetary cutbacks they would no longer be able to offer radio examinations here on Guam. Anyone who wished to obtain an amateur license of the Technician class or higher, or any of the commercial licenses, would have to travel to Honolulu for testing.

When this announcement was made, several island hams approached Rear Admiral Bruce DeMars, Commander Naval Forces Marianas, and requested that he look into the possibility of having the Navy administer exams for the FCC at no charge. The approval for this arrangement finally came through in early April, 1983. Marianas Amateur Radio Club (MARC) President Dave Chartier W1YRM announced that exams will most likely be given on a quarterly basis as before, but will now be administered by representatives from the Naval Communications Area Master Station (NAVCAMS) here on Guam.

MARC has a supply of FCC form 610 applications for amateur licenses as well as form 756 applications for commercial radiotelephone and radiotelegraph licenses. Forms may be obtained by writing to Marianas Amateur Radio Club, PO Box 445, Agana GU 96910, and enclosing either a self-addressed stamped envelope or self-addressed envelope with sufficient IRCs to cover return postage.

When the applicant completes the appropriate form, he should send it to the FCC, PO Box 50023, Honolulu HI 96850. The FCC then will inform the applicant when and where the test will be given here on Guam. Advance notice of at least one month will be given prior to scheduling of test dates.

After the tests are scored in Honolulu, applicants will be notified by mail as to whether they passed or failed. Applicants who pass will have their paperwork forwarded to FCC headquarters for issuance of the appropriate license.

All of us who are either anxious to upgrade or get our first license owe a note of thanks to the Navy and those amateurs who worked to get approval of this system.

ISRAEL

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Negev Mobile Post Office
85530 Israel

In June, I briefly outlined the Israeli amateur scene and licensing structure. In this month's column, I'd like to sketch out how a typical amateur here goes about getting on the air and in this way give you some of the flavor of ham life in our country.

Our typical amateur started out while still in high school, finding out about the hobby either from friends or a notice advertising an amateur radio course. The course is either at a high school, community center, or local radio club. (Community centers in Israel offer a wide variety of activities ranging from arts and crafts and folk dancing to computers, and some of them also have a club station with a ham on staff part-time to supervise it.)

4X4HQ, for instance, the Tel Aviv Youth Center's club, has turned out scores of licensed amateurs over the past years. While learning the code and theory, the newcomer can get a taste of what's on the bands by operating the club station, under watchful supervision, of course.

Well, he or she has finally passed the Novice test and is now faced with the task of assembling a station on a meager high-school student's budget. Thankfully, there is no shortage of surplus equipment available (one of the very few advantages of living in a country with a high defense budget). Some of this gear finds its way to junk dealers where ham scouts snooping around are quick to let out the word on the two-meter grapevine. Other items are sometimes donated directly to the Israel Amateur Radio Club. Such was the case last year with forty-four excellent circa 1960 Siemens tube-type general-coverage communications receivers retired from government service. Interested IARC

members mailed postcards to the club, a draw was held, and for a nominal donation to the club's treasury, the winners became the owners of these beautiful boat anchors.

Now, the first transmitter is almost always home-brew, crystal-controlled, built from scrounged parts, reminiscent of what American Novices were putting together in the fifties and sixties. The schematic diagram must be on file with the Communications Ministry, as all transmitters must be authorized and registered. In Israel, it is a criminal offense to be in possession of unlicensed transmitting equipment.

And what is the scope of our Novice's on-the-air activity? After putting up some kind of simple antenna, our new ham begins his DXing on 15-meter CW and works the local gang on 40 meters on Saturdays, our Sabbath. But few Novices are satisfied with these limitations after the novelty has worn off, and with the radio club's help they go for the Grade-B license for the use of all bands and modes.

By this stage, few amateurs will still be working with home-brew gear. I must point out that customs duties on ham gear in Israel are quite reasonable, so that Japanese transceivers sell here for slightly under US list prices. And this is in a country with 100-to-200-percent duty on automobiles, electrical appliances, and television receivers. So it's not rare to hear fellows with the latest Kenwood rigs who don't own their own car. But then, we must keep our priorities straight!

There's a lot of used gear for sale ranging from older tube-type transceivers to fairly recent solid-state rigs, again with prices comparable to those stateside. At present, there's only one outfit dealing in new ham gear, but they seem to be doing a rip-roaring business.

The Grade-B licensee will no doubt also get on the very popular two-meter band, using the five national repeaters with a wide variety of equipment—but more about that in a future column when we'll delve into the VHF scene here.

I hope that you don't get the idea that all beginning hams here are youngsters, but a great many indeed are. Recently, the Holon-Bat Yam (a southern suburb of Tel Aviv) Club started a course especially for adults who found it emotionally difficult to be studying with a group of kids. However, I know of adults who studied along with younger enthusiasts without any hang-ups.

Just recently, a correspondence course for the Novice-class ticket was put out by the "Open University," a government-aided post-secondary institution, and they are reported to have a Grade-B course in the works. Hopefully, their books will soon be available over the counter, and at long last, literature in the Hebrew language will be available for aspiring radio hams.

An interesting statistic is that in the last five years, over 250 new licenses have been issued, this being roughly one-quarter of the total Israeli amateur population. There can be no mistake about it—ham radio is definitely on the upswing here!

AWARDS FROM ISRAEL

The Israel Amateur Radio Club has two certificates available. The first is the veteran 4 × 4 = 16 Award and is valid for all contacts with Israeli stations since 1948. You need a total of sixteen contacts on at least four different bands in any mode.

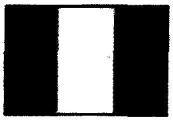
The second certificate is the new Israeli Award. This is valid only for contacts made after January 1, 1982. Twenty-five points are required—contacts on frequencies lower than 10 MHz are worth two points and on other bands are worth one point, while VHF and UHF contacts are worth ten points.

For either of these two awards, send one dollar or four IRCs plus a fully detailed log of the contacts certified by another licensed amateur to: Awards Manager, Israel Amateur Radio Club, POB 4099, Tel Aviv, 61040, Israel.

The Jerusalem amateurs have just recently made available the Jerusalem Award. You need five contacts with Jerusalem stations dating from January 1, 1983, on any bands or modes, crossmode acceptable. Here QSLs are necessary, and along with them send ten IRCs to the award custodian: Dr. Milt Gordon 4X6AA, POB 4079, Jerusalem, Israel.

All the above awards also are available to shortwave listeners under the same conditions as to hams.

Well, that wraps it up for this month. I'll be happy to relate any areas of the Israeli amateur scene that may interest you in this column, so don't hesitate to drop me a line. Till next month, *73* and shalom.



ITALY

Dr. Giancarlo "Chas" Martelli I0XXR
18, Via Bevignani
00162 Roma, Italy

Italian amateurs are not yet permitted to use the new WARC bands, including 160 meters. The WARC Acts were ratified with a presidential law dated July 27, 1981, and it stated that the WARC 79 Acts should become effective in Italy on February 1, 1983.

Despite that, and in open contrast, the Ministero delle Poste, with its own edict, issued the new Italian band plan which does not consider the new WARC bands, including the 160-meter band, and does not mention the UHF bands above 24 GHz.

The band plan, which was issued without previous consultation with the Associazionne Radioamatori Italiani (ARI), is filled with errors and discrepancies with respect to the WARC allocations confirmed on the other side by an official law of the republic. One of the funniest topics is the statement that in case of natural disasters, the Ministero delle Poste reserves use of the 144-146-MHz band for "its own *international relief* communications."

This gives only a pale idea of the situation of the Italian administrative bureaucracy, completely out of tune with the real necessities of an advanced society. It misunderstands the specialized and technical problems in any field due to the lack of capable and specialized personnel and due to the chronic laziness of the office workers.

I think that the ARI is presently making some progress toward overcoming the situation, but there are not many hopes for a fast resolution to the problem.

Diploma Anno Santo
(Holy Year Award)

This award will be issued by the ARI, Sezione di Roma, PO Box 361, 00100 Roma, Italy. It will celebrate the Extraordinary Jubilee, 1983. The requirements are, for Europe: 15 QSOs, any band, any mode, with stations in Rome, or 10 QSOs with Rome stations and one QSO with a station in Vatican City; for other continents, 10 QSOs, or 7 and 1, respectively. The same stations can be worked only once per band.

The award period: March 25, 1983, to April 30, 1984. Send logs certified by officials of your association (or two other amateurs) with your application and US $8.00 or 20 IRCs.

The award is 18 × 13 inches, beautifully printed in six colors on deluxe paper, and represents engraved copper artwork of the St. Peter Basilica. The same artwork is used on the special QSL which will be used mostly by the radio amateurs of Rome in the course of the Holy Year.

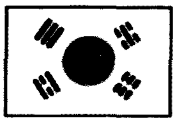
The St. Peter engraving and the layout of the award is by an artist in Rome who is also a radio amateur—I0EBR.

New Italian Prefix

The Italian Ministero delle Poste e Telecomunicazioni has recently started to assign IK to the prefix of all new licensees. The callsign combinations restarted with AAA for all IK-prefix licenses.

The IW prefix is for special licenses with permission to operate to 28 MHz. These are no-code licenses. Different prefixes are assigned to the residents in the so-called "special statute regions." These regions have their own parliament which institutes minor laws with regard to particular local administrative and economic problems. Sardinia has an IS0 prefix and Sicily has an IT9. Other special statute regions and their prefixes include: Valle d'Aosta—IX1, Trentino Alto Adige—IN3, and Friuli Venezia Giulia—IV3.

Other prefixes are assigned to the Italian islands:
Ligure Archipelagus—IA1
Tuscan Archipelagus—IA5
Ponziane Islands—IB0
Napoli Islands—IC8
Eolie Archipelagus—ID9
Ustica Island—IE9
Egadi Archipelagus—IF9
Pelagie Archipelagus—IF9 (Zone 33)
Pantelleria Island—IH9 (Zone 33)
Cheradi Islands—IJ7
Tremiti Islands—IL7
Minor Sardinian Islands—IM0



KOREA

J. Michael Wengert HL9KT/KH2AC
CPO Box 2961
Seoul, Korea

The Korean Amateur Radio League President, Mr. Min-sup Lee, is now on the air with his newly acquired callsign, HL1AOT. Mr. Lee is the first Korean National Assemblyman to hold an amateur radio license and to operate on ham bands. Unlike US Senator Barry Goldwater or the Japanese Dietman who also are legislator/hams, Mr. Lee became a radio amateur after being elected to public office. In fact, Mr. Lee was elected KARL president even before he was licensed. He holds the Radiotelephone Class license and is expected to operate SSB in the 3.5-, 7-, 21-, and 28-MHz bands as well as 144-MHz FM. He operates Korean-made equipment. A welcome to HL1AOT to ham radio and to his second year as president of the Korean Amateur Radio League.

SIARA

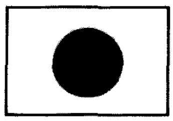
A new organization is being formed, or rather, an old organization is being reactivated, in Korea. It is the Seoul International Amateur Radio Association. SIARA was formed originally in 1978 as a way for hams of various nationalities to get together socially. Later, a club of HL9 operators (US military/civilians) was formed and more or less took the place of SIARA. Now, in 1983, SIARA is being reorganized with the sole purpose of promoting reciprocal operating agreements between Korea and nations of the rest of the world. Our sister organization, TIARA, in Tokyo, proved to be very effective in such a capacity in Japan. Now that the US military authorities have decreed that all HL9 operation will take place only from US military installations, and considering that about 90% of all American hams in Korea live off post, it would seem that such an organization would be useful in getting direct operating permission from the Korean government instead of the US signal authorities. If you are a ham of any nationality residing in Korea or planning to live here, contact SIARA, CPO Box 2961, Seoul, Korea, or telephone 720-6188 and ask for Mike.

* * * * *

A net, composed mostly of members of TIARA (Tokyo International Amateur Radio Association), AARCK (American Amateur Radio Club of Korea), FEARL (Far East Amateur Radio League), and SIARA meets every Sunday. The time for The Far East Net is 0100Z, and frequency is 14.285 MHz. Everybody is welcome, the language is English, and the *Westlink News* tape is aired at 0130Z.

* * * * *

Items of operating news are requested from all HL stations as well as station or club photographs. Send all information to me. That's all for this month. 73 from the Land of the Morning Calm.



JAPAN

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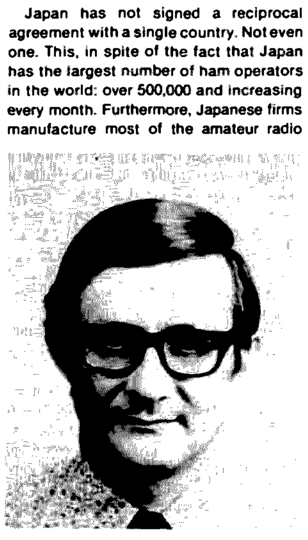
NO RECIPROCAL LICENSING IN JAPAN YET! WHAT HAPPENED?

Japan has not signed a reciprocal agreement with a single country. Not even one. This, in spite of the fact that Japan has the largest number of ham operators in the world: over 500,000 and increasing every month. Furthermore, Japanese firms manufacture most of the amateur radio



Roy Waite W9PQN.

equipment sold around the world, and by now probably everyone is aware of the superpower status that Japan has attained in the fields of computers, televisions, cameras, radios, audio equipment, etc.

Japanese tourists are most of those travelling in Asia, including Australia, replacing Americans in that latter category. Japanese industry produced more automobiles than did the US last year, and Nippon Steel replaced the United States Steel Corporation as the world's largest producer of steel. (Most Japanese, however, live in small, crowded "rabbit hutches" and do not yet enjoy the "good life," but this is a separate matter.)

But when it comes to a relatively and apparently simple matter like amateur radio reciprocal operating, the score is zero. What happened?

Until 1981, Japanese radio law stipulated that only Japanese nationals could operate ham radio in Japan:

Article 5.
A license for a radio station shall not be granted to a person in any of the following categories:
Paragraph 1.
(1) A person who is not a Japanese national...

On May 15th, 1981, the Japanese upper house of the government passed a new law and added the following paragraph to the existing radio laws of Japan:

Paragraph 2.
The provisions contained in the preceding paragraph shall not apply to the following radio stations:
An Amateur Radio station (a radio station established by an individual for the purpose of conducting radio communications for his personal interest) which is established by an individual who holds citizenship of a country that permits Japanese nationals to establish the same kind of radio station in that country.

So there you have it! Pretty simple, isn't it? There is the legal status for reciprocal operating. It's on the books. It's the law! So all we do now is fire up the rig and go on the air, right? Wrong! Agreements have to be signed with governments of other countries first. Well, all right. Let's sign the agreements. Japanese officials have stated privately that their goal is to sign an agreement with America first. The other countries can wait. Well, all right again. I happen to be an American. I feel sorry for the citizens of other countries, but if Japan wants to sign with America first, I'll go along with that. Why don't we sign? Here it is getting towards the end of 1983 and so far we have nothing. Well, not exactly nothing. Read on.

The Japanese government sent letters to the governments of twelve "prominent" countries around the world, including the United States, outlining the terms of a reciprocal agreement that Japan would like to enter into. Some responses were thereafter received—some good, some not so good. The US response, mercifully, indicated that the US would not accept the Japanese terms. Why do I say "mercifully"? Well, first of all we will have to understand the regulations that presently apply to Japanese applicants to get on the air here in Japan.

After passing the Japanese license examination, if a Japanese person wishes to operate with more than 10 Watts, he has to pay a fee the equivalent of over $100 and wait six months for a government inspection which can be rather strict. Of course, if he is satisfied to stay within the 10-Watt power limitation, he simply applies for that through the JARL, pays his fee, and after permission is granted, he may go on the air without going through the trauma of an inspection. But only 10 Watts.

It is these terms plus some additional red tape that the Japanese government wishes to pass on to the Americans and other foreigners who wish to operate in Japan. This seems to ignore the short-term visitor to Japan. How will he get on the air? Obviously he won't have time to wait for the inspectors to come, so he will have to operate with only 10 Watts. And don't forget the $100-plus fee he has to pay for only a few days of operating.

Another condition the Japanese government wishes to impose on the foreign ham is a requirement that the applicant obtain written permission from the landlord or hotel manager (or whomever) to operate ham radio on the premises. Furthermore, prior application to the government will not be permitted. Application has to be made by the applicant after he arrives in Japan. We are told that an American visitor would be allowed to operate a station owned by a Japanese friend. But what if you don't happen to have a Japanese friend?

Is this reciprocity? Of course not. And it is for that reason that the US has wisely decided to negotiate the matter. But, my friends, the word "negotiate" to a bureaucrat turns on all kinds of happy thoughts, for this is the stuff that justifies their existence. Negotiations take days, months, even years, as we all know. But negotiate we must if we are going to get anywhere.

Another side problem is that 88% of Japan's amateurs are no-code phone-class Novices. How will they fit into the US scheme? The US is considering letting them use the bands above 50 MHz. In Japan, these same Novice no-coders are allowed everything except the 20-meter band, but they are limited to 10 Watts.

Incidentally, the no-code-class hams in Japan are the reason that, for the most part, Japanese amateur radio is more or less an extension of the citizens band, including its numerous abuses, bad manners, overcrowding, and general lack of knowledge of what amateur radio is all about. (Are you listening, America?) But that, too, is another story.

Japan has a long history of xenophobia and it is not surprising that it has taken so long to come this far. Non-Japanese are barred from many activities in Japan. For instance, an American lawyer is strictly forbidden to practice law in Japan, even if he can speak, read, and write Japanese fluently and could pass the bar examination if he were permitted to take it. Conversely, a Japanese lawyer may take the bar examination in any one of the States and freely practice law in the US. Many are doing so.

Discrimination is not illegal in Japan and is freely practiced. It is not unusual, for example, to see an advertisement in the vernacular press promoting a certain product or inviting readers to participate in some sort of promotional contest, with the notation at the bottom of the advertisement, "Japanese nationals only."

In the area of trade, Japanese are often considered to be unpatriotic if they purchase foreign-made goods here. Tobacco dealers (controlled by the government) are not allowed to promote US cigarettes and, in fact, only 30% of the cigarette shops throughout Japan are allowed to sell American cigarettes. (The question of whether smoking is good for you or not is a separate matter. The Japanese government has not yet determined that smoking is hazardous to your health, and cigarette packages carry only a mild warning: "Don't smoke too much.")

The government puts an extremely high tariff on beef and oranges imported from the US, which results in US beef selling at $25 and $30 per pound and oranges at $2 each. These measures are designed to protect the Japanese farmers. In fact, the Japanese have never allowed any product to be imported that would damage Japanese industry or agriculture in any way. An American car costs two times here what it would cost in the US due to taxes and charges added by government regulations. Japan, on the other hand, freely sells automobiles, cameras, computers, television sets, and, of course, ham rigs and whatever else in the US.

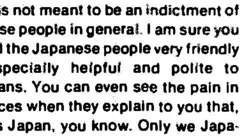
Now back to ham radio. A Japanese ham may take the US test and receive a license and callsign of his very own. In Japan, even if you take and pass the Japanese ham exam (many Americans and other non-Japanese have done so), you will be given an operator's permit but not a callsign. You will have to operate a Japanese club station—but not without first reporting the fact to the government.

Some of the preceding does not seem pertinent to ham radio, but I think it is useful to look at reality instead of viewing Japan through cherry-blossom-colored glasses. So many Americans visit Japan for a few days and seem to come away convinced that everything is fine in Japan, the "great economic miracle." Few would care to live in crowded hovels and pay super-high prices for goods which are kept artificially high by government regulations.

So, with this background information in mind, where Americans are not allowed to participate in society, where all American (all non-Japanese) residents are fingerprinted when they take up residence here (and re-fingerprinted every five years) and required to carry a foreign registration card at all times, and where foreign goods are not welcome, it should not come as a surprise that the Japanese government is reluctant to license foreign hams. There is a tendency for the government of Japan to try to control its residents, and this tendency is even more evident in the case of non-Japanese residents. We often refer to Japan as the country of "over-control."

This is not meant to be an indictment of Japanese people in general. I am sure you will find the Japanese people very friendly and especially helpful and polite to Americans. You can even see the pain in their faces when they explain to you that, "This is Japan, you know. Only we Japanese can get an amateur radio callsign in this country. Sorry."

The JARL, under the able leadership of Shozo Hara JA1AN, has done a lot in attempting to solve the problem and continues to work closely with the Ministry of Posts and Telecommunications. It's possible that a solution will be forthcoming soon. We wish them a lot of luck.



LIBERIA

Brother "Don" Donard, Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of Holy Cross
St. Patrick High School
PO Box 1005
Monrovia, Republic of Liberia

The Liberia Radio Amateur Association is making an all-out effort to help the Ganta Leprosy Control Center which finds itself practically in a state of emergency.

The two-room, mud-walled houses in which the patients live are termite- and rat-infested. The lepers have no feeling in their extremities, and the patients awake in the morning to find that their fingers and feet have been chewed on by the rats. The situation is bad, and Sister Dr. Chambers has made an appeal for help.

H. Walcott Benjamin, president of the Liberia Radio Amateur Association, and S. Richelieu Watkins, assistant minister of Post and Telecommunications of Liberia, have decided to organize the amateurs and put on a worldwide special-event program. The object of this program is to acquaint the outside world with the plight of these unfortunate patients in the hope that help will come. Mr. Watkins has forbidden amateurs in Liberia to request donations, but it is hoped that donations will come.

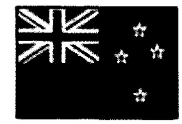
Mr. Benjamin has set up a special QSL manager, Bob SM4CWY, who will handle all the mailing for the project. His address is Box 134, S-67101, Arvika, Sweden.

The association designed a special QSL card with pictures of the leper colony on it. The special event began in May and will continue to December 31, 1983. Any amateur who contacts one of our Liberian amateur stations and sends a QSL card to our manager with a self-addressed envelope and postage coupons will receive the special QSL card. There is a special award if an amateur submits satisfactory evidence of having worked six Liberian counties on any band, with at least two contacts on CW.

Amateurs in Liberia work under severe handicaps. Their numbers are small (less than a hundred) and in some of the counties there may be no operators at all, or just one or two. There is a Liberian Net which meets every day and everyone makes a special effort to check in twice a week. Because of schedule conflicts, it is difficult for all amateurs to check in at the time scheduled for the net.

In spite of these difficulties, Liberian amateurs have distinguished themselves several times by their handling of real emergency situations. It is almost routine for amateurs in outlying areas where there are no doctors or medical facilities to accept medical advice, over the air, from a doctor in the city who very likely is an amateur himself.

If the amateurs in Liberia succeed in substantially helping the Ganta lepers, they will chalk up another victory in their efforts to help their fellow man.



NEW ZEALAND

D. J. (Des) Chapmen ZL2VR
459 Kennedy Road
Napier, New Zealand

In a previous column, I explained the national structure of NZART and this month I shall move on down the line to the branch level of the organization.

There are 80 branches of NZART throughout the country, each branch an autonomous body, affiliated with the national association. Branches have their own finances, club rooms, and assets in the way of amateur radio equipment, test gear, repeater stations, etc. They make their own policies and domestic decisions in most instances, without any reference to the national body. The only decisions

requiring ratification from the national association are those which might conflict with that association's constitution and rules.

The main objectives of the branches are "to further the objects of the NZART, to establish and operate amateur transmitting stations, etc., to foster local interest in amateur radio and associated electronics, and to assist with Civil Defense and emergency communications."

Branches are controlled by a president and a committee elected at the Annual General Meeting each year. Branch activities include the following: participation in the annual National Field Day station operation, the annual Amateur Radio Emergency Corps (AREC) Network Field Day, meeting every month for the purpose of conducting club business, providing technical or nontechnical discussions or lectures, and organizing other activities for the members' interest.

Looking through the "Branch Directory" published in the *NZART Annual Call Book* indicates that most branches have a regular club net, all have a branch callsign, most meet regularly each month, organize or run classes of instruction for prospective radio amateurs and encourage qualified amateurs to advance their respective licenses by further qualifying at CW, and operate a section of the AREC in their areas, and about half of the branches operate and maintain VHF repeaters. A few branches in the larger cities also operate a UHF repeater.

Some branches organize group projects from time to time, and these project kits are made available to branch members at a small cash profit to the branch to assist club finances. In some instances, the project kits are also made available to all NZART members through the national magazine, *Break-In*, or by direct advertising methods to the various branches throughout the country.

Some recent project kits include power supplies, 12-V fixed and variable, RTTY accessories, VHF converters, preamplifiers, instrument cases, small transceivers, and numerous pieces of small ancillary equipment for use in or around the amateur radio station.

Amongst the NZART contests and awards, there is one for working different branches; overseas stations are required to work 35 different branches, and there is a special endorsement if the award is worked within a 12-month period. (The cost is 60 cents NZ, and if you want further information, contact me at the QTH above.) Some individual branches have branch awards, including Auckland, Upper Hutt, Kapiti, Mamawatu, Gisborne, Christchurch, Western Suburbs, Hutt Valley, and Wanganui.

Bits 'n' Pieces

The results of the National Field Day Contest held in February have just come to hand. ZL1RK of the Western Suburbs Branch station was 1st overall, ZL1VK of the Papakura Branch station was 2nd overall, and ZL2ABJ of the Napier Branch station was 3rd overall. Napier ZL2ABJ (Branch 25, NZART), as well as making 3rd place overall, was 1st place in the ZL2 area (see the photo). Because of various problems, there are winners for each of the four ZL districts at each Field Day as well as overall winners for the whole country. ZL1RK also won the ZL1 area contest; the winners of the ZL3 and 4 areas were not available at the time of writing.

New ZL Awards

As part of the NZART activities for World Communications Year, 1983, a Five-Band Worked all Pacific Award will be made available. The requirements are to work 30 eligible countries in the Pacific (e.g., those Oceania countries eligible for WAC as Oceania) on each of 5 different bands, making a total of 150 contacts. QSLs are not required. Send a list of log extracts to the NZART Awards Manager, 152 Lytton Road, Gisborne, New Zealand, with NZ$9.00 for airmail postage and the award, which is on a handsome, suitably-inscribed wooden shield with an NZART badge mounted on it.

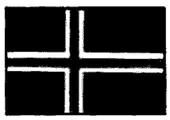
The Napier Branch 25 Group, winners of the ZL2 section of the 1983 National Field Day Contest.

Another new ZL award available this year is the IARU Region III Operating Award. This award is made available to publicize Region III. It is for all licensed amateurs and SWLs. Contacts made after April 5, 1982, are eligible, but certificates will date from January 1, 1983, as part of WCY. QSL cards are not required. Send a certified list of eligible contacts from your log book; the cost is NZ$1.00 surface mail or NZ$2.00 by airmail. The basic award requires 7 countries, the Silver Star endorsement requires 12 countries, and the Gold Star endorsement requires 17 countries. Awards may be endorsed for any mode or band. Eligible countries: Japan, Australia, New Zealand, Korea, Philippines, Hong Kong, New Guinea, Thailand, Singapore, India, Sri Lanka, Tonga, Western Samoa, Soloman Islands, Indonesia, Malaysia, and Fiji. Send your applications to the NZART Awards Manager, 152 Lytton Road, Gisborne, New Zealand.

NZART has a new president, Don Mackay ZL3RW, who has been on the air since 1952 when he started off with an ARC-5 war-surplus transmitter. Don is involved with the electronics industry in Christchurch and has served in many positions in ham radio, both at branch and national levels. He also had a period as editor of *Break-In* from 1970 to 1976. Don is returning to the administrative ranks of NZART after a spell from these duties, and when time permits he is active from 160 through 432 MHz and with mobile activities 80 to 10 and 2 meters.

Our retiring president, Jumbo (Arthur Godfrey ZL1HV) has served the amateur fraternity of New Zealand well. Arthur travelled extensively during his presidency, visiting most branches and attending branch meetings throughout the country. His actions were appreciated by amateurs everywhere, especially those in the smaller centers without any direct representation on the National Council. We all wish him well and hope that the time gained will be put to good use on the ham bands.

Another old-timer making a return to the national scene as a councillor is "Jock" White ZL2GX. Jock is better known to overseas amateurs as the NZART Awards Manager, a position he has held for over 35 years. He has been associated with NZART for some 50 years now and is a life member of the national association and his local branch at Gisborne. He has retired now, so he must have some spare time available to help administer our national organization.



NORWAY

Bjorn-Hugo Ark LA5YJ
Postboks 39, Manglerud
Enebakkveien 208
Oslo 6, Norway

I would like to begin this presentation of ham radio in Norway with the sad news of a great loss to DXing in Norway. Our top DXer, Arne-Sten Gretland LA1KI, left us last autumn only 40 years old. The whole DX fraternity is still stunned with grief. All the great times we had together are still clearly remembered. As president and one of the founders of the LA-DX Group and a member of the board of NRRL and many other associations, he will be remembered for his willingness and eagerness to do everything for everybody. We often wondered: How does he manage time to work DX? A great friend to everyone, may he rest in peace.

LA1KI started what I am here writing about: He joined the whole country in one DX association, an association which now has 76 members and is still growing. 76 members does not sound like a lot, but remember there are only 4000 amateurs in Norway and to be a member you must show proof of having at least 100 counties confirmed. Most have more than 200. Those 76 members together with the Trondheim DX Association are the top DXers and contesters in Norway. You probably have heard them in the pileups.

In the Oslo area, there is a DX frequency on 2 meters, 145.375 MHz FM. You will always find somebody listening on that frequency if you happen to visit Norway. (I will write about reciprocal licensing below.)

The LA-DX Group meets every Sunday at 0900 Norwegian time, on 3750 kHz, to exchange news and information about the happenings on the HF bands. Quite often during wintertime, DX stations check in and we are very pleased indeed.

Actually, some of the comments made after a DXpedition has taken place could give some of the guys on that expedition something to remember till next time. Of course, Europeans are not the easiest lot to handle in a pileup, but the right guy on the frequency can do wonders with the mob. The opposite, which unfortunately happens too often, makes you wonder: Why on earth did I choose DXing as a hobby and not rag chewing? You really just want to give it all up. But, stubborn as only a DXer can be, you stick it out, wait for the moment when the QRM gives in a little, work the station, and go QRT, still wondering why you don't sell the gear.

I will in the future take up this matter and offer some comments about the DXpedition's way of handling the traffic and try to illuminate what really is going on on the frequency. I think quite a few hams not interested in DXing would like to have that explained—why people behave as if they haven't the slightest idea about normal human behavior. Sometimes I really wonder myself.

It's not very easy to start a column! I'm not sure what should be in it, so I'll just have to take a chance and hope somebody will be reading it. I have already mentioned reciprocal licensing, and I can assure you that a license in Norway is not very difficult to obtain. You won't have to wait for an answer too long, either, if you fill the requirements and do as I suggest below.

Norway has reciprocal licensing agreements with the following countries, as per April: Canada, Denmark, England, Finland, France, Iceland, Luxembourg, Spain, Switzerland, Sweden, USA, Germany, Austria, and Holland.

The procedure to be followed by a foreign amateur to obtain temporary permission to operate an amateur radio station in Norway is as follows: The person in question shall prove, by a copy of his license, for example, that he has been registered in his country as a radio amateur.

An application should be made on a special application form, B1.570.3.80, obtainable from the Norwegian Telecommunications Administration. The address is listed below. Do remember an SASE and sufficient IRC postage to cover the way you want the form to be forwarded to you.

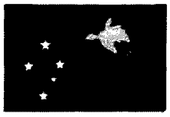
The application should be carefully filled out and sent to the proper licensing administration in the applicant's native country. The administration concerned is requested to give, under "Comments on the Applicant," its opinion on the applicant. The form should then be forwarded to The Norwegian Telecommunications Administration, Radio Inspection Office, PO Box 6701 St. Olavs Plass, Oslo 1, Norway.

A certificate of good conduct, issued by the applicant's local police authority, must be enclosed.

The application should be sent in time to arrive at the headquarters of the Norwegian Telecommunications Administration at least one month before the permission will be required.

A foreign amateur staying permanently will be issued an LAØ callsign, valid for one year at a time. If the stay is less than one year, temporary permission will be issued for three months at a time. The callsign used will be the same as used in the amateur's native country, followed by

. In both cases, a fee of Norwegian kro-
90 must accompany the application.
)perations taking place in the Norwe-
n Arctic or Antarctic are subject to
ecial conditions. Application must be
de separately for such operations.
The license issued to the applicant in
, native country must correspond to a
rwegian Class-A (General) or Class-B
ovice) license. In the latter case, the
efix will be LB0 or the suffix will be /LB.
I hope you will enjoy operation from
orway and make some good friends
re. I wish you good luck and welcome!



The late Arne-Sten LA1KI and Hugo LA5YJ involved in some heavy contesting at LA1KI's. Photo by Jorgen LA5UF, the third participant.

PAPUA NEW GUINEA

iegi Freymadl P29NSF
O Box 165
abaul, Papua New Guinea

Once again, greetings from P29-land to ll amateurs around the world. The New uinea Islands received a lot of "shakes" uring March; one earthquake registering .5 on the Richter scale lasted four ninutes and was followed by dozens of ftershocks. Fortunately, no loss of life nd not too much damage were suffered nd I'm very happy to report that there vas no damage to rig or antennas. That vould have been a real disaster!

Bob P29NBF, in Goroka had a visit from he electronics king of Australia, Dick mith VK2DIK, who was touring Papua lew Guinea with his wife. Goroka was on he itinerary with an overnight stop from '4 March to the 25th. Dick got together vith Bob P29NBF and Margaret P29NUN, ınd he did manage a number of contacts rom Bob's shack. We knew we would ear from Dick again soon as he resumed is "around-the-world helicopter flight" in Aay, setting out for Indonesia and west rom there.

The Annual General Meeting of the Papua New Guinea Amateur Radio Societ y was held in Port Moresby on March 25 ınd a new committee was elected. Amateurs from other provinces had been nvited to come up on the 80-meter net for voting, but apparently no votes were eceived over the air. Bob P29BS was elected president, but has since resigned for health reasons. Peter P29NUK s the secretary and Pat P29NPN is the reasurer.

Trevor P29ZTD is the committee member representing VHF activity. The QSL Bureau remains with Rae P29NYL, who has handled it so efficiently in the past. Col P29NAB is the awards manager, and net controllers for the 80m net are Gordon P29NGG, Brian P29BP, and Peter P29NUK/ ZUK. Also discussed at the meeting was the fact that a monthly column now appears in *73* giving news of the P29 ham scene. Everyone was interested and agreed that it was a good thing to get P29 on the map. With P29BS having resigned the presidency, an extraordinary General Meeting will have to be held. It is hoped that Bob can be persuaded to change his mind. He is a ham of long standing and vast experience and is admirably suited to the task.

Over the Easter weekend we had two amateurs staying with us: Shirley P29SM and her OM, Phil P29PM. Phil has just been allocated a full call; he was P29NPM previously. Shirley and Phil are from the Summer Institute of Linguistics at Ukarumpa. They are spending two months in the East New Britain province and will be erecting buildings in a village a few kilometers from our QTH. The buildings will be used for literary classes in the local language. We had fun with three operators in the shack at times and it was a case of musical microphones rather than musical chairs! We were able to oblige a number of VK stations and a VS6 with contacts for the Bird of Paradise Award. Phil and Shirley spent 12 months in the United States some years back, and while there, Shirley attended a ham cram course which enabled her to obtain her full call.

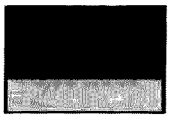
The Western Province of Papua New Guinea should be fairly well represented on the amateur bands soon, with operations going ahead at the OK Tedi Mine in the Star Mountains. The mine will eventually be producing gold, silver, and copper and is still in the stages of construction. John P29NJS is already on location and operating there. Another operator was due at OK Tedi during the second week of April. He is VK3BSO, Stan from Melbourne, and we hope to hear him soon with a P29 callsign. Signals should be good from such a lofty QTH.

Now a bit of history from the area which might be of interest. Prior to World War I and beginning in the late 1880s, the northeastern part of New Guinea and the New Guinea Islands were German possessions. A powerful radio station was in operation at Bitapaka, approximately 45 kilometers from Rabaul. The radio tower was between 80 and 100 feet high, balanced on a glass ball. From there, radio contact was maintained with Berlin via relay stations.

At the outbreak of World War I, when the German transmissions were monitored, it appeared that they were in regular contact with a German warship (the *Scharnhorst*?) in the New Guinea waters. This led to a considerable force being sent by the Australian government for the invasion, to be ready for anything, as it were. The Australian soldiers landed at Kabakaul and proceeded to march towards Bitapaka, about 10 kilometers away. On the way, they ran into a ragged band of German planters and native police, hastily armed with any weapons they could lay their hands on. Shots were fired and a number of men killed, mainly Germans. The radio contacts with the formidable warship had been a sham to deceive the enemy! There was no warship nearby. The capitulation was quick and relatively painless.

There is a final chapter to this particular story: About 50 years later, my OM removed the guy anchors of the radio tower at the site. By then a TB hospital was there, being run by Catholic nuns (a lot of them German), and they wanted to be rid of the three huge cement anchors for the guy wires. RSJs 1 foot in size had been cemented in to give support to the tower. That was the last evidence of the setup.

More news from here next month. See you then.



WEST GERMANY

Mitchell B. Wolfson DJ0QN
Carl-Von-Linde-Str. 35
D-8044 Lohhof
Federal Republic of Germany

Here are some aspects of operating VHF/UHF in Germany. This should assist any of you planning a trip here in the future and give non-visitors an insight into the primary differences between operating in Germany and the United States and Canada.

The most obvious difference between the VHF and UHF bands is the pure lack of "wide open spaces" found on the 2-meter and 70-cm bands, plus the total lack of a 6-meter or 220-MHz band. Our allocation on 2 meters is from 144 to 146 and on 70 cm from 430 to 440 MHz. That's it. Oh, we also have a number of frequencies available and in use on 1240 and above, but now I will concern myself with the two primary bands of 2 meters and 70 cm.

Another major difference is the lack of private repeaters and autopatch repeaters (verboten!). This certainly makes operating repeaters in Germany a different experience than operating in the USA or Canada, but not necessarily a less enjoyable one.

A different attitude prevails in Germany, aside from any difference in mentality. This is due to many factors, such as the limited number of repeater pairs available, the concentrated population centers, and the Class-C (code-free) license. One interesting aspect of operating here is the number of random QSOs going on, exchanging QTH, name, DOK (DARC chapter), etc. This is done on a large scale just to collect QSL cards! Yep, just like on the HF bands in the States, but on a larger scale, QSLs are exchanged for VHF/UHF repeater contacts.

A major reason for this is the DLD Awards program held by the DARC. These awards are given for confirming various DOKs. QSLing in Germany is actually relatively cheap since DARC members can send and receive any number of cards through their local chapter which, in turn, sends the cards through the DARC QSL card computer in Baunatal. In other words, no postage costs! This is a boon to the visitor to Germany, as he or she can, without hesitation, call CQ on a German repeater, perhaps make a nice QSO, and receive a QSL card in a few months to boot. Just don't forget to get some QSLs printed yourself!

Depending on your location, there will always be at least one repeater on each band within working distance. Operating patterns will be like any other industrialized country, so don't get frustrated if you can't make a QSO at 2:00 pm on a Tuesday afternoon. Some repeaters are incredibly busy, such as the "Zugspitze Relay" located here in southern Bavaria. Due to this repeater's tremendous coverage of southern Germany, Austria, and Switzerland, it is really difficult to get a word in edgewise, even late in the evening.

This is, of course, assuming that it isn't being jammed when you want to use it. (Even the disciplined Germans have their share of turkeys!) If you run into this type of situation, you can either go to another repeater or switch to a simplex frequency. The main calling frequency in Germany is 145.500. In addition, most of the DOKs will have a club simplex frequency. For example, my club, DOK C-26, uses the frequency of 145.325. Give it a try when you're in the northern part of Munich!

Many of you have heard about the required 1750-Hz tone burst required in Germany. This is correct, but it is definitely not required for a casual visitor to Germany's population centers. After a repeater has been brought up by tone burst, it will remain on as a straight carrier-operated repeater for a number of seconds. This should allow you sufficient time to gain access. In the worst case, you can always whistle up a repeater. It is cer-

2-METER AND 70-CM STANDARD REPEATER BAND PLAN IN GERMANY

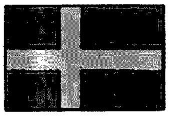
Channel	Input	Output
R0	145.000	145.600
R1	145.025	145.625
R2	145.050	145.650
R3	145.075	145.675
R4	145.100	145.700
R5	145.125	145.725
R6	145.150	145.750
R7	145.175	145.775
R8	145.200	145.800
R9	145.225	145.825

Simplex frequencies are every 25 kHz from 145.250 to 145.575; calling frequency is 145.500. SSB/CW is located on the bottom of the 144-MHz band (very active). There are also a number of linear transponders on oddball pairs.

R70	431.050	438.650
R71	431.075	438.675
R72	431.100	438.700
R73	431.125	438.725
R74	431.150	438.750
R75	431.175	438.775
R76	431.200	438.800
R77	431.225	438.825
R78	431.250	438.850
R79	431.275	438.875
R80	431.300	438.900
R81	431.325	438.925
R82	431.350	438.950
R83	431.375	438.975
R84	431.400	439.000
R85	431.425	439.025
R86	431.450	439.050
R87	431.475	439.075

tainly not worth a large investment in time or money to acquire a 175-Hz generator before arriving here, but it can help under specific circumstances (rural areas, 70 cm, etc.). By the way, Austrian repeaters do not require tone burst.

Last but not least, don't forget that although you may get the impression that most German hams speak excellent English, this is not necessarily true, especially on VHF/UHF. Many of the people you meet may be Class-C licensees with no HF operating experience. Please speak slowly and clearly and have patience with your QSO partner. Enjoy your visit; you may make many permanent friends during your stay!



SWEDEN

Rainer Martinsson SM2DMU
Sikea 3178
S-915 00 Robertsfors, Sweden

I have covered the regulations concerning amateur radio in Sweden, so this month I will give you the details for obtaining a reciprocal license if you are planning your holidays in Sweden. The following is an extract from a memorandum published by the Swedish Telecommunication Authorities.

1. General Rules.
The following rule must be conformed to by any foreign national wishing to obtain a permit to hold and utilize an amateur radio transmitter in Sweden.

On condition that there is no risk of the transmitter or the permit being misused, and provided that its use will not contravene the interest of the community, a permit will be granted to:

Any foreign radio amateur, during a temporary stay in Sweden, who has passed an acceptable test made by the authorities concerned in his native country and co cerning whom satisfactory informatic has been obtained and who, on special e quiry, has been considered fit to ho such a permit in Sweden.
Any foreign radio amateur who has ol tained a permit to hold and utilize a amateur radio transmitter in Sweden ha to follow the direction stated in th Swedish Regulations concerning th Amateur Radio Service mentioned above

2. Application Procedure.
Any foreign radio amateur applying for temporary permit shall submit his appl cation early enough to reach the Swedis Telecommunications Authorities no late than one month before the permit is re quired. The application, which may b written in Swedish, Danish, Norwegiar English, French, or German, shall norma ly be furnished with a pronouncemen made by the licensing authorities in th applicant's native country. The applica tion may, however, be sent direct to th Telecommunications Administration i doing which either a copy of the licens valid in the applicant's native country provided that it was issued not more tha six months ago, or a certificate issued b the licensing authorities in th applicant's native country, proving hi holding of a valid license, must be en closed. Such a certificate must not b older than six months. The applicatio shall also be accompanied by a certificat of good conduct (impunity) issued by th police authorities in the applicant's nativ country. In certain countries, howeve such a certificate cannot be obtained. certificate issued by the applicant's ama teur radio organization must be enclose instead.
When applying for a temporary permit, th following documents *must* be sent in:

1. The application form.
2. A certificate issued by the police au thorities (in certain cases the applicant' amateur radio organization as above).
3. A copy of the valid license or a pro nouncement delivered by the licensing au thorities in the applicant's native countr (as above).

3. Fees.
80 Swedish kronor for a maximum of thre months during a period of twelve month (one year). The time may at most be di vided into four different periods.
The fee shall be paid on the receipt of th invoice.
The application should be addressed to Swedish Telecommunications Radio De partment, Licensing Section, S-123 8 Farsta, Sweden.

4. Callsigns.
To any foreign radio amateur obtaining temporary permit there will be assigned callsign, consisting of his ordinary call sign immediately followed by /SM and digit stating the district within which th radio transmitter is to be used temporari ly. For traffic exchanged from a mobile o portable radio transmitter, the letters M (MM for vessel) or P, respectively, preced ed by an oblique stroke, may be added t the callsign.

5. Classes of Certificates.
A license for a foreign radio amateur wi be issued and valid for the Swedish clas of certificate corresponding to the clas of certificate assigned to the licensee i his native country.

With this, I end the extract from memo randum no. Rft 1940. Anyone who wishe to obtain further information can write t the above address or call (08)-713-2162 Swedish Telecommunications will be hap py to answer your questions and assis you in your application.

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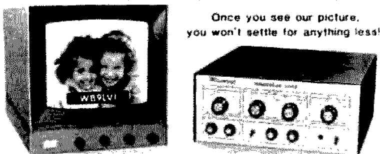

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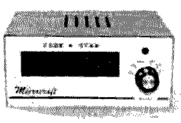

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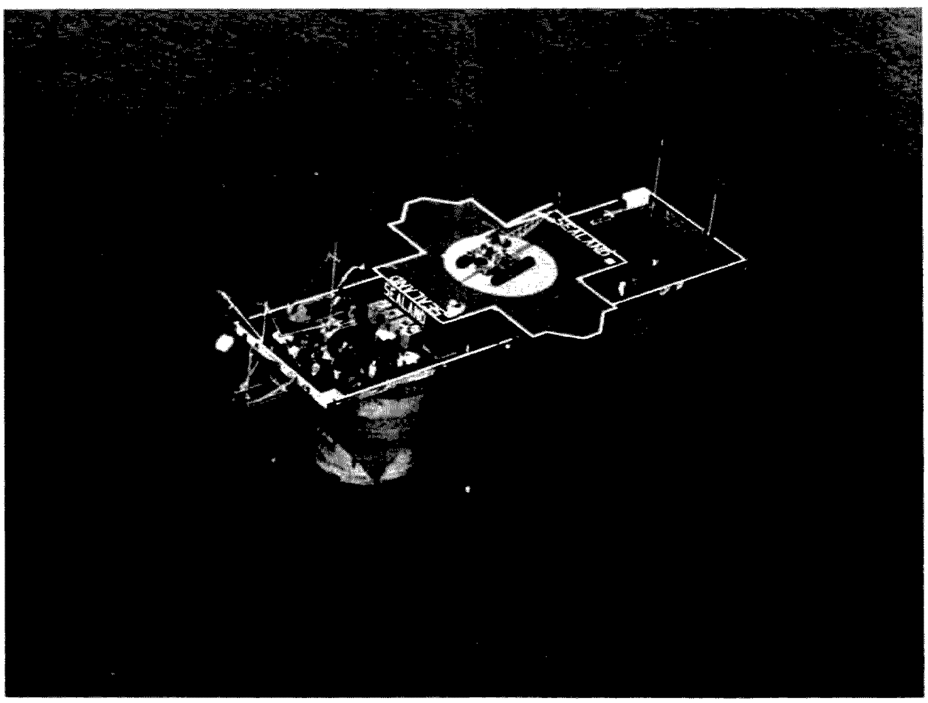
To Go Where No Ham Has Gone Before—Sealand!

An enterprising team of DXers takes to the high seas to work S1, the smallest country in the world.

Let's activate a new country, we thought. Let's just go there and set up our station, we thought. It obviously was a simple thing to do.

But yet here I am, cowering in a soapbox, swinging 40 feet above the stormy North Sea, firmly clinging to the support wires. Then at last! The waves down below me have disappeared and given way to firm ground to step upon. My eyes have stopped looking anxiously through the holes in the bottom of the soapbox lift and turned to catch a glimpse of the smallest state in the world: Sealand.

It had all started more than a year ago. Along with a couple of friends, who later formed the team, I began to think about DXpeditions to the more remote spots of the globe. But the problem was: It's all been done! Then, all of a sudden, one of us came up with *the* idea. There was an artificial island called Sealand in the North Sea outside British territorial waters which was declared independent years ago. The proposal to go there was enthusiastically met by all the amateurs present. So at once we sent a letter to Sealand describing in general the amateur radio service and in particular our idea of a DXpedition to activate the island for the first time.



Sealand on a calm day. (Photo by Southend Air Photography, Ltd., courtesy of Jeff Maynard G4EJA.)

In the meantime, we gathered information about Sealand from newspaper articles and books. The following picture emerged from our studies: During World War II, the United Kingdom built several offshore platforms firmly grounded at the bottom of the sea for air defense purposes. One of them, the one in question, then being called "Roughs Tower," was put up in 1940 about seven miles east of Harwich. Its exact position at 51° 53′ North, 1° 28′ East puts it outside British territorial waters.

The artificial island was maintained for a few years after the war, and upon leaving, the British did not dismantle it. In early 1967, a group of people including Roy Bates and his family went out to the island and took possession of it. On the 2nd of September, 1967, it was proclaimed the independent "Principality of Sealand," and Roy Bates

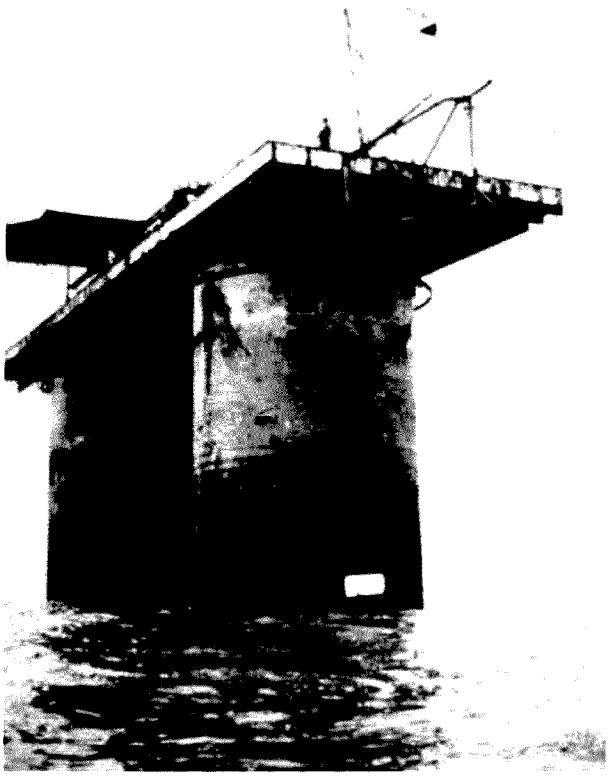


Photo A. Soapbox lift swinging above the waves.

and his wife Joan became Prince and Princess of Sealand. The usual attributes of statehood, like a coat of arms, constitution, citizenship, passports, coins, stamps, and a national flag subsequently were adopted.

Following a few quarrels with the local authorities, Prince Roy was summoned to appear at a number of British courts, but in each case it was ruled that Sealand was outside the United Kingdom and therefore not within its jurisdiction.

The only "nationwide" crisis which shook the small state occurred in 1978 when the previously-dismissed foreign minister successfully launched a coup d'etat. But his interregnum did not last long. After only six days, the principality struck back. A rapid-deployment force of four people returned by helicopter and retook possession of the platform.

A public session of the Sealand Court of Justice sentenced the leader of the coup to seven weeks of detainment. After that, he finally was allowed to leave the country. Since then, the history of Sealand has continued a lot smoother.

After getting to know this stormy history, we did not really expect a positive answer. But to our great surprise, we were invited by Prince Roy himself to come and to celebrate the 15th anniversary of Sealand's independence. Immediately, we began working out the details of the DXpedition. The team consisted of four members: Butz DL6PE, Geri DK8KW, Dick DC5BT, and Ben DF2AO. Lots of equipment, coax strings, orange juice, food, and other bits and pieces had to be obtained and coordinated properly until we had taken care of everything we thought useful.

Finally, on the 31st of August, 1982, we packed our bags and left Cologne with two cars to reach Oostend in Belgium later that night. There we boarded a ferry. After having managed to take a nap on board, we reached Dover very early in the morning. Our voyage continued round the mouth of the river Thames until we reached Southend-on-Sea

STATEMENTS ISSUED BY THE PRINCIPALITY OF SEALAND

During the 39/45 war, Great Britain established an artificial island on the High Seas. This island was equipped with radar and heavy armaments and occupied by some two hundred servicemen. The task of the island and its inhabitants was to guard the approaches to the Thames Estuary where large and vulnerable convoys of shipping were assembled. Some time after the cessation of hostilities, the island was derelicted and abandoned by the British Government.

In the winter of 1966, a British family took possession and commenced the task of equipping and restoring the island. On the 2nd September 1967, they hoisted their own flag and declared the existence of a new State—the Principality of Sealand. Their rights and claims of Sovereignty over the island and its territorial waters have been ratified time after time over the intervening years by National Courts and leading international jurists.

European States have—during disputes involving Sealand—stated that they have no rights or authority in Sealand and the major European States have repeatedly given de facto recognition to the existence and the Sovereignty of Sealand.

Over the years since the declaration of Statehood by Sealand, the family lived a free frontier lifestyle. They made and enforced the laws of Sealand. They faced and drove off armed attackers and on one occasion a member of the family was actually kidnapped by armed men and forcibly taken to a foreign country against his will.

Sealand came under threats from hostile naval units from other States; in the early days of independence, there were the most determined attempts made to isolate and starve out the island. The elements and the sea had to be fought constantly with a relentless determination. It was a very busy, active, and adventurous life for the family and their fellow Sealanders and they all thrived on it.

Sealand issues her own coins and postage stamps and runs a postal service between Sealand and Britain, the British postal services collect mail for Sealand's collection and delivery to and from the island.

It is now planned to extend Sealand by reclaiming land from the sea and by building leisure and industrial complexes. There will be a modern freeport for the transhipment of cargo from larger to smaller vessels for the better distribution of freight throughout Scandinavia and Northern Europe. With the potentials and the planned developments of Sealand, it is unquestionably the greatest commercial adventure of this century.

Perhaps there is still something of the old buccaneering spirit about Sealand, but it must be made quite clear that Sealand is a realistic and very modern fact. This spirit will ensure that the Sealand story will continue and that Sealand will go on to emphasize the freedom and determination of the individual and to bring back the excitement and dash of the old merchant adventurers. Sealand is unique. There is nothing anywhere in the world like Sealand and the development of the Sealand potential will also be unique.

Bureaucracy will be at an absolute minimum and free enterprise and bright ideas will always be actively encouraged and rewarded without the State taking the larger share of earnings or penalizing in any way the true spirit of adventure and hard work that it is our aim to engender. The only taxes payable on Sealand will be those decided by businessmen controlling the Sealand State Corporation in order to raise money necessary to run the island.

Photo B. Antennas and orange juice being unloaded by Dick (left) and Geri.

Photo C. Butz operating the CW station inside the tower.

where Prince Roy received us in his private apartment. After a short audience which included the issue of our personal licenses with the S1 calls, we headed for Felixstowe where our boat to Sealand awaited us. It was not a very large one, but it did rather nicely on all three trips necessary to get everything across.

The most exciting stage of our trip, however, was the last one. In Photo A, you can see the aforementioned soapbox lift almost touching the waves. After the overwhelming moments described in the first paragraph above, the great instant had arrived. (It was a small step for a ham . . .)

The soapbox lift had to work hard to get all the luggage "upstairs." Photo B shows Dick working and Geri assisting at the unloading of the box. One of the orange juice packages was torn to pieces, but, luckily, that was the only casualty. The reception committee was formed by Prince Michael of Sealand, son and successor-to-be of Prince Roy, who gave us more than just a helping hand during the erection of masts and antennas.

After we went through the necessary passport formalities, the HF stations, consisting of two IC-720As, a five-band GPA, and a windom, were put up immediately inside one of the concrete towers at about sea level. The first station finally was on the air on the 1st of September at 1956 UTC. Soon afterwards, Butz took up telegraphy at the other station (see Photo C).

You can imagine that very mixed reactions were instantly flooding in from our QSO partners around the world. The majority expressed their pleasure that at last Sealand was on the air; others did not believe a word, but obviously did not want to miss us. There even were two or three "imitators," but they soon gave up.

In the same tower as our shack we also were assigned a living room. (Each tower includes seven stories of circular rooms, and on top of the platform there are another eight rooms.)

On the next day, the anni-

Photo D. The 2m station operated by Ben.

Photo E. Dick (left) and Geri enjoying a sunny day out in the "countryside."

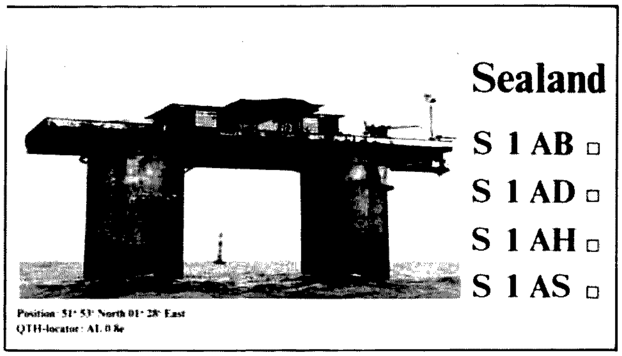


Fig. 1. DXpedition QSL card.

versary day, we put up the 2-meter station, a TS-700S, a 60-Watt linear, and a 10-element yagi beam. Photo D shows Ben working 2m DX in the 2m shack on top of the platform. In general, not-too-regular shifts added up to an almost continuous operation on HF and VHF.

During our time off we had quite a few interesting conversations with the three natives present, so a lot of additional information about Sealand was supplied to us. Sometimes, when the weather was nice, we could even take a sun bath—see Photo E.

All in all, we were given the impression that we were very welcome on Sealand. Therefore, the five days really passed in a jiffy, and soon the 6th of September, our day of departure, had arrived. The crossing to England was a lot rougher than it had been on our way to the island, but again nothing suffered any damage. Again we crossed the channel at night, and then returned to Cologne.

After our return we sat together and summarized our DXpedition. About 3600 contacts were established with more than 80 countries on all continents. One thousand QSOs were made on 2m, almost exclusively by Dick. We had great fun, and we erased the last white spot on the radio amateur's world map. So now this, too, has been done. But we'll return to Sealand in a few weeks, possibly before you read this. Anyway, please listen for us on the usual DX frequencies in SSB and 22 kHz from the band edges in CW. Hpe cuagn. Ben DF2AO. ■

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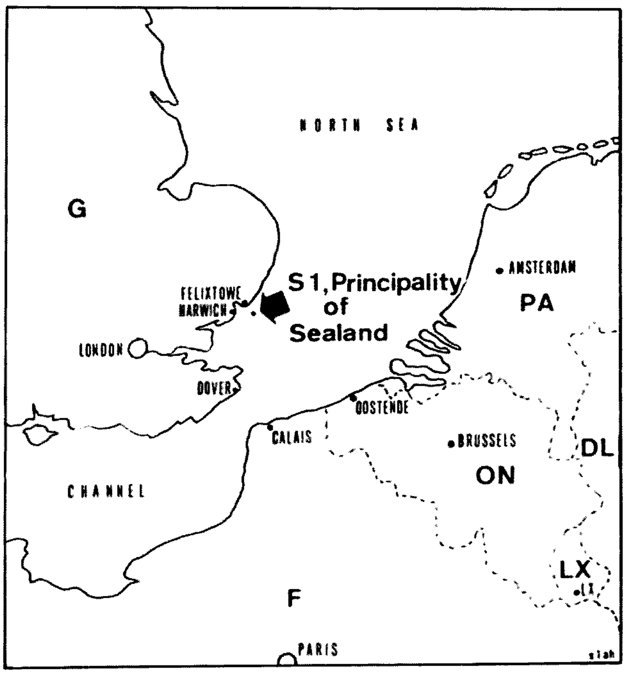

Fig. 2. Map of southern North Sea area.

Constitution of the Principality of Sealand

1. Every person has the right to liberty and justice.
2. Every person has the right to exercise his own beliefs provided only that such beliefs do not infringe upon the beliefs and well-being of others.
3. The freedom of the individual can be restricted only by the due process of law.
4. All individuals are equal before the law and no one may suffer prejudice for any reason.
5. The legal system is based on the British Common Law and the British Law of Contract with certain exceptions.
6. Any ordinances passed in Sealand by the Senate properly constituted will exclude and take precedence over such Laws.
7. The National language of Sealand is English and all official documents must be in that language.
8. All companies registered in Sealand are subject to the same laws as individuals.
9. Every person shall have the right either to join or refrain from joining a Sealand Trade Union but no person will be permitted to attempt to coerce any other person so to join and no trade union other than a Sealand Trade Union will be recognized on the island.

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1001 Uses for the 9400

Experiment with this cheap chip. It's the IC you've always wanted, with applications you've never dreamed of.

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The 9400 is now available, off the shelf, from Radio Shack. Part #276-1790 priced at $3.49 will allow you to take a flying leap into the world of IC exotica. The 9400 is a 14-pin DIP that may be used in one of two modes. It will convert an applied voltage to a frequency or will, with some slight circuit rearrangement, convert an applied frequency to a dc voltage.

Briefly described, the chip is a marriage of bipolar and CMOS technologies which utilizes the principle of charge balancing. This is a fancy buzzword for the process which takes an input voltage and converts it to a current which is then operated on by an "on chip" integrator. The integrator capacitor charge is monitored by a comparator and at a predetermined time the charge is "dumped" and the circuit recycled. We could struggle all over hell's half acre of high-flying technological niceties, but some simple (on the surface) ideas of how to use the IC seem to be the better part of valor.

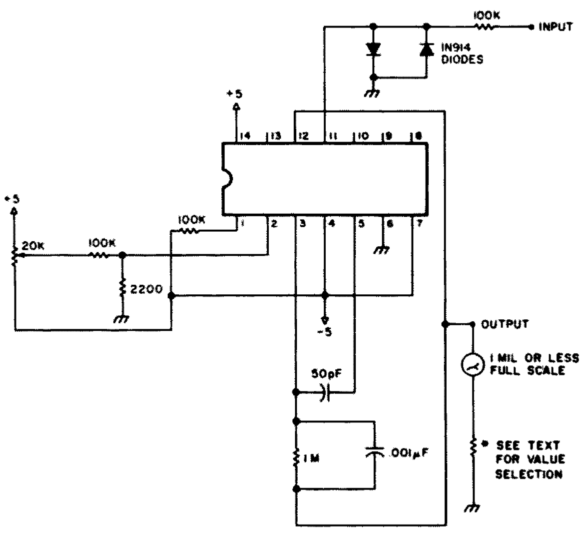

Fig. 1. The 9400 used as a dc-to-10-kHz frequency-to-voltage converter. Note: Pins 8, 9, 10, and 13 not used.

The IC will work either with a split supply of plus and minus five volts or from a single supply of ten to fifteen volts. For many reasons, my personal preference goes for the split supply. Since, by definition, the applications will be voltage-sensitive, your supply voltage should be at least zener-regulated.

For the first flight out of the barn, examine the circuit of Fig. 1. This shows the use of the 9400 as a dc-to-10-kHz frequency-to-voltage converter. In basic English, if you put a one-kHz tone (waveshape is unimportant) into the circuit, the meter at the output would show a voltage of some 360 millivolts. If you double the input frequency, then the output voltage doubles. If you halve the input frequency, then the output voltage falls by a factor of two. The rise and fall of the output voltage versus the input frequency is very linear; hence, it is no trick at all to calibrate the output voltage meter in terms of input frequency over the range of interest.

Circuit setup is simple. Merely adjust the 20k pot for a zero reading of the output meter with no signal applied and that is that. To what use can we put the circuit? Look at it as a low-cost dedicated frequency meter. You can put it across the output (sample) from a dc-to-ac converter and know that the frequency coming out is indeed 60 Hz. You could calibrate the meter for mark and space frequencies of your RTTY setup. In

any situation where you want to keep tabs on an audio frequency up to 10 kHz, this simple handful of parts will give you a way.

By now you may get the idea that this is a versatile item, and you are right. For the gentlemen who know that CW is still a viable part of the ham art, try this on for size. The circuit of Fig. 1 makes an interesting variety of CW filter. Due to the use of a comparator as part of the chip's innards, a comparator with a threshold of some 200 millivolts, some good things are available. Feed the voice coil output of your receiver to the input of what is now our "CW purifier." Place an audio amplifier right across the output. Tune in a CW signal and advance the gain control of the receiver until you hear picture-pure code in the speaker. Almost all of the background garbage vanishes, be it Russian BCI on forty meters or the guy up the road a few kHz. The CW note is quite pleasing to the ear, the waveshape being a sawtooth ramp of the same frequency as the beat note applied to the input. Weak off-frequency stations and sideband splatter just vanish.

There is one fly in the ointment after all . . . Murphy lives! If the signal fades so that the audio level is not high enough to trip the threshold of the comparator, you get nothing out but beautiful silence. This may mean a bit of twiddling with the audio gain control of the receiver, but the results overall are quite impressive.

Let's review a bit of the bidding before looking at the 9400 in its other mode. The two diodes across the input are safety valves to prevent any exuberant voltage in excess of the IC safety zone from sending it to IC heaven. The circuit as configured has a limit of 10 kHz, above which the input voltage versus output voltage is no longer linear. To use the device as an analog frequency meter, merely wire up what you see. If you want to use the device strictly as a CW filter, then replace the meter circuitry with a 47k resistor from the output pin to ground. Couple out of the resistor with a .005-μF capacitor which will de-thunk the output which might otherwise be generated by the Morse flowing through it. Remember to at least zener-regulate the supply which will have a current demand of ten mils or less.

Leaving it to your originality to come up with other uses of the 9400, let us examine Fig. 2, the circuit that becomes a voltage-to-frequency device. Simply put, any voltage (ac or dc) that is put into the circuit produces a frequency at the output. Within the linear range of the circuit (10 Hz to 10 kHz), this output frequency is in direct proportion to the applied voltage. To pick some random numbers: If one volt in gave a 5-kHz tone at the output, then 2 volts in would give 10 kHz at the output. As there are two output pins shown, we have to watch which one we use as they differ in one respect. For a given voltage input, the output frequency at pin 8 will be twice the frequency as at pin 10, as there is a divide-by-two built into the 9400, the output of which appears at pin 10.

While most of the uses for this configuration get a bit abstruse, the simplest idea is to connect the input to +5 volts through a variable resistor network and vary the input voltage. Listen to the output and you will hear the frequency vary with the applied voltage. My 9400 produces one kHz with an applied voltage of 1.3 volts and just a shade over 2 kHz with double the applied voltage. This frequency was measured at pin 8. Measured at pin 10 (due to the divided frequency available), these frequencies would be half those appearing at pin 8. You can see the sensitivity of the frequency change by appreciating that one millivolt changed the frequency by one Hz.

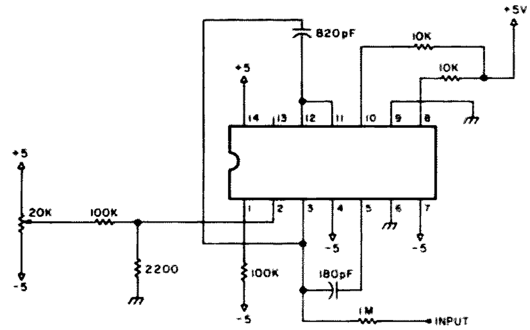

Fig. 2. The 9400 used as a 10-Hz-to-10-kHz voltage-to-frequency converter.

A non-related (hamwise) application readily becomes apparent if you shut off the power supply to the unit when it is set up as an oscillator. As the filter capacitors drain down, the frequency falls in a fine siren-like fashion. If you have a function generator capable of producing triangles, ramps, pulses, and square waves, it is possible to get all sorts of weird and/or pleasing noises upon application of these waveforms to the 9400. Everything from motorboats to phasers and sirens is readily achieved.

Getting down to the nitty-gritty, the voltage-to-frequency mode does not seem to lend itself to simple implementation for the ham. For openers, contrast the simple setup of the frequency-to-voltage mode (which consisted of turning a pot until an output meter read zero) with the following setup for the voltage-to-frequency mode: Set the input voltage to 10 millivolts and trim the zero adjust pot to obtain an output frequency of 10 Hz. Set the input voltage to 10.00 volts and trim either the input resistor or the 180-pF capacitor until the output frequency is 10 kHz.

Now let us consider some of the applications that appear. We could construct a simple audio voltmeter that would tell us that one voltage is higher or lower than another, which might have some possible use. We could use it as a bridge balance indicator. We could use it in any situation where a sensor changes ohmic value, causing a change in output voltage to produce a change in frequency which might be measured by a standard frequency meter or a 9400 connected as an F/V converter using an analog meter. Such an application might utilize a thermistor for remote temperature sensing. Without belaboring the situation unduly, unless you get interested in some form of ham-connected digital transmission or something that requires some sort of FSK that naught else will provide, the F/V mode of the 9400 will be of greater value than the V/F mode under discussion.

Keep in mind that the dual uses of the chip will often be complementary so that the V/F and the F/V modes used together will produce a desired end result. The modest investment in the 9400 and some time learning what it can do are well worth the money and time. Ham radio has and is going through various technological phases. Keep up with them to a degree and many unexplored facets of the world's greatest hobby will become your yellow brick road to happiness. ■

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Propagation Explosion on 220

This theoretical inquiry into the properties of 220 MHz yielded some unexpected results. Find out when and why your signal will be at its best.

Not long ago, I was talking to a ham friend of mine who is locally considered as quite learned in the ways of the black magic world above 2 meters. When I raised the subject of 220 MHz and the appalling lack of local activity on that band, he gave me a somewhat irritated look and dismissed the issue by saying, "Who'd want to use those frequencies? You can't get out of your backyard with them, anyway."

Wasn't that what they said at one time about everything below 200 meters? A rather strange attitude, I thought, for a man who is supposed to be savvy about that part of the radio spectrum. The more I thought, the more curious I became about the 220-MHz band. Surely, this good ham and electronics professional who daily uses the many amateur and commercial frequencies above 148 MHz couldn't be discounting their usefulness for communications! Or was my friend trying to say that some mysterious radio anomaly existed just around the 220-MHz band which rendered only it useless? (My rather overactive imagination quickly conjured up a sort of propagational black hole which sucked up all energy from transmitters in that region.) Obviously, none of this was true. Yet, the myth of 220 as a band that offers little to amateurs seems to persist among a lot of us in the fraternity. I wanted to know why.

Could the myth be based, partly, at least, on some propagational features of 220 that are alien to the understanding and experiences of most lower-frequency operators? In earlier years, it was generally true that almost all VHF work was done at essentially local distances (i.e., up to about 30 miles). Even today, particularly in densely populated areas, this range is still probably typical of the average amateur communication path. Therefore, I reasoned that if any unusual propagational behavior degraded signal strength at 220 on paths of this length, especially during the earliest days of experimentation on this frequency, it might be part of the explanation of why this much-neglected band got its less-than-good reputation then, and why the band maintains its reputation with amateurs like my friend even to this day. I needed to study this possibility, and I needed an adventuresome, experimentally-inclined partner to help me. Jim K9MLK, who was located about 10 miles from my station, gamely agreed to help.

How's the Weather on 220?

Though far from being a scientific type, the next requirement I would have to fulfill would be carrying out my investigation in as scientific a manner as possible. Therefore, a working hypothesis was in order. I began with a piece of information that even relative newcomers to VHF have known for years: Weather changes in the lower atmosphere can affect propagation at these frequencies. But what, *specifically,* about the weather would change 220-MHz propagation? What about the effects of solar activity? Though generally discounted as a factor, could it be ruled out entirely here? And could I discount the effects of the Earth's magnetic field? I arbitrarily set a hypothesis which would include most common elements of the weather and of solar and geomagnetic activity. I decided that K9MLK's 220-MHz signal strength, as received at my location, would probably vary with changes in air temperature, humidity, the level of the cloud ceiling over the transmission path, barometric pressure, geomagnetic fluctuations as measured by the "A" index, and solar flux numbers. The latter two types of data would be provided on each appropriate test day by the National Bureau of Standards station, WWV, and the National Oceanic and Atmospheric Administration (NOAA). Humidity and temperature measurements could be taken at my station location, but cloud-ceiling data and barometric-pressure readings, because of the lack of accurate home instruments, would have to be obtained from the flight service at the local airport.

Setting Up the Test

The remaining things which required a decision before beginning our tests were choosing transmission mode, antenna, polarization, power level, station equipment, and, lastly, a method of measurement for the received signal which would be accurate and yet would be easy to use. Two criteria would have to be satisfied in making these decisions. First, our station equipment would have to operate in some mode which could provide some constant-carrier signal for meaningful comparison. This constraint almost automatically dictated that we use CW, AM, or FM. Second, in the interest of scientific control, what was true with one station had to be true with the other, that is, power levels, antennas, antenna height, model(s) of equipment, type of feedline, method of measuring the received signal, and the like had to be duplicated on both ends of the transmission path as nearly as possible. We also would have to duplicate the time of day each time the experiment was run so we could minimize any effects other unknown but *time*-related variables might have on our signal-strength measurements.

Picking station gear was relatively easy and consequently came first. Two AM transceivers became available almost immediately, so AM became the mode of choice because of convenience. The transmitter sections were low powered and thus offered an unexpected opportunity. Since each of us would be putting only about 1/2 Watt into our feedlines, we felt that, at a distance of 10 miles, we should be able to detect even relatively small signal changes which might be the result of propagational shifts. It was our belief that higher power levels might have masked this phenomenon over such a short path. As for polarization and antenna decisions, horizontal was chosen since it has traditionally been used in most weak-signal work. Both stations, then, were outfitted with horizontally-mounted, homemade 5-element quagi beam antennas, and both were fed with RG-8/U foam coaxial cable. Lastly, in an attempt to abide by the rule of duplication, both antennas were to be mounted as close as possible to a height of 40 feet. That would, it was hoped, minimize individual station differences based on antenna height gain or feedline length.

The final decision to be made concerned choosing a method for measuring and comparing the levels of received signal. Neither of us felt particularly comfortable working in any measurement scale that was nonlinear, so a very simple yet reliable alternative had to be devised. Because both receivers employed circuits with excellent agc characteristics, we simply decided to measure the differences in associated voltage at a no-signal and a signal-present condition. Since the voltage figures used for final data analysis are *difference* numbers, any internal voltage variations or any transient external receiver conditions such as an increase in line noise which might increase the total voltage reading during the experiment are essentially minimized as a data bias. To further minimize bias caused by variations within each of our stations, we both measured signal voltages in this manner and then these readings were averaged to produce the day's final data. Voltage readings were taken at both ends of the experiment with each station transmitting a constant-amplitude 1000-Hz audio tone to the other for a period of 60 seconds.

Data was collected in this manner over the period of November 1, 1979, to March 25, 1980. This period was purposely chosen since it represented the best of several possible experimental conditions. First, we felt we would best be able to test the influence of warm and cold air inversions which are so common in this part of the midwest in the fall. Second, we would experience a wider range of temperature and humidity extremes during this time than probably any other. And lastly, this particular time period was predicted to be near the maximum for solar activity in the current solar cycle. So, if the sun had any influence on propagation at this frequency, we felt that it probably would be most evident at this time.

The Expected and the Not-So-Explainable

The results of the experiment are portrayed in Figs. 1 through 5. Each of these graphs shows a correlation line between received signal and data from one of the five meteorological or geo-solar variables mentioned in the starting hypothesis. For those of you who are mathematically inclined, these correlation lines were derived by using standard regression methods.

Results range from the expected to the almost unexplainable. Fig. 1, for example, shows the relationship between signal strength and the percentage of air humidity. A statistically significant negative relationship between the two is strongly suggested here. The findings indicate that as humidity levels declined in the atmosphere over the transmission path, signal strengths increased in response. According to Thornburg in the March, 1978, *QST*, while this phenomenon is known to occur with signals transmitted in the gigahertz range, it is not typically associated with propagation at frequencies this low. Yet the effect at

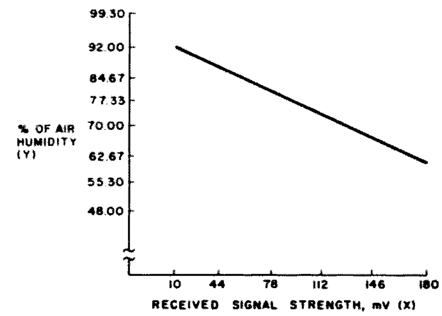

Fig. 1. Relationship between humidity and signal strength.

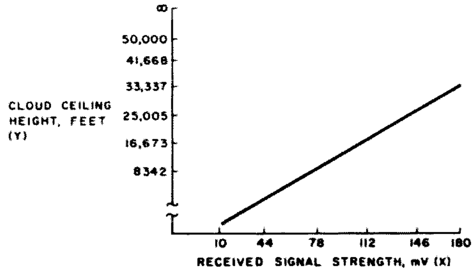

Fig. 2. Cloud ceiling height vs. signal strength.

220 appears to exist. (It was interesting to note that during our test, during periods of high moisture, such as rainy or snowy days, signal strengths which typically ran at S9 or better under more clear conditions, would plummet into the noise level.)

Fig. 2, on the other hand, shows the relationship between signal strength and cloud-ceiling height in feet. Some intuitive feeling suggested prior to this experiment that at this frequency and above, a low cloud ceiling might act almost as a pipeline or duct. In other words, it might concentrate the signal and its strength. Also, the possibility occurred to me that if a cloud layer did duct the signal, this phenomenon might exist if and only if the cloud layer were at some critical height above ground. That is, signal reinforcement might take place only with the cloud layer present *above* or *below* some special height. The data portrayed in Fig. 2 suggests the opposite is more likely. A mild correlation was found between signal strength and ceiling height and this correlation was statistically significant. Yet the relationship was positive. So, here the data was suggesting that as the cloud ceiling rose, signal strength also slowly rose. This finding doesn't give much support to the belief that a low cloud ceiling will increase signal strength. Nor did the data analysis support the notion of a particular critical ceiling height above any certain level.

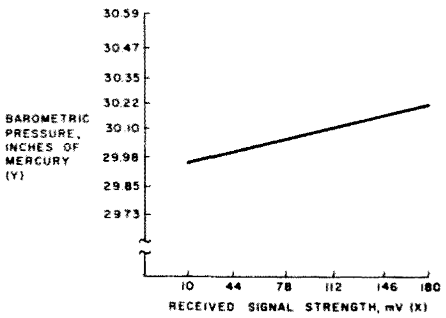

Fig. 3. Barometric pressure vs. signal strength.

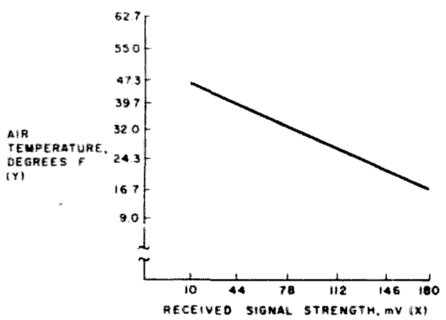

Fig. 4. Air temperature vs. signal strength.

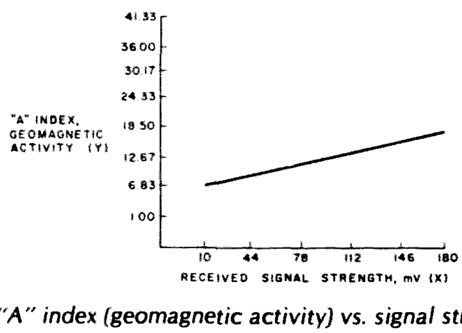

Fig. 5. "A" index (geomagnetic activity) vs. signal strength.

It is difficult to know how important this apparent relationship is. One possible explanation for the correlation between signal strength and cloud height might be found in the fact that periods of high humidity are most frequently associated with wet and stormy conditions, and these conditions are normally accompanied by lower cloud ceilings. Thus, the correlation between cloud height and signal strength may, in fact, be only an indirect reflection of the relationship between high humidity and low signal strength as was discussed earlier.

Fig. 3 represents a phenomenon that is somewhat harder to explain. Here a weak positive correlation was found to exist between signal strength and barometric pressure. In short, the data indicates that as barometric pressure rose (an event typical of the coming of clear dry weather), signal strength generally tended to increase as well. This finding should not come as any surprise to veteran weak-signal operators on 6 and 2 meters who know that the changeover between low- and high-pressure weather systems can produce some pretty nice DX contacts at times. What will be surprising to the mathematically inclined reader is the fact that the relationship on 220 MHz was not found to be statistically significant. At least mathematically, the apparent changes in signal levels could not clearly be explained by changes in barometric pressure.

Again, a *possible* explanation exists. As was just mentioned, it is well established and commonly known that weather-front boundaries involving differences between low- and high-pressure air masses do enhance signals over *long* paths, but this experiment was conducted over a relatively short transmission path. It was probably true that over our 10-mile path no sizable differences in barometric pressure existed during our tests, and thus no sharp reflecting air-mass boundaries were available to provide us with significant enhancement of our signals. Certainly, more testing of this idea should take place before the short-path effect of barometric pressure changes on signal propagation is ruled as unimportant.

The next relationship, signal strength and air temperature, is much clearer. Fig. 4 shows a strong negative correlation line between the two, thus suggesting that as temperature over the transmission path lowers, signal strengths tend to increase. This correlation was found to be statistically significant, thus giving some weight to the contention held by many old-time VHF operators that signals were often stronger on a cold, clear day.

Geo-Solar Activity and Its Effect

The effects of the sun interacting with the Earth's magnetic field were, at least by the criteria we used, predictably disappointing. Fig. 5 shows the data comparing the NOAA "A" index with signal strength on 220 MHz. For those not familiar with this measurement, the "A" index is a linear scale which is designed to show variations in the magnetic field of the

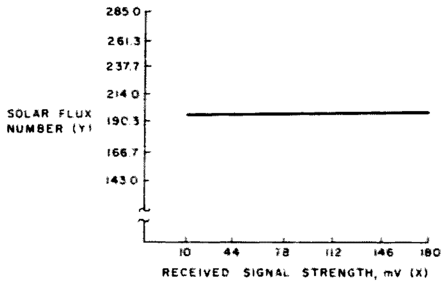

Fig. 6. Solar flux number vs. signal strength.

Earth. This data is collected daily and transmitted hourly by WWV. Although a very weak positive correlation was shown to exist here, this correlation was not found to be statistically significant. In fact, the correlation is so weak as to indicate that the relationship between the two possibly might be caused by strictly random events. Again, it should be remembered that the lack of a significant relationship here for short-path propagation does not in any way prove that geomagnetic variations are insignificant in shaping 220-MHz propagation over longer paths.

The interaction of solar activity and signal strength, as in the prior comparison, also was minimal. Here, as indicated in Fig. 6, though, the lack of any statistically-significant correlation between what are essentially sunspot count numbers and 220-MHz signals was even more evident. Again, any positive correlation of the data was so small as to be explainable in terms of random events or accidents. Thus, a reasonable conclusion to be drawn from this last comparison might be that regardless of changes in the sunspot number, signal levels over short paths on 220 will probably not be improved or hurt significantly as a result.

What Does This All Mean?

The original intent of our experiment and this article was to shed some light on the behavior of 220 MHz. It was felt that if this band were better understood, even in just the area of signal propagation, other amateurs might be more encouraged to explore the band for the first time.

What we found can be summarized in very plain words as a fascinating propagational picture. 220-MHz propagation is not as mundane and as simple as it might seem to the uninitiated. Nor is it so formidable or so unpredictable that the average ham could not understand and even take advantage of it. What does appear to the band user is a colorful propagational world which is probably not quite like what most of us experience on 2 meters and below. Here, over relatively short distances you can expect your signal strength to vary with air temperature, humidity, cloud conditions over the signal path, and possibly to some extent, even barometric pressure. Expect high temperature, high humidity, the presence of precipitation, and the presence of low cloud ceilings to degrade signal levels. On the other hand, our experiment predicts that you can expect relatively cloud-free, cool, low-humidity days (days typically characterized by high barometric-pressure readings) to produce much better signal reports. However, other than providing pleasant conditions in which to work, the sun and its associated sunspot activity cannot be counted upon to either increase or decrease 220 signals over a short path. This lack of effect also appears true for changes in the Earth's magnetic field, as well.

One additional word about the methodology employed here and about the interpretation of our findings is in order before concluding. We realize that more scientific and perhaps more precise results might have been achieved had this experiment been performed with professional equipment and personnel involved. It was, however, performed under conditions which are consistent with the Amateur Radio Service. Consequently, the reader is reminded that the conclusions drawn here are only meant to suggest the indication of *possible* relationships. That is all that the mathematical tools used in the analysis of the data may claim anyway. Certainly, more complete and controlled research should be conducted in these areas and other members of the hobby are heartily encouraged to do so.

The author wishes to extend his sincere thanks to Jim Genisio K9MLK, without whose help this research might have been impossible, to Sr. Rosemary Schmalz, PhD, Mathematics Department, St. Mary of the Woods College, for her assistance in computer analysis of the data, and also to the National Oceanic and Atmospheric Administration, Boulder, Colorado, for their help by providing solar data and general information.■

References

The Radio Amateur's Handbook, Fifty-Third Edition, American Radio Relay League, 1976, Chapter 19.

Thornburg, Bob, "Microwave Mobile Propagation," *QST*, March, 1978.

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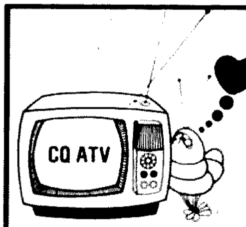

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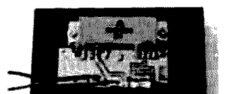

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You need high voltage, but surplus transformers can't turn the trick. Try this solid-state solution.

One drawback of the proliferation of solid-state components has been the disappearance of high-voltage power supplies and components, particularly high-voltage transformers. This became clear about two years ago when I needed a negative 600-volt supply to test a surplus reflex klystron. The current requirements were less than one hundred microamperes. After realizing the junk box no longer contained such traditional items as a 250-0-250-volt television power transformer, I had to come up with a different solution—voltage multipliers.

A times-four multiplier supplied the needed negative 600 volts directly from the 117-volt line. Later, a small transformer with a 115-volt secondary was used to isolate the supply from the ac mains for safety.

Since then, I have made several high-voltage, low-current supplies ranging from 18 kilovolts to 600 volts for applications including infrared image converters, a two-inch oscilloscope, and a simple Geiger counter.

A basic times-four multiplier schematic is shown in Fig. 1. As the input voltage alternates between plus E and minus E, it is easy to see how the circuit multiplies the voltage. During the first half cycle, C1 is charged through D1 to plus E volts. During the next half cycle, C1's voltage is added to the input and charges C2 through D2.

Because some of the charge on C1 is transferred to C2, reducing the voltage on C1, several complete cycles are required to charge C2 to two times peak input voltage E. But, for clarity, let's assume that C2 is fully charged to 2E. During the third half cycle, the voltage across C1 bucks the input and the voltage across C2 charges C3 through D3 to 2E. Now, during the fourth half cycle, the sum of input voltage E plus the voltage across C1, E, plus the voltage across C3, 2E, charges C4 through D4 to a total voltage of 4E.

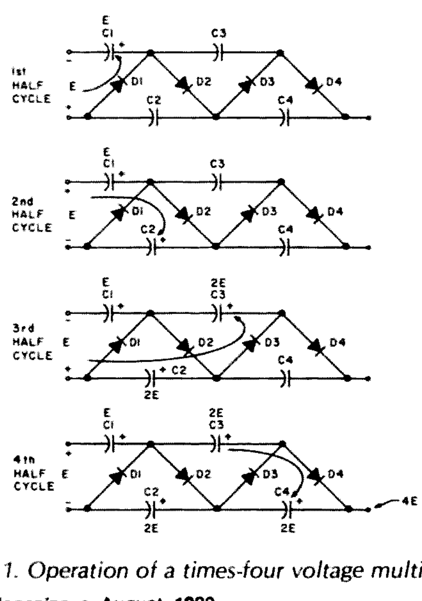


Fig. 1. Operation of a times-four voltage multiplier.

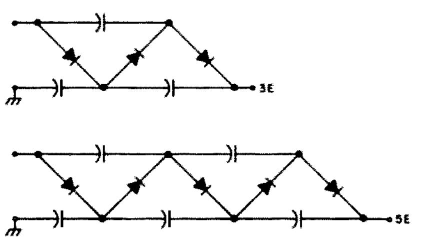


Fig. 2. Schematic of times-three and times-five voltage multiplier.

However, the voltage across C2 bucks the charging voltage and therefore C4 is charged to 2E. The output voltage is the sum of the voltage across C2 and C4, or 2E plus 2E, or simply 4E.

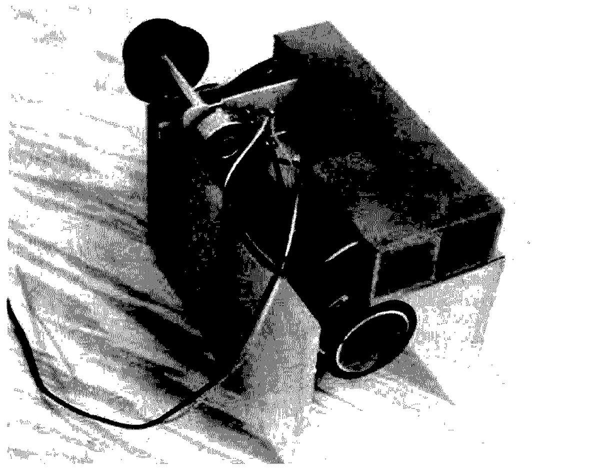
By adding pairs of diodes and capacitors, outputs of 6E, 8E, or higher can be obtained. The breakdown voltage of the individual diodes and capacitors should be greater than twice the peak input voltage.

This is fine for multiplication by even numbers, but what about multiplication by odd numbers to get 3E, 5E, or odd multiples of the peak input voltage? Examining Fig. 1, the sum of the voltages across C1 plus C3 is 3E, but there is also an ac voltage of E volts peak present. By switching the input ac and ground connections, the ac voltage will be on the other capacitor chain and odd dc multiples of the input are obtainable. See Fig. 2. The circuits shown in Figs. 1 and 2 are for positive output voltages. To get negative output voltages, all that needs to be done is to reverse the polarity of each diode (and each capacitor if electrolytics are used).

As an example, I needed an 800-to-1000-volt supply for a Geiger-Meuller tube for a demonstration of radioactivity. I had a 115-volt secondary, 15-milliampere transformer available. Using a times-six multiplier would yield (115) (1.4) (6) = 966 volts.

A multiplier was built with six 1N4006 diodes and six .0075-uF disc ceramic capacitors. The no-load output was measured to be 920 volts. Out of curiosity, I measured the output voltage as a function of the load resistance. The results are plotted in Fig. 3. Actually, Fig. 3 shows two curves, one using .0075-uF capacitors and one using 0.1-uF capacitors. Obviously, the output regulation is much better with the larger capacitors. However, the light loading of the Geiger-Meuller tube permitted me to retain the smaller .0075-uF capacitors.

Another way of improving the output regulation would be to increase the input frequency, which is what I did for an 18-kilovolt supply I built for a 6032A infrared image converter tube. This supply, shown in Fig. 4, consists of two separate supplies driven by a single source. One supply is a twenty-two-times multiplier for the 18-kV anode. The other supply is a times-four multiplier for the focus electrode. Both supplies are driven from a 600-volt, 2-kHz solid-state inverter salvaged from a damaged aircraft transponder. All of the capacitors are .002-uF/2-kV disc ceramics and each diode symbol represents two 1N4006 diodes in series.



Completed 18-kV and focus supply for an infrared viewer.

Originally, the focus voltage was derived from a resistive voltage divider across the anode supply. Using a 100-megohm resistor chain meant that the multiplier had to supply over three Watts of heat that was dissipated in the resistors! Adjusting the focus meant moving a tap, an activity I do not enjoy around an 18-kV supply. By using the second four-stage supply, I could vary the focus potential with a simple potentiometer across the input and the cost of the diodes was cheaper than the resistors.

A 116-megohm load was used as a bleeder and load for the output of the focus supply because the current drain by the focus electrode was negligible. Without this additional load, the output voltage would increase smoothly with the input, but would drop very slowly when the input was reduced. With the resistor present, the focus potential varies smoothly.

The photograph shows the completed supply. The two multiplier chains were potted to reduce losses from corona. Those who might be interested in exact design and analysis of these types of power supplies should read the excellent article by Dr. E. H. Borneman in *Electronic Design*, 7, March 29, 1978, pp. 72–74. ■

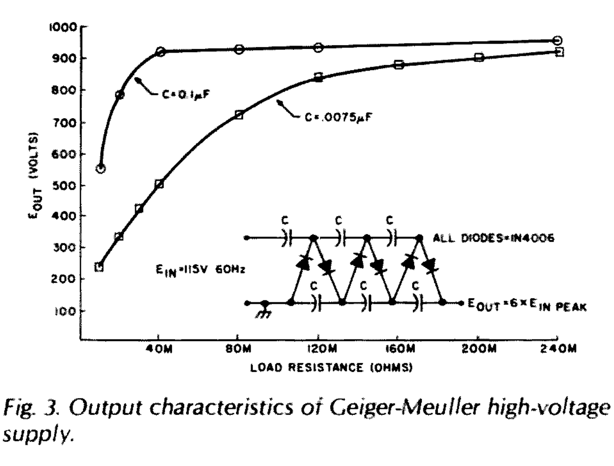


Fig. 3. Output characteristics of Geiger-Meuller high-voltage supply.

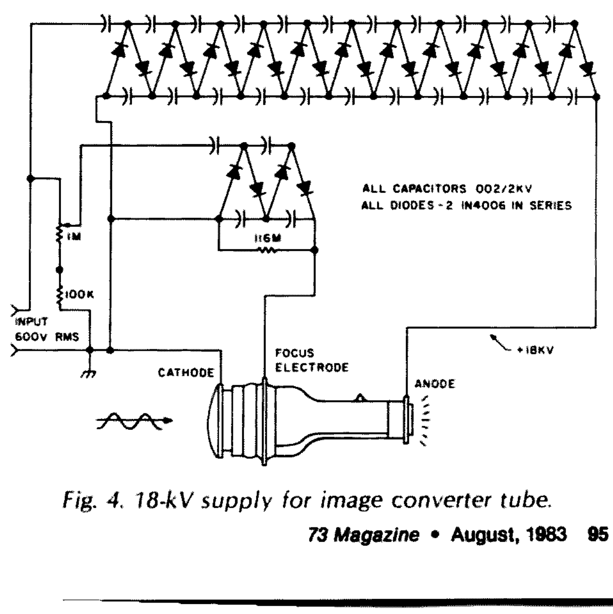


Fig. 4. 18-kV supply for image converter tube.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

CHARLESTON SC
JUL 23-24

The Charleston Hamfest will be held on July 23-24, 1983, at the Omar Shrine Temple, Charleston SC. Talk-in on 146.16/.76. For more information, call (803)-747-2324.

JACKSON WY
AUG 5-7

The 1983 ARRL Rocky Mountain Division Convention, in conjunction with the 51st WIMU Hamfest, will be held on August 5-7, 1983, at the Virginian Motel, Jackson WY. Talk-in on 146.22/.82 and .3923 kHz. For reservations, call the Virginian at (307)-733-2792. For more information, phone R. L. "Pete" Stull WB7AMP at (307)-382-9032 or Dave Gregory N7COA at (307)-875-5324.

MOBERLY MO
AUG 7

The NEMO ARC of Kirksville MO and the Tri-County ARC of Moberly MO will hold the 5th annual North Missouri Hamfest on Sunday, August 7, 1983, at the Moberly Municipal Auditorium, Moberly MO. The auditorium has 12,000 square feet of air-conditioned space for the inside flea market and there will be a limited number of tables available free. Tickets are $1.50 in advance or $2.50 at the door. Doors will open for the flea market and distributors beginning at 8:00 am and for the hamfest, from 9:00 am until 3:00 pm. There will be forums, films, sandwiches, and drinks, as well as donuts and coffee for the early birds. Talk-in on 147.69/.09. For more information and/or tickets, contact Sam Fischer KA0ILO, PO Box 341, Moberly MO 65270.

ANGOLA IN
AUG 7

The Steuben County Radio Amateurs will hold their 25th annual FM Picnic and Hamfest on Sunday, August 7, 1983, at Crooked Lake, Angola IN. Admission is $2.50. Features will include picnic-style BBQ chicken, inside tables for exhibitors and vendors, a large electronics flea market, and overnight camping (fee charged by county park). Talk-in on 146.52 and 147.81/.21.

PITTSBURGH PA
AUG 7

The 46th annual South Hill Brass-pounders and Modulators Hamfest will be held on August 7, 1983, from 9:00 am to 4:00 pm, at the South Campus of the Community College of Allegheny County, Pittsburgh PA. Tickets are $3.00 each or 2 for $5.00. Features will include computer, OSCAR, and ATV demonstrations, as well as a flea market. Talk-in on 146.13/.73 and 146.52 simplex. For further information, contact Andrew L. Plato, 1433 Schauffler Drive, W. Homestead PA 15120.

AUSTIN TX
AUG 12-14

The Austin Amateur Radio Club and the Austin Repeater Organization will sponsor Austin Summerfest '83 on August 12-14, 1983, at the Austin Marriott Hotel, Interstate 35 at Highway 290. Admission is $5.00 in advance and $6.00 at the door. Swapfest tables are available on a first-come, first-served basis, but each seller may also reserve one table in advance for $1.00. Summerfest '83 will combine the Texas VHF-FM Society Convention with forums, meetings, an indoor swapfest, dealer exhibits, and many outside activities for the family at Austin's annual Aqua Festival. Talk-in on 146.34/.94. For more information, write Austin Summerfest '83, PO Box 13473, Austin TX 78711.

DUNKIRK NY
AUG 13

The Lake Erie International Hamfest Association will hold its fifth annual Lake Erie International Hamfest on Saturday, August 13, 1983, beginning at 8:00 am, at the Chautauqua County Fairgrounds, Dunkirk NY. Admission is $2.50 in advance and $3.00 at the gate. Each flea-market space is $1.00 plus admission. There will be indoor dealer exhibits as well as a large flea market. Talk-in on 146.25/.85 and 146.52. For more information, write Lake Erie International Hamfest, PO Box 455, Dunkirk NY 14048.

POMONA CA
AUG 13

The Tri-County Amateur Radio Association will sponsor the TCARA 13th Annual Hamfest and Picnic on Saturday, August 13, 1983, from 8:00 am to 2:00 pm, at the Los Angeles County Fairgrounds in Pomona CA. Tables will be available for ham/computer exhibits and displays. There will be sandwiches and soft drinks available. For more information, contact Tony Skvarek W6ELZ, 1514 W. Mission #14, Pomona CA 91766.

BURLINGTON VT
AUG 13-14

The Burlington Amateur Radio Club will hold its annual International Hamfest and Flea Market on August 13-14, 1983, at the Old Lantern Campgrounds, Charlotte VT. For both days, tickets are $4.00, outdoor flea-market spaces are $2.00, and indoor spaces are $5.00. Food and drink will be available. Talk-in on .34/.94, .01/.61, and .52 simplex. For further information, contact Frank W1CTM, Burlington Amateur Radio Club, PO Box 312, Burlington VT 05402.

TACOMA WA
AUG 13-14

The Radio Club of Tacoma Hamfair will be held on Saturday and Sunday, August 13-14, 1983, at Olson Auditorium, Pacific Lutheran University, Tacoma WA. Events will include seminars, contests, a flea market, commercial exhibits, a dinner, and a loggers' breakfast. A 31" × 6' flea-market table is $10.00 for both days if reservation is postmarked before August 1st and $15.00 if reserved after August 1st. Dormitory and trailer spaces will be available. Talk-in on 147.28 and 224.52. For more information, contact Grace Teitzel AD7S, 701 So. 120th, Tacoma WA 98444, or phone (206)-564-8347.

HAMDEN CT
AUG 14

The seventh annual WELI/Hamden Radio Club Flea Market will be held on Sunday, August 14, 1983, from 9:00 am to 4:00 pm, rain or shine, at Radio Towers Park, Banham Street, Hamden CT. General admission is $1.00 and vendor space is $5.00. For further information, contact Darrow Loucks WA1ZWA, 199 Wayland Street, Hamden CT 06518, or call (203)-288-3765 after 6:00 pm.

GEORGETOWN KY
AUG 14

The Bluegrass Amateur Radio Society will hold the Central Kentucky ARRL Hamfest on Sunday, August 14, 1983, from 8:00 am to 5:00 pm, at Scott County High School, Longlick Road and US Route 25, Georgetown KY (off I-75/64). Tickets are $3.50 in advance and $4.00 at the gate. There is no charge for outside flea-market space. Features will include technical forums, awards, and exhibits in a/c facilities. For more information or tickets, write Edward B. Bono WA4ONE, PO Box 4411, Lexington KY 40504.

MONTGOMERYVILLE PA
AUG 14

The Mid-Atlantic Amateur Radio Club will hold its annual hamfest on Sunday, August 14, 1983, from 9:00 am to 4:00 pm, rain or shine, at the Route 309 Drive-In Theater, 1/4 mile north of Route 63, Montgomeryville PA (6 miles north of the Fort Washington interchange of the Pennsylvania Turnpike). Admission is $2.50 with $1.00 additional for each tailgate space (tailgate setup begins at 8:00 am). There will be refreshments and ample parking. Talk-in on 147.66/.06 (WB3JOE/R) or 146.52 simplex. For further information, write the club at PO Box 352, Villanova PA 19085.

WILLOW SPRINGS IL
AUG 14

The Hamfesters Radio Club, Inc., will hold their 49th annual hamfest and picnic on Sunday, August 14, 1983, at Santa Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of Chicago). Tickets are $2.00 in advance and $3.00 at the gate. Featured will be the famous swappers' row. There will be exhibits for OMs and XYLs. For advance tickets, send a check or money order and an SASE to Hamfesters, PO Box 42792, Chicago IL 60642.

RENO NV
AUG 19-21

The Wide Area Data Group will host the 1983 ARRL Pacific Division Convention on August 19-21, 1983, at the Tennis Pavilion at the MGM Grand Hotel, Reno NV. The convention hall will open at 6:00 pm on Friday, August 19, and close at 3:00 pm on Sunday, August 21. Tickets for convention facilities only are $7.50 in advance and $10.00 at the door; tickets for all facilities including the banquet and after-dinner sessions, are $35.00 in advance and $37.50 at the door. There will be an indoor Swap Meet (with tables available at $5.00 each), forums, commercial and club exhibits, a banquet with Roy Neal K6DUE as the featured after-dinner speaker, an RV park with all hookups, special room rates, and many nearby attractions. Talk-in on 147.63/.03, 147.90/.30, and 222.86/224.46. For reservations for special room rates at the MGM Grand, call (800)-648-5080. For further information, contact Royce P. Bell

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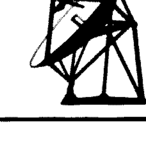

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KD7DI, Public Relations Director, Wide Area Data Group, Inc., PO Box 3132, Sparks NV 89432-3132.

OAKLAND NJ
AUG 20

The Ramapo Mountain ARC (WA2SNA) will hold its 7th annual flea market on August 20, 1983, at the Oakland American Legion Hall, 65 Oak Street, Oakland NJ (20 miles from the GW Bridge). Admission is $1.00 and non-ham family members will be admitted free. Indoor tables are $6.50 and tailgating is $3.00. Talk-in on 147.49/148.49 and .52. For more information, contact Tom Risseeuw N2AAZ, 63 Page Drive, Oakland NJ 07436, or phone (201)-337-8389 after 6:00 pm.

BLOSSBURG PA
AUG 20

The Tioga County ARC will hold its 7th annual Amateur Radio Hamfest on Saturday, August 20, 1983, from 0800 to 1600, at Island Park, Blossburg PA, just off Route 15. There will be a flea market and food will be available. Talk-in on 146.19/.79 and 146.52. For more information, write Tioga County ARC, PO Box 56, Mansfield PA 16933, or contact John T. Winkler WB3GPY, RD #2, Box 269, Wellsboro PA 16901, on .19/.79.

MARYSVILLE OH
AUG 20-21

The Marysville OH Hamfest will be held on Saturday and Sunday, August 20-21, 1983, rain or shine, at the fairground in Marysville OH. Admission is $3.00 each and children under 12 will be admitted free. There will be a large flea-market area and each 10-foot space is $2.00. Features will include inside commercial exhibits, food and free overnight camping on the grounds, and a square dance and entertainment on Saturday night. For more information, contact Union Co. ARC, 13613 US 36, Marysville OH 43040, or phone (513)-644-0468.

HUNTSVILLE AL
AUG 20-21

The Huntsville Hamfest will be held on Saturday and Sunday, August 20-21, 1983, at the Von Braun Civic Center, Huntsville AL. There is no admission charge. There will be exhibits, forums, an air-conditioned indoor flea market, and non-ham activities. Tours of the Alabama Space and Rocket Center will be available for the family. Flea-market tables are $4 per day and should be reserved prior to the hamfest. A limited number of camping sites with hookups are available at the VBCC on a first-come, first-served basis. Talk-in on 3.965 and .34/.94. For more information, write Huntsville Hamfest, 2804 S. Memorial Parkway, Huntsville AL 35801.

LAFAYETTE IN
AUG 21

The Tippecanoe Amateur Radio Association will hold its 12th annual hamfest on Sunday, August 21, 1983, beginning at 7:00 am, at the Tippecanoe County Fairgrounds, Teal Road and 18th Street, Lafayette IN. Tickets are $3.00. Features will include a large flea market, dealers, and refreshments. Talk-in on .13/.73 or .52. For advance tickets and additional information, write Lafayette Hamfest, Route 1, Box 63, West Point IN 47992.

RIVER GROVE IL
AUG 21

The Chicago Area Computer Hobbyist Exchange and the Chicago Amateur Radio Club will hold a joint swapfest on August 21, 1983, from 10:00 am to 4:00 pm, at Triton College, Fifth Avenue (just north of North Avenue), River Grove IL (8600W and 2000N). For more information, call CARC at (312)-545-3622.

ST. CHARLES IL
AUG 21

The Fox River Radio League will hold a hamfest on Sunday, August 21, 1983, at the Kane County Fairgrounds, St. Charles IL. Located midway between Elgin and Aurora in the Fox River Valley, the hamfest can be reached from either the northwest or east-west tollways via the state route 31 exits. Advance tickets are $2.00; at the gate, $3.00. Overnight camper and motor-home parking (available by prior arrangement) is $3.00. All commercial exhibits, contests, and demonstrations will be indoors. There will be indoor and outdoor flea markets. Talk-in on 146.94 simplex or 147.21/.81 (Aurora). For camping, commercial exhibits, and flea-market reservations, contact George R. Isely WD9GIG, 736 Fellows Street, St. Charles IL 60174. For tickets, send a check and a business-size SASE to Gerald Frieders W9ZGP, 1501 Molitor Road, Aurora IL 60505.

WILMINGTON DE
AUG 21

The eighth annual New Delmarva Hamfest will be held on Sunday, August 21, 1983, at Gloryland Park, 5 miles south of Wilmington DE. Admission is $2.25 in advance, $2.75 at the gate. Tailgating is $3.50; bring your own table. There will be limited space under the pavilion on a first-come, first-served basis. Food and drinks will be available. Talk-in on .52 and .13/.73. For more information and a map, send an SASE to Stephen J. Momot K3HBP, 14 Balsam Road, Wilmington DE 19804. For advance tickets, make checks payable to Delmarva Hamfest, Inc.

TRUMANSBURG NY
AUG 27

The annual Finger Lakes Hamfest will be held on August 27, 1983, from 8:00 am to 5:00 pm, at the Trumansburg Fairgrounds, Rt. 96, 12 miles NW of Ithaca NY. Admission is $2.00 at the gate. There will be a flea market, commercial exhibitors, a boat anchor auction, refreshments, and a craft show for the ladies. Talk-in on .37/.97 and .52. For further details, write Dave W2CFP, 866 Ridge Road, Lansing NY 14882.

PORTLAND OR
AUG 27-28

The Hoodview Amateur Radio Club will hold its first hamfest on August 27-28, 1983, at Mount Hood Community College, Gresham OR. Hours will be 9:00 am to 6:00 pm on Saturday and 9:00 am to 3:00 pm on Sunday. Admission is $2.00 and children under 12 will be admitted free. Swap tables will be $2.50 and $5.00. Food will be available and children's activities will be provided. Talk-in on 147.88/.28 repeater and 146.52 simplex. For more information, please send an SASE to Hamfair '83, PO Box 20264, Portland OR 97220.

MONTGOMERY AL
AUG 27-28

The Central Alabama Amateur Radio Association will hold its 6th annual hamfest on Saturday and Sunday, August 27-28, 1983, at the Huntington College Deichamps Student Center, Montgomery AL. The hours will be from 0800 to 1700 on Saturday and to 1500 on Sunday; setups will be at 0600 on Saturday. Admission and parking are free. Features will include a flea market, a DX forum, a RTTY demonstration, and on Saturday night, a dutch-treat buffet with Peter Weatherall G3MLO of Canterbury, England, as guest of honor. Talk-in on 146.04/.64, 146.31/.91, 147.78/.18, or 146.25/.85. For further information or market reservations, write Hamfest Committee, 2141 Edinburgh Drive, Montgomery AL 36116, or phone Phil at (205)-272-7980 after 1700 CDST (2200 UTC).

SEWELL NJ
AUG 28

The Gloucester County ARC will sponsor the fifth annual GCARC Ham/Comp Fest Electronics Show and Flea Market on Sunday, August 28, 1983, from 8:00 am to 3:00 pm, at the Gloucester County College, Tanyard Road, Sewell NJ. Tickets are $2.00 in advance and $2.50 at the door. Parking spaces for tailgaters and dealers are $3.00 each. Doors will open for setups at 7:00 am and indoor and outdoor spaces will be available. (If the weather is bad, the hamfest will be held entirely indoors.) Features will include speakers, seminars, contests, and FCC exams. Talk-in on 146.52, 147.78/.18, and 223.96/224.36. For more information, contact GCARC Hamfest Committee, PO Box 370, Pitman NJ 08071, or phone (609)-456-0500 or (609)-338-4841 days, or (609)-629-2064 evenings.

HERSHEY PA
AUG 28

The Central Pennsylvania Repeater Association, Inc., will hold its 10th annual Hamfest/Computerfest on August 28, 1983, adjacent to Hersheypark, Hershey PA. Registration is $3.00 and wives and children will be admitted free. There will be a special reduced admission to Hersheypark for families of registrants. At the indoor dealer and flea-market area, 10-foot spaces are $8.00 each, 8-foot tables are $4.00 each, and single electric sockets are $1.00 each. An outdoor tailgate area and food and refreshments also will be available. Talk-in on 145.47, 146.76, and 146.52 MHz. For further information or advance registration, write Timothy R. Fanus WB3DNA, Hamfest reservations, 6140 Chambers Hill Road, Harrisburg PA 17111, or phone (717)-564-0897 between 12:00 noon and 8:00 pm.

WENTZVILLE MO
AUG 28

The St. Charles Amateur Radio Club, Inc., will hold its 8th annual hamfest on August 28, 1983, at the Wentzville MO Community Club. Tickets are $1.00 each or 4 for $3.00 in advance and $1.50 each or 4 for $5.00 at the door. Admission per car is $1.00. Features will include a large open-air flea market, dealers, distributors, contests, and food. For tickets, motel or camping information, or dealer reservations, write SCARC Hamfest '83, PO Box 1429, St. Charles MO 63301.

DALTON MA
AUG 28

The Northern Berkshire Amateur Radio Club will hold a flea market on August 28, 1983, at the Veterans of Foreign Wars, West Housatonic Street, Dalton MA. Admission is $1.00 and XYLs and children will be admitted free. Tailgating is free and tables are free on a first-come basis. Refreshments will be sold by the Dalton VFW.

ARGOS IN
AUG 28

The Marshall County ARC will hold their 8th annual hamfest on August 28, 1983, from 8:00 am to 2:00 pm, at the Marshall County 4-H Fairgrounds, State Road 10, Argos IN. Tickets are $2.00 in advance and $3.00 at the door. There will be more space this year and computers, as well as ham gear, will be on display. Table rental is $4.00 and dealers may set up at 6:00 am. Food, hot and cold drinks, and activities for the ladies (including arts and crafts)

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will be available. For more information, write Marshall County ARC, Box 151, Plymouth IN 46563, or call Bob Nellans KB9DE at (219)-892-5224.

LEBANON TN
AUG 28

The Short Mountain Repeater Club will hold the Lebanon Hamfest on Sunday, August 28, 1983, at Cedars of Lebanon State Park, US Highway 231, Lebanon TN. There will be outdoor facilities only and exhibitors must bring their own tables. Food and drink will be available. Talk-in on 146.31/146.91. For further information, contact Morris Duke W4WXQ, 210 Disspayne Drive, Donelson TN 37214.

FLINT MI
AUG 28

The Genesee County Radio Club, the Bay Area Amateur Radio Club, the Lapeer County Amateur Radio and Repeater Club, the Saginaw Valley Amateur Radio Association, and the Shiawassee Amateur Radio Association will hold the seventh annual Five County Swap-n-Shop on Sunday, August 28, 1983, from 8:00 am to 3:00 pm, at Bentley High School, 1150 Belsay Road, Flint Mi. Tickets are $2.00 per person in advance and $3.00 at the door. Children under 12 will be admitted free. Features will include a computer forum, trunk sales, free parking, and a food concession. Dealers may set up beginning at 5:00 am. Talk-in on 146.52 and 147.87/.27. For table reservations, contact Bill Cromwell KU8H, 1204 Overland Drive, Lennon MI 48449, or phone (517)-288-5046.

LARAMIE WY
SEP 9-10

The fourth annual High Plains Ham Roundup will be held on September 9-10, 1983, at Yellow Pine and Pole Creek Campgrounds, Medicine Bow National Forest, 10 miles east of Laramie, Interstate Highway 80, Lincoln Monument turnoff. The campgrounds have been reserved for hams and their families. Bring your own food and drink and stay as long as you wish. Roast beef will be furnished for the potluck supper on Saturday evening. There will be a bluegrass band, a barbershop quartet, and a sing-along. Talk-in on 146.25/.85, 146.22/.82, or 146.52 simplex. For further information, contact Mick Marchitelli, PO Box 731, Laramie WY 82070.

HAMBURG NY
SEP 9-10

Ham O Rama '83 will be held on Friday and Saturday, September 9-10, 1983, at the Erie County Fairgrounds (Buffalo Raceway), Hamburg NY, just south of Buffalo NY. The hours on Friday are 6:00 pm to 9:00 pm and on Saturday, 7:00 am to 5:00 pm. General admission is $3.50 in advance and $4.00 at the gate. The inside flea market is $10.00 and the outside flea market is $3.00. Features will include new equipment, video, and computer displays, technical and non-technical programs, an auction, and a radio test bench. Talk-in on .31/.91 (W2EUP). For more information, contact N. Oldfield WA2ZSJ, 126 Greenway Boulevard, Cheektowaga NY 14225.

JOHNSON CITY TN
SEP 10

The Bristol, Kingsport, and Johnson City Amateur Radio Clubs will hold the 3rd annual Tri-Cities Hamfest on Saturday, September 10, 1983, at the Gray Fairgrounds, Gray TN, midway between the three cities and just off I-81. General admission is $2.00 in advance and $3.00 at the gate; flea market, $5.00. Everything will be indoors and computer enthusiasts are welcome. For tickets or more information, write Tri-Cities Hamfest, PO Box 3682 CRS, Johnson City TN 37601.

MOBILE AL
SEP 10-11

The Mobile Amateur Radio Club will sponsor the Hospitality Hamfest on September 10-11, 1983, beginning at 9:00 am, at Al's Party Palace, 2671 Dauphin Island Parkway (1 mile off I-10). Admission is free. There will be XYL and YL activities, swap tables, adequate parking, reasonable overnight rates, and good food. Talk-in on 146.22/.82. For more information, write Jim Wilder N4GUC, (205)-343-7365.

WINDSOR ME
SEP 10-11

The Augusta Emergency Amateur Radio Unit will hold the 1983 ARRL-sanctioned State of Maine Hamfest on September 10-11, 1983, at the Windsor Fairgrounds. The gate donation is still $1.00 and camping is $2.50 per night. Features will include a flea market, programs for all, speakers, commercial distributors, light meals, and the traditional Saturday bean and casserole supper. Talk-in on the 146.22/.82 repeater or on 146.52. For further information, contact N1AZH, RFD #2, Box 3676, Greene ME 04236, or phone (207)-946-7557.

MONETT MO
SEP 11

The Ozarks Amateur Radio Society will hold the 2nd annual Ozarks Amateur Radio Club Congress & Swapfest on Sunday, September 11, 1983, beginning at 11:00 am, at the Monett City Park, junction of highways US 60 and MO 37, Monett MO (about 40 miles southwest of Springfield MO). There is no admission charge and no charge for swappers and tailgate traders (all space available on a first-come, first-served basis). The picnic and social hou begin at 1:00 pm. Bring a single coverec dish to the country-style picnic and share ir the buffet. Clubs are urged to attend as a group with an intent to form an alliance tc expand the event in future years. Talk-in or 146.37/.97, 146.52, and 7.250. For more infor mation, contact OARS, Box 327, Aurora MC 65605.

BOULDER CO
SEP 25

The Boulder Amateur Radio Club wil hold its fall swapfest, Barcfest, on Sep tember 25, 1983, from 9:00 am to 3:00 pm at the National Guard Armory, 4750 N Broadway, Boulder CO. Admission is $3.00 per individual or per family. There will be an indoor and outdoor flea market a snack bar, and free parking. Talk-in or 146.10/.70 and 146.52 simplex. For more information, phone Tim Groat KR0U at (303)-466-3733, or write 1000 East 10th Avenue, Broomfield CO 80020.

HAM HELP

I need service manuals for the HQ-129X and Lavoie LA-261 oscilloscopes. I will pay for copies.

John Poplawski WB2GFR
9 E. 15th St.
Bayonne NJ 07002

Wanted: tuning slug or L105 coil assembly for a Collins R388. I am also looking for coil-winding information for the 20- and 40-meter plug-in coils on a pre-WWII Meissner signal shifter.

Walt Hill NM6L
Rt. 2, Box 323 Aliso Circle
Bishop CA 93514

I am looking for the schematic and manual for the Collins 75-A3 receiver. I will pay a reasonable price for the original or copies, plus all postage costs.

Donald D. Kupferschmidt WB9YYA
3004 N. 70th St.
Milwaukee WI 53210

Does anyone have the manuals or schematics for a Gonset G-76 6-80-meter transceiver and a Signal Corps BC-659 transceiver? I will pay a reasonable price for copies.

Gene Smith KA6ZAH
PO Box 240
Oroville CA 9596

I need the addresses for Jerold Antenna Corp., Galvin Antenna Corp., and Grundig Radio Corp. I also need manuals for the Eico 944, the Eico 625, the Jerold 704B TV SWR meter, the US army ME6 multimeter the US army TS-155E/UP, the B & K TV analyst 1076, and the Grundig 3165U. I have an Eico 950B manual if anyone needs it.

Kevin Nea
Rt. A Box 221
Flippin AR 7263

I am looking for modifications for the Davco DR-30 receiver. I would also like to purchase any Davco receivers, speakers or power supplies in any condition.

Michael Crestohl VE2FW
PO Box 64
Victoria Station
Montreal, Quebec
Canada H3Z 2Y7

I need schematics for the following: KIN TEL model 301 voltage standard; RT-66 transceiver; BC-983-A VHF/UHF radio modulator; BC-638-A frequency meter with type 5004 monitor crystal; Nems-Clarke noise-factor measurement unit, type NTS-200; and Hickok VTVM, Navy Model OBQ-1.

John C. White WB6BLV
560 North Indiana
Porterville CA 93257

I am trying to find any kind of information, including the manual, schematic, or even old ads, for the Hallicrafters FPM 200 transceiver. It is a solid-state rig made around 1959-60.

Hans Zimmermann HB9AQS
PO Box 5C
CH-3780 Gstaad
Switzerland

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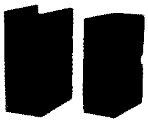

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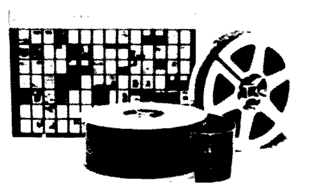

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HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared post cards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½" × 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

A small group of Limassol amateurs is trying to organize a club station and attract young people to the hobby, but our own means are not sufficient to do so. We are making an appeal to amateurs worldwide for help, either in equipment or funds.

Aris Kaponides 5B4JE
Secretary, Limassol CARS Group
PO Box 1723
Limassol
Cyprus

I have an Osborne 1 computer and I would like to get on RTTY. Could anyone help me find software for it?

Orbra W. Bliss W9GEK/HC1BW
Box 3000
Opalocka FL 33055

I have an Eico model 324 rf signal generator kit. I would be very grateful if someone sent me the assembly manual, schematic diagram, parts list, or any other information about it.

Darshan V. Bhatia
6-3-345/3, Rd. No. 1
Banjara Hills
Hyderabad-500034
India

Telephone buffs: Could you assist me with schematics and data for GTE's telephone intercom, which uses an Orbit Industries PC board? The board is a DA-2. I am repairing the unit for a needy elderly couple.

J. F. Johnston W6ESK
14210 Douglas Lane
Saratoga CA 95070

I am writing this as a reply to the many hams who answered my ham help letter requesting diode ratings. I was very pleasantly surprised at the amount of replies I received. Thanks, fellows, for the wonderful turnout of mail and phone calls.

G. Kitts KA3IMO
38 Queenlily Road
Levittown PA 19057

I have a Sears model 412 3880 0700 (which was made by Yaesu a few years ago). I would like any modification information to put it on 145-148 MHz. I am also looking for the external channel selector for it, model 3881. And if anyone can tell me about using the VIC-20 on SSTV, or video reception of satellite photos, please get in touch.

Ken Walker KA4WBR
Route 3, Box 97
Rocky Mount NC 27801

I'm looking for operation and maintenance manuals for the following military-surplus signal generators: TS-418/URM-49 (400 MHz to 1000 MHz) and TS-510A/USM-44A (10 MHz to 420 MHz). I will copy and return the manuals or pay a reasonable amount for your copying expenses.

Bruce A. Rahn WB9ANQ
410 Coronado Trail
Enon OH 45323

I need information on the PLL of the Icom 22. My unit drifts out of lock and returns, apparently from a thermal intermittent. I am also seeking any information on redesigning the 22 for band expansions. Finally, does anyone have an EPROM substitute for the diode board?

I will gladly pay for copying or mailing costs.

Robert Palmer
Unit 705-So
520 Palm Springs Blvd.
Indian Harbour Beach FL 32937

I have a Pickering Radio Company model KB-1 CW keyboard, serial number 182. It works well except it makes a J when I press the Ø key. I do not have a schematic of the unit. Can someone help me?

John A. Barolet KJ3E
108 Elliott Court
California MD 20619

I need a schematic, power plug, and any information on a KLM 10-160BL 2-meter amplifier.

Tom Norris KA4RKT
Rt. #1 Box 412
Auburn KY 42206

CORRECTIONS

"Unleash the TS-900," which appeared on page 10 of the February, 1983 issue, should have been titled "Unleash the TS-9000"; in addition, Q8 in Fig. 4 was drawn with the collector and emitter leads reversed.

Avery L. Jenkins WB8JLG
***73* Staff**

On page 87 of the July issue, in "Down-Under Depth Sounder," the construction notes said that pins 8 and 16 of IC4 and IC5 should be soldered to the board last. Actually, these supply pins should be soldered first.

Avery L. Jenkins WB8JLG
***73* Staff**

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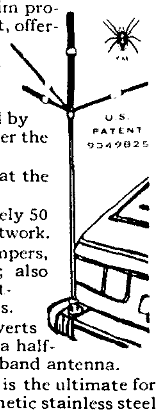

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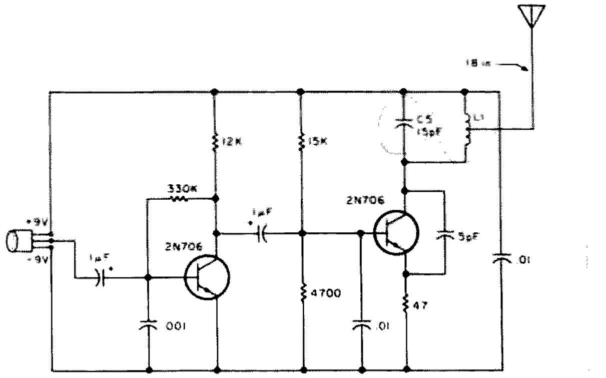
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73 Magazine, Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*

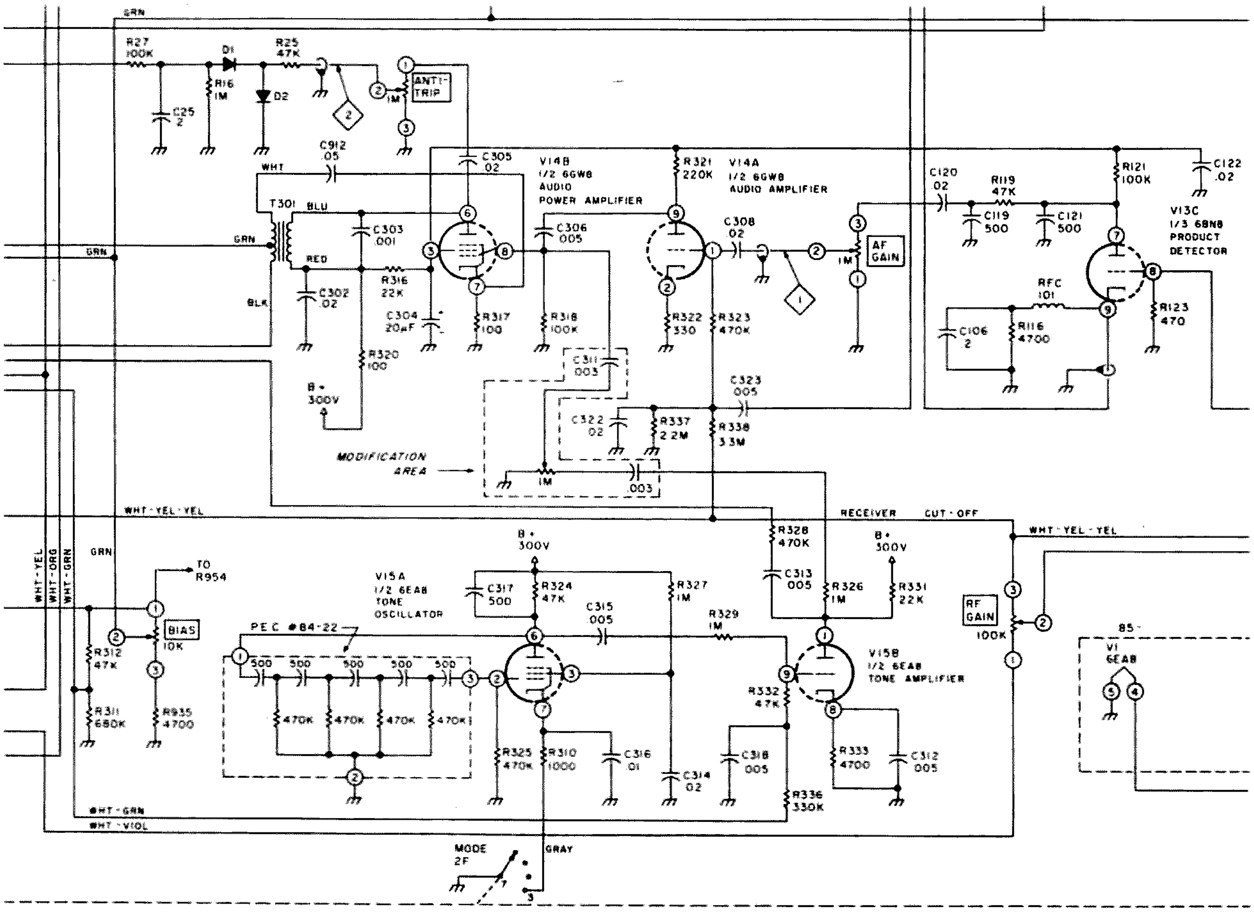
WARPING ZENER VOLTAGES TO AN EXACT VALUE: Most people think of a zener diode as being a fixed reference voltage, perhaps containing some tolerance around the nominal voltage, but fixed nonetheless. In fact, a zener's voltage is rather dependent upon the current flowing through it. By varying the zener current, the reference voltage can usually be varied by about 10 percent. For example, a nominal 12-V, 1-W zener diode (1N4742) can be set to any voltage between about 11.5 and 12.5 V. Thus, by using a combination of zener and potentiometer, a very precise reference voltage can be obtained. However, this is a relatively high impedance source and loading will change the zener voltage.—Craig Crichton K7UKW, The Dalles OR.



SIMPLE FM TRANSMITTER: This transmitter can be tuned to the FM broadcast band, 2 meters, or other VHF bands by changing C5 and L1. The values given for C5 and L1 will place the frequency somewhere in the FM broadcast band. L1 is 4 turns of #20 enameled wire airwound, ¼ inch in diameter, 5mm long, and center-tapped. The microphone is an electret type and the antenna is 18 inches of any type of wire. Keep all leads as short as possible to minimize stray capacitance. The range of the transmitter is several hundred yards.—James Kretzschmar N4HCJ, Huntsville AL.

MEMORY POWER SUPPLY FOR THE ICOM IC-720A: The IC-720A memory for both vfo's can be powered by the Radio Shack 9-V-dc Battery Eliminator (cat. no. 270-1552). To interface the supply to the rig, cut off the snap connector of the Battery Eliminator and replace it with a phono plug with the positive lead going to the center conductor of the plug.—Charles Hall N4ESJ, Sterling VA.

VARIABLE SIDETONE FOR THE HW-101: This circuit adds a separate volume control for the 101's CW sidetone. Remove C311 and use the mounting holes to connect the additional components to the board. The value of the capacitors is not critical; any combination between .002 and .005 uF should work.—Vernon Henry, Manchester NH.



W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 6

recorder is opening up the unwanted television transmitting hours to prime-time watching via delayed viewing, we amateurs might start thinking in terms of sending messages to friends rather than actually talking with them. Our soon-to-come satellite will work this way. We'll send a message to it which will be stored and then, as the satellite circles over Bangkok, say, it can be dumped upon demand.

The cost and bother of writing letters is a limiting factor, but if we could keep in touch every day or so with a hundred friends via amateur radio messages, messages which would be delivered error-free and without fail, I wonder how we would look at our hobby. The DXpedition in Burma could be reached via messages which would be queued up for them, each then answered and confirmed.

Or perhaps you're willing to fight to death to keep amateur radio the way it is today... virtually unchanged in the last 50 years. I've enjoyed what we've had, but I'm looking for change ... for faster, surer communications. I'd love to swap messages with old friends... Eddie W2OCL, Frankie W2OCM, good old Walt W2LBF, Frank W6AOA, Reg W6ITH... old ham friends from places where I've lived, such as Sarasota, Hampton, Brooklyn, Troy, Dallas, Cleveland... hams from countries I've visited all around the world. It's a real bear finding Paul 9M8PW on the bands in the few minutes a week I have available, yet I'd like to keep in touch without the dollar or so postage and three weeks for airmail to Borneo.

We'll see what comes of the latest FCC effort toward deregulation. I'm certainly behind them 100% on this one.

POTENTIAL GROWTH

Should my modest concept of having a ham club in every school in the country come about (and I think it can be swung), there is going to be some demand from this program for assistance from existing ham clubs... a need for information to help faculty advisors cope and a need for beginner-type study courses.

For starters, I'd like to devote at least a page of *73* each month to a message of inspiration for potential club members, something which might be posted on the bulletin boards of schools along with meeting notices. You can help with this. You can help a lot, actually. Sure, I can write little messages telling about the fun I've had in amateur radio, but I'm just one of over a million hams around the world, so every possible experience I've had has been eclipsed a hundred or thousand times over... if you'll think about it and write.

I'd like to have some of your stories telling us why you enjoy amateur radio. I'd like to hear about some of the things which have been exciting to you about the hobby. I'd like to hear how it may have helped you in some way. I know that ham radio saved my life once and the lives of a whole bunch of my friends. There are stories in every ham... and some of them are very exciting. Let's get them told and see if we can use the enthusiasm that you and I have built up for this wonderful hobby to spark interest in yet another generation of hams. We need them.

There are fascinating stories of DXpeditions, of moonbounce operations, of contest operations, of getting medicine to some remote spot of the world to save a life, of rescue at sea... and all of these can be translated into what are almost typical personal experiences as examples of what amateur radio has to offer the newcomer.

Sure, I can write about those bitter cold nights on top of the local mountain, Mt. Monadnock, trying to establish contact with WA1KPS with an experimental 10.5-GHz transceiver. I had to have it pointed in exactly the right direction and be tuned to exactly the right frequency at the right time to make it go. I stood there in the cold framework of a fire tower with the wind whipping me into numbness, holding onto the transceiver so the wind wouldn't whip it off into the night and aiming its little horn antenna hopefully in the right direction, a flashlight cradled by my head against my neck to light up the dials. I'm not sure why such misery is fun, but it sure is.

I remember the night when I was on my first DXpedition. We were sailing toward Navassa Island from the Bahamas and were in the grips of a fierce storm. It was pitch black and the ship was rolling almost beyond recovery every now and then. I'd been on watch all night because no one had dared to try to get up to the bridge in the storm. The captain was there, convinced that the black mass looming ahead was just another inky cloud, while I was sure it must be land. Just moments before we would have crashed on a reef offshore of the island, I spotted a small light, convincing the captain that perhaps it was not a cloud.

Then there's the time two other hams on a trip with me came within minutes of being killed by the Shifta tribesmen of Somalia when we were driving in the great Rift Valley in the Kenya desert. But was that any more exciting than sitting in Puerto Rico and hearing ham signals bouncing off the moon on 1200 MHz from all around the world... and working them?

Your stories don't have to be dramatic; we just want to know what it is about amateur radio that makes it such an important part of your life. My own life is riddled with it. So, probably, is yours. What gets you? Is it traffic handling? Contests? Certificates? Outdoing others with over-the-air filth? Jamming repeaters? DXing? Eyeball nets? Hamfests? Dig down in your memories and give me the material to fire the imaginations of a million kids... two million. And please double-space it, okay?

JOBS AND CAREERS

Back in 1960, one of the kindest people to me that year was the publisher of *CQ* who fired me. I was at a loss for a few months, looking around for what to do next. I tried an ad agency and hated it. The idea for a new ham magazine devoted to building small construction projects was eating at me, but it takes a bundle of money to start a magazine and I had no big bundle.

Efforts at firing the enthusiasm of a couple of hams with money came to naught. So, despite my involvement with putting on a Hudson Amateur Radio Council convention in New York, getting Mensa started, being involved deeply with car rallies as president of the Porsche Club, and so on, I decided what the hell and got *73 Magazine* going. The work started in May and the first issue came out in October. Fortunately, it was in the black and the long haul toward success was started. I'd sold off everything I could to get things going... my boat, plane, horse, one of my Porsches—anything which would bring in some money.

Just as the magazine was really getting going (in 1963), the "Incentive Licensing" debacle hit and within a couple of years 80% of the ham dealers in the country were out of business, taking away both the counter sales of the magazine and a lot of advertising. Then virtually every major manufacturer went either out of business or into something else. We got down to about five people to survive those hard years.

It wasn't until around 1970 and my discovery of FM and repeaters that things began to turn around. By publishing hundreds of articles, organizing FM symposiums, putting out a dozen or so books on FM and repeaters (even a special *Repeater Bulletin*), I began to build up interest in this activity. *QST*, *CQ*, and *Ham Radio* either fought me or were indifferent to FM, so I got no help from them.

By 1975, we were finally in fairly good shape, despite a hard battle with the IRS over expenses of ten years previous. This was when we started *Byte*... only to have it disappear in the middle of the night after a few months of getting an incredible start. Bent, but not stopped, as they say, we worked hard to pay off the mountain of bills left by *Byte* when the magazine left, taking its fat bank account with it. As soon as we could, we started *Kilobaud Microcomputing*, which took off fine. That was in January, 1977. In 1978, we started our Instant

Software division with one technician working out of the potato cellar. That grew to where we had to get a whole building for it. . .our Elm Street building.

By 1980, we'd seen the growth of the TRS-80 and figured that we'd try something new: a system-specific magazine (*80 Micro*). It was a first and started off with 132 pages. By the end of the first year, it was up over 400 pages!

By late 1981, we were able to get *Desktop Computing*, a magazine in plain English for the businessman, going. And then a year later, *inCider*, our Apple magazine, was up and running, following the same successful path of *80 Micro*.

All this meant more people, more buildings, and a development of our management team. Almost everyone coming into Wayne Green Inc. started out from the bottom, learning from those already here and then working on up into management.

Now the growth is picking up. This month we started *Hot CoCo* for the Radio Shack Color Computer, and we have a growing number of new publications in the planning stages. We're even thinking of getting into a new-magazine-a-month mode by next year!

There are plans for developing a college, a combination high tech and business college. We're working toward a possible television station. We're going to be expanding our book department substantially. . . and so on. All this means, of course, that we're going to be needing a lot more people to help with the growth.

At present, we have about 250 people. In a year, I think we'll be running about double this. . . and double again within another year. This means that we have an awful lot of good hot career spots open for people interested in working in magazine publishing, education, graphic arts, data processing, writing, editing, technician work, programming, sales, marketing, sales force managing, circulation, writing up new products, and so on. No, we don't have a lot of spots for top management. We're both lean on management and primarily interested in developing managers from our own ranks so they will know what we're doing and how it all fits together. Oh, we'll be needing some experienced people to help get completely new projects going.

While most of our development will be in New Hampshire, we are going to test out an idea in Boston and see if it flies. If so, we may be looking for teams in every major city around the country to work on similar projects. And if the pilot project college is a success, can there be college franchises?

One of the best things about our success has been the fun involved. The people working here have been having a fantastic time. Ideas are constantly springing up for new divisions of the business. . .new publications. . .promotions.

So, if you're looking for a career, what we're doing up here in New Hampshire may be what you're looking for. You can't find a better place in the country to live and work. No, we still don't hire smokers, so our air is crystal clean. Even if you've quit smoking *recently*, please don't call, okay? We want people who are not addicted to drugs. . . even tobacco. We have beauty in our mountains, the lowest taxes in the country, surprisingly low-cost housing, and a quality of life that California only wishes it could provide.

Readers with small high-tech firms should start thinking in terms of an eventual move to New Hampshire. I'm aiming at starting a high-tech industrial complex which will have a good low-cost pool of high-tech youngsters available to work at product design, production, programming, sales, and so on. You'll have a chance, once we get going, to get the cream of the country's brains, helping them to train for life and getting their enthusiasm at bargain rates.

Keep thinking about this. I'll have more news as we move ahead.

WWII FINAL BATTLE WON!

A card from Joe Vegh W5VSV of Corpus Christi put things into an interesting perspective. He says, "Dear Wayne: Sorry about your undying love affair with the Nipponese! I'll straighten screws, glue on decals, touch up paint, and complain like hell to the manufacturer, but I will not knowingly buy Nipponese products unless there is no other choice *and I need* the products. It is a sorry thought indeed that our government purchases products from a nation which caused us so much pain! The final battle of WWII is now in progress!"

Amen! Yessir, I got to thinking about Joe's position on this and as a veteran of WWII, I can see where he's coming from. Those Nipponese worked hard and long to try to kill me during the war, and they did manage to polish off about 20% of my shipmates in American submarines. When I look back at the trouble the Japanese caused (and the Germans and the Italians), why, it makes my blood boil.

And just a generation earlier, those Germans, along with the Austrians, Hungarians, and so on, were out there killing my parents' friends. These are things that we probably should not forget when we are shopping and thinking in terms of a Porsche car or even a German meal. But that isn't the end of it by any means, because when I look back in my genealogy books, I find that a surprising number of my ancestors were being fought by the British in the revolution. I wish I'd thought of that when I was shopping for a Jaguar car a couple years ago. Those English scoundrels killed tens of thousands of pioneer Americans.

And what about the rebs in the Civil War? You can bet that the next time I see a southern fried chicken franchise I am going to turn and head the other way. Just think of the thousands upon thousands of Yankee youngsters that were slaughtered by the rebels!

And how many of you have forgotten the Alamo? Should we casually forget the brutal killing of our patriots in San Antonio. . .and not all that long ago, either? I'll bet that if Joe thinks about it, he'll be right out there on the Rio Grande with a machine gun wiping out the wetbacks who are infiltrating our country and taking away the low-paying jobs from our inner city illiterates.

Perhaps we should think more in terms of blacklisting businesses who consort with our known enemies. We're already doing this to some extent with firms who are doing business in South Africa, and they haven't even fought a war against us yet! The Arabs have blacklisted firms doing business with Israel, such as Coca Cola; you get Pepsi in most Arab countries. Well, I want you to remember the next time you see a McDonald's that they have branches in Germany, Italy, Japan, Britain, and so on. The same goes for the southern fried chicken chain.

The brutal fact is, if you look at it, that about the only major country in the world we haven't had a war with is Russia. That's something to think about when you are looking to see where your real friends are, isn't it? You know, thinking about that, the fuss over the huge American military budget (which is mostly to threaten Russia), and the growing groups against nuclear weapons, perhaps we could make everyone happy with one simple change. I know this is a daring thought, but it seems to be the direction that the nuclear opponents and disarmament groups are headed—what if we just turned America over to Russia?

With the US and the USSR together, we could take over every other country in the world in a couple of years, setting up a real world government. Then, without the need for military spending by *any* country and an end to coups in the erstwhile Third-World countries, we could all work toward getting enough food to feed everyone.

We hear a lot about Hitler killing twelve million people during the war, but we don't hear so much about the even greater number that Stalin wiped out to consolidate his power. With such ruthless control from Moscow, we might see countries like India cut back in population to a more controllable number. The Russians have managed to get used to communist rule and the slave labor camps that go with it, so we probably could, too. I'm sure that many people would prefer that problem to a nuclear war. . .right? Heck, we have people ready to die to fight nuclear power plants!

Without the need to support a monster military-industrial complex, I'll bet we could most of us go back to farming, cultivating a small plot of land and taking it easy. We wouldn't have to work so hard to support the government bureaucrats. . .which is taking over one third of our work these days, as I recall. We could get rid of our computers, most of our telephones, throw out the television, and go back to

the simple life of a hundred years ago.

Isn't it interesting what creative thoughts a new point of view can generate?

SCI-FUN

With the awakening interest in science, there may be an opportunity for all you ex-science teachers who have gone on to greater earnings in industry to reap some benefits. Just because you are making a lot better living in the electronics industry doesn't mean that you can't still teach. . . and make more than ever.

My utopian view of the ideal teaching system encompasses the concept of learning being fun. It has to do with people learning under their own steam instead of the system I grew up under: slavery. Yep, I'm looking forward to the emancipation of kids. I *had* to go to school every day. It was the law. There was no free will about it.

Now that there seems to be a sprinkling of parents who are becoming aware that educators have been going with the flow, making more and more of our government-run educational system plain vanilla, perhaps it is time for an alternate approach, at least as far as science education is concerned. I have the concept for a series of books which would make science fun. . . not only for kids, but for anyone interested in taking a few hours away from Monday Night Football, M*A*S*H reruns, and other prime-time garbage which lines our way from the crib to the coffin.

If you think you're a good enough writer to put together a book which will cover some particular aspect of science and do it in both an entertaining and informative way, start outlining what you have in mind, write a first chapter, and let's see if we might be in business.

THE AGONY OF DEFEET

In amongst all of the usual bad news (which must sure be popular since there is so much of it) was a news flash of particular interest to me. It had to do with a recent medical breakthrough to the effect that flat feet are now being considered as normal.

When I was young, having flat feet was on a par with the heartbreak of psoriasis. I had 'em. I mean that my footprint in the locker room coming out of the shower was square. I had no detectable arch at all. Well, I suppose the flat feet went well with my knock knees.

Those damned arch-support shoes may be okay for people with weak arches, but they are terrible for people with perfectly good, though flat, arches. The foot experts did everything they could to get my flat bones to arch, adding a good deal of extra pain to my already painful teen years.

When I was twenty, the government decided that there really was not going to be any way to bring the great war to a successful conclusion without my full cooperation. They reasoned with me about this with draft notices, but I escaped death in the trenches by joining the Navy. Well, with flat feet I figured I probably could swim better than I could walk.

Already being a ham at the time, I opted for their radio technician training, which turned out to be incredibly good, truly an anomaly for the government. After nine months of this training, it was time to go into the fleet. Since I'd have the best chance to be my own boss on either a submarine or a destroyer, the extra pay and the special food you get on submarines swung it that way. I volunteered.

They have a tough physical for the submarine service. I was sent down to be checked out. I sat there with all the others, memorizing the eye chart. But when it came my turn, they said "too fat; next."

Not to be dumped out of submarines that easily, I pressed them. How much overweight was I really? They grudgingly looked it up and said I was eight pounds overweight. This was Friday, so I asked if I came back Monday eight pounds lighter I'd pass. Sure.

Early Saturday morning, I was out on the grinder running. I then went over the damned obstacle course four times. Then I changed into my liberty clothes and headed for San Francisco, where I walked miles, ending up at a steam bath. I steamed for hours, the sweat pouring off.

By Monday morning, I was almost totally exhausted. I'd had nothing to eat since Friday and hardly anything to drink. I dragged myself into the sick bay examination room and presented myself for weigh-in. Sure enough, I was ten pounds lighter! The doctor was not terribly impressed. He took another look at me and said, "You're disqualified for submarine duty because you have flat feet."

I was furious as well as incredibly tired as I staggered back to the school. When I got there, they asked me if I'd passed the submarine physical. I said sure, and that was that. As the depth charges dropped around us off the coast of Japan, I looked at my medical records where it was clearly stamped in red: DISQUALIFIED FOR SUBMARINE DUTY.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

The Cheynes II, *a former whaling tender, carried the Heard Island DX Association 15-member team to and from Heard Island.*

THE HEARD ISLAND STORY

This year, DXers have enjoyed not one but two successful DXpeditions to tiny, frozen Heard Island in the southern Indian Ocean. The "Heard Island Expedition" won the race to Heard (see this column, January, 1983) with VK6FS first in the VKØCW logbook on January 22. Jim Smith's "Heard Island DX Association" group arrived soon thereafter, and for a few days, DXers worldwide had a choice of Heard Island stations to call. Despite poor band conditions, by the time bad weather forced the two groups off Heard, DXers had made about 45,000 QSOs with the DXpeditioners.

A few months later, the primary operators of both Heard Island DXpeditions met at the International DX Convention in Visalia, California, and at the Dayton Hamvention in Ohio in April.

Al Fischer K8CW Heard Island Expedition

On the last day of December, 1982, the Heard Island Expedition departed Perth in western Australia for Heard. For two and a half weeks the expedition yacht, the *Anaconda II*, battled the winds and seas of the notorious southern Indian Ocean before making landfall at Kerguelen Island, about 300 miles north of Heard. The winds blew out 25 sails during the passage, and the DXpedition generators got a good workout supplying electricity to the sewing machines repairing ripped sails. Any expedition member venturing out on deck kept a safety line firmly attached to the boat, as the rough seas made falling overboard an ever-present concern.

The *Anaconda II* reached the comparative calm of Atlas Cove on Heard Island on January 21, but the amateur radio operators learned that the old radio towers hadn't survived the last winter. The DXpeditioners appropriated one of the best-preserved of the numerous shacks abandoned 30 years ago. The tribander and vertical went up, the Icom transceivers were connected up to the amp supply linears, and VKØCW went on the air.

At first, Al couldn't raise a pileup from Heard. Simultaneous pileups on Chad, China, and others made DXers overlook the comparatively weak signal out of the Indian Ocean. Al finally got the contacts rolling, however, and, with the help of Dave VK3DHF, made more than 30,000 contacts in the next month.

The Icoms survived the harsh environment faultlessly, and even the tribander outlasted all but the strongest winds. Unfortunately, propagation on the higher bands was poor. 20 and 40 meters provided most of the contacts, and a beacon on 6 meters went unanswered the entire trip. Al found California DXers hardest to work, since the radio path to California passed directly over Europe, and he couldn't get European DXers to stand by during the short propagation window to W6.

The stay on the island was not without its hazards. A constant wind blew fine vol-

canic sand into everything: sleeping bags, food, clothing. It was so cold that Al left the amp supply linears on all the time, for warmth, even though Australian regulations prohibit the use of linears on CW. The DXpeditioners also provided communications for the mountaineering group tackling Heard's volcanic peak, Big Ben. This short-range communication task forced the amateurs off the DX bands during some of their best propagation, as the generators had to be turned off. Perhaps worst of all, the amateurs had only 2 cases of beer to last 6 weeks!

Between stints at the radio, the DXpeditioners assisted some of the scientists on the expedition with their research. Since the largest plant life of the island is no bigger than a cabbage, scientific interest centered on an abundant bird population and the colonies of elephant seals. So when Al wasn't handing out Heard Island contacts, he was chasing (and tackling!) penguins for blood samples!

VK0CW lost the triband beam in a hurricane, but it was a tribute to the advance planning that the expedition had so little trouble. The tribander was equipped with newly-machined parts, since regular hardware would have had little chance against Heard's hostile climate. The expeditioners even spent a night in a deep freeze in Australia, testing their tents and sleeping bags against the anticipated harsh weather.

Jim Smith VK9NS—
The Heard Island DX Association

Meanwhile, Jim Smith's group was having transportation problems. Their chartered ship, the *Cheynes II*, had to put back into port twice, putting the group behind schedule. By the time the 15 members of the Heard Island DX Association DXpedition landed on Heard, the Heard Island Expedition had been on the air for more than a week. And this was just the start of Jim's troubles.

The first group grabbed the best of a sorry lot of abandoned shacks at the Atlas Cove landing site. Jim Smith's group had to set up shop as far away as possible, to avoid mutual interference, but the remaining shacks were uninsulated and doorless. The hard ground made driving guy stakes almost impossible, and their Minooka Special didn't even last the first night. The 3-element monobanders for 10 and 15 were useless, with the low maximum usable frequencies. Intermod problems between the two DXpedition stations, less than a half-mile apart, kept the two groups from operating 20 meters at the same time. At times, Heard Island transmitters sat idle, with no one calling!

Weather conditions went from bad to worse on Heard. The barometer plummeted as a hurricane lashed across the island. The Heard Island Expedition, whose mountaineering team had reached the top of Big Ben, packed up their gear and boarded their ship for the sail back to Australia. The high winds and waves forced the *Cheynes II* to fire up its boilers, to avoid being dragged onto the rocks. But the *Cheynes II* was critically short on fuel from its long, upwind trip to Heard. So once the engines were started, the Heard Island DX Association group was forced to curtail operation, leaving Heard after only 14,000 contacts. But the storm did further damage. *Cheynes II*'s motor launch, used to ferry personnel and equipment between ship and shore, sank in the heavy seas. The Heard Island DX Association mountaineering team, thwarted in their attempt to climb Big Ben by, of all things, too warm weather (4-5 degrees Celsius—about 40° F.), was trapped on the other end of Heard, with no way to get to the *Cheynes II*. The *Anaconda II* loaned their inflated Zodiac tender to rescue the stranded climbers.

Even the return trip was not the easy downwind sail predicted. The *Cheynes II* was so low on fuel by this time that they "sailed" most of the way back to Australia. "Drifted" might be a more accurate description of the process, as sheets and tarps were fashioned into makeshift sails for the mastless vessel. A mid-ocean rendezvous and refueling helped the *Cheynes II* limp home from its odyssey.

Between them, the two DXpeditions did an excellent job of satisfying the DX demand for Heard, even though the poor propagation kept the total number of contacts low and frustrated those DXers looking for 5-band contacts. And the 6-meter beacon went unheard the entire trip. On the plus side, Kirsti Smith, Jim's wife, was the first YL operator on Heard, under her own VK0NL callsign. Jim's group also made the first RTTY and satellite contacts from Heard Island.

But even as Jim returned to Norfolk Island with his wife, and Al Fischer was reunited with his new bride, the Heard Island 1983 saga continued.

Rumors and accusations filled the airways and DX bulletins and carried over to the personal presentations at the conventions. Did the amateur community "buy" seats on the Heard Island Expedition for too much money? Was the *Cheynes II* really properly fueled and equipped for the voyage? It is unfortunate that such bitter aftereffects should mar two fine DXpeditions.

The final chapter of the Heard Island DXpeditions has not yet been written. Both groups invested a great deal of money to bring Heard Island onto the amateur bands, and both hope to recoup some of those funds now.

QSLs: If you were one of the lucky ones who worked Heard, you should have your QSL card by now. If not, try another card to N2DT for North American contacts with VK0CW and VK0HI, or via Box 90 Norfolk Island, South Pacific 2899, for VK0JS and VK0NL contacts. Jim Smith got his QSL cards out quickly and included a pitch for membership in the Heard Island DX Association Club.

Finances: Whether you worked Heard or not, you have to admire the courage and dedication of the operators of both groups. "Frozen Fingers" Al Fischer interrupted his honeymoon to leave for Heard, and he endured weeks at sea, terrible weather, and hostile penguins to help you work Heard. He figures his personal costs for the trip at over $10,000.

Meanwhile, Jim Smith is selling philatelic covers from the Heard trip to help cover the more than $23,000 he advanced the HIDXA for the trip, and to help pay for the *next* DXpedition by this active amateur.

If you haven't made a contribution, no matter how small, to one or more of the sponsoring groups, by all means do so now. Your membership in one of the three DX organizations involved in the Heard DXpeditions will encourage other operations of this type.

In a few months the promised slide, movie, and videotape presentations should be out, and DXers around the world will be able to share in some of the excitement of a major DXpedition. And it seems unlikely that there will ever again be two different stations simultaneously active from Heard Island.

(For an insider's view of the HIDXA DXpedition to Heard Island, see "The True Story Behind Heard Island," *73*, July, 1983, page 20.—Ed.)

Jim Smith VK9NS, organizer and chief operator of the VK0JS Heard Island DX Association DXpedition, spoke at the International DX Convention in Visalia CA.

PILEUP BUSTING—BY THE EXPERTS

At the International DX Convention in Visalia, California, in April, program chairman Jay O'Brien W6GO moderated a panel of top DXpeditioners on the topic of busting pileups. Members of the panel have made hundreds of thousands of contacts over many years of DXpeditioning. Here are their suggestions of ways to get through the calling horde:

Eric Sjolund SM0AGD: "How do I break pileups? I gave that up ten years ago; it's so much easier to be on the other end of the pileups! Seriously, first listen to the pileup: where is the DX station listening? Don't stay on the same frequency; keep moving around. If the pileup is especially heavy, move to the edge of the crowd. Send your complete callsign once, then listen, don't send just the suffix, as that takes too much time. On SSB, use proper phonetics, not crazy, cute, or geographic phonetics. When I work split I'll suddenly change my listening frequency and announce it once. If you're listening, you can catch me quickly."

Al Fischer K8CW: "Listen first, to determine the DX station's listening frequency. I use wide splits to eliminate calls from transceiver-equipped stations. I usually work the loudest station first, a plus for DXers with large antenna farms. Finally, when the DX station asks for the station with the 'N,' stations without an 'N' in their call had better stop sending. I maintained a blacklist of poor operators on the cover of the logbook; they won't get QSLs!"

Jim Neiger N6TJ: "Listen to the pattern of the operator: who does he come back to? Avoid sending just your suffix; having to go back to confirm the rest of the callsign is too slow. Don't get into a shouting match with a rival; neither of you will work the DX station. If you can do it on CW, you can do it on phone; CW is where it's at!"

Fred Laun K3ZO: "On CW, tune down from the top of the pileup. Find the last station worked, and move a little lower for your call. On SSB, count to 3 after the DX station says 'QRZ,' to give the pileup a chance to thin out a little. If you are transmitting more than 10 seconds at a time, you're doing something wrong. Don't say 'QRP'; send your call. If the DX station can hear your 'QRP,' he can hear your callsign."

Jim Smith VK9NS: "Don't send just your suffix. I write logs left to right, and you don't want to go into the log backwards. I listen for the weaker signals as well as the strong ones, but don't spread the pileup out too much. As I use push-to-talk, I hear the tailenders. Familiar calls are easier to recognize, so being active on the DX bands helps break pileups."

Iris Colvin W6QL: "Listen to the DX station, especially instructions such as listening frequency; working by call areas, etc. If you're not getting through, try something different."

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

NEW JERSEY QSO PARTY
2000 GMT August 13 to 0700 GMT August 14
1300 GMT August 14 to 0200 GMT August 15

The Englewood ARA invites all amateurs worldwide to participate in the 24th annual NJ QSO Party. Phone and CW are considered the same contest. A station may be contacted once on each band. Phone and CW are considered separate "bands" but CW contacts may not be made in phone band segments. NJ stations may work other NJ stations.

EXCHANGE:

QSO number, RS(T), and ARRL section, country, or NJ county.

FREQUENCIES:

1810, 3535, 3900, 7035, 7135, 7235, 14035, 14280, 21100, 21355, 28100, 28610, 50-50.5, and 144-146. Suggest phone activity on the even hours; 15 meters on the odd hours (1500 to 2100 GMT); 160 meters at 0500 GMT.

SCORING:

Out-of-state stations multiply the number of complete contacts with NJ stations by the number of NJ counties worked (21 maximum). NJ stations count 1 point per W/K/VE/VO QSO and 3 points per DX QSO. Multiply total QSO points by the number of ARRL sections (including NNJ and SNJ—maximum, 74). KP4, KH6, KL7, etc., count as 3-point DX contacts and as section multipliers.

AWARDS:

Certificates will be awarded to the first-place station in each NJ county, ARRL section, and country. In addition, a second-place certificate will be awarded when 4 or more logs are received. Novice and Technician certificates will also be awarded.

ENTRIES:

Logs must show date/time in GMT, band, and emission. Logs must be received not later than September 10th. The first contact for each claimed multiplier must be indicated and numbered and a checklist of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed. Logs and comments should be sent to: Englewood Amateur Radio Assoc., Inc., Post Office Box 528, Englewood NJ 07631.

A #10 SASE should be included for results. Stations planning active participation in NJ are requested to advise the EARA by August 1st of their intentions so that they can plan for full coverage from all counties. Portable and mobile operation is encouraged.

NEW MEXICO QSO PARTY
Starts: 1800 GMT August 20
Ends: 2100 GMT August 21

Sponsored by the Albuquerque DX Association. Work stations once per band and mode. Repeat QSOs are allowable for credit only if the NM station changes counties. NM stations operating on county lines count as a single QSO, but multiplier credit is allowed the non-NM station for both counties. Use all amateur bands except 30 meters. Repeater QSOs are not allowed. Entry categories include both single and multi-operator, regardless of whether operating fixed, portable, or mobile.

EXCHANGE:

Phone—1835, 3985, 7230, 14280, 21370, 28570, and 147.51. CW—1805 and 60 kHz up from low end. Novice—25 kHz up from low end.

SCORING:

Count 2 points for each phone QSO and 3 points for each CW QSO. NM stations multiply total QSO points by total number of NM counties, states, provinces, and DX countries worked. All others multiply total QSO points by the total number of NM counties worked (33 maximum).

AWARDS:

Plaques will be presented to the top-scoring NM stations, the highest-scoring non-NM station in each entry category, and the highest-scoring NM club with 3 or more members submitting scores. Certificates will be awarded to the top scorers from each NM county, state, province, and DX country in each entry category. A special certificate will be awarded the highest-scoring NM mobile or portable station.

ENTRIES:

Entries must be postmarked no later than October 1st and addressed to: Ed Graham N5HH, 12449 Regent NE, Albuquerque NM 87112. All entries must include a summary sheet, and entries with over 200 QSOs must include dupe sheets. Include a large SASE for results.

SARTG WORLDWIDE RTTY CONTEST
Contest Periods:
0000 to 0800 GMT August 20
1600 to 2400 GMT August 20
0800 to 1600 GMT August 21

This is the 12th annual contest sponsored by the Scandinavian Amateur Radio Teletype Group (SARTG). Operating classes include a) single operator, b) multi-operator, single transmitter, and c) SWL. Please note that the logs from multi-operator stations must contain the names and callsigns of all operators involved. The same station may be worked once on each band for QSO and multiplier credits. Only two-way RTTY QSOs will count.

EXCHANGE:

RST and QSO number.

SCORING:

QSOs with your own country count 5 points. Other countries on the same continent count 10 points. Other continents count 15 points. In USA, Canada, and Australia, each call district will be considered as a separate country. Use the DXCC list and the above-mentioned call areas for multipliers. Note that contacts with a station which would count as a multiplier must be found in at least 5 logs or a contest log must be received from the multiplier station in order to be valid. Final score is the sum of QSO points times the sum of the multipliers. SWLs use the same rules for scoring, but based on stations and messages copied.

AWARDS:

Top stations in each class, country, W/K, VE/VO, and VK call district.

ENTRIES:

Logs must be received by October 10th and should contain band, date/time in GMT, callsign, exchanges sent and received, points, multipliers, and final score. Use a separate sheet for each band and enclose a summary sheet showing the scoring, classification, callsign, name, and address. Multi-operator stations should include the names and callsigns of all operators involved. Comments will be very much appreciated by the contest committee. Send logs to: SARTG Contest and Award Manager, C. J. Jensen OZ2CJ, PO Box 717, 8600 Silkeborg, Denmark.

K8TIW 146.790

S.M.A.R.T.

SOUTHWEST MICHIGAN AMATEUR RADIO TEAM

NEWSLETTER OF THE MONTH

Reminiscent of Clark Kent dashing into a telephone booth and returning as Superman, this month's winning newsletter recently received quite a face-lift. The makeover began when the club changed its name from the Oshtemo Amateur Radio Club, a rather plebeian title, to the Southwest Michigan Amateur Radio Team—or SMART, for short. To the name change, add a club member who also happens to be a graphics artist and you get a handsome logo such as the one adorning the SMART newsletter masthead.

Newsletter editor Clint Williams KB8SY said the name change was prompted by the club's acquisition, through an anonymous donor, of an ACC repeater controller. Not many clubs are that lucky, and SMART has made the most of their good fortune.

The newsletter offers the latest information on upcoming events, board meetings, and RACES. In addition, the Letters to the Editor column is often filled with controversial subjects and provides a forum for all of the club's 160 members to speak their piece. Some of the reports in the SMART newsletter have been on the Skywarn Net, the technical committee's efforts to make the most use of the new repeater controller, the Slow-Speed CW Net, and, last but not least, on members who have recently upgraded.

Congratulations to the SMART team not only for having an active club, but also for having the foresight to provide an equally active newsletter to back it up.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send a copy to *73*, Pine Street, Peterborough NH 03458.

CALENDAR

Aug 6-7	ARRL UHF Contest
Aug 13-15	New Jersey QSO Party
Aug 19-21	*A5 Magazine* UHF FSTV DX Contest
Aug 20-21	SARTG Worldwide RTTY Contest
Aug 20-21	New Mexico QSO Party
Aug 27-28	Occupation Contest
Sep 3	DARC Corona 10-Meter RTTY Contest
Sep 9-11	Connecticut Oyster Festival
Sep 10-11	ARRL VHF QSO Party
Sep 10-11	Cray Valley Radio Society SWL Contest
Sep 17-19	Washington State QSO Party
Oct 1-3	Oregon QSO Party
Oct 8-9	ARRL QSO Party—CW
Oct 9-10	ARRL QSO Party—Phone
Oct 15-16	ARRL Simulated Emergency Test
Oct 22-23	Pennsylvania QSO Party
Oct 22-23	MF Runde SW Activity Weekend
Oct 22-23	CLARA Ac-Oc Contest
Oct 22-23	QRP ARCI Fall QSO Party
Nov 5-6	ARRL Sweepstakes—CW
Nov 6	DARC Corona 10-Meter RTTY Contest
Nov 19-20	ARRL Sweepstakes—Phone
Dec 3-4	ARRL 160-Meter Contest
Dec 10-11	ARRL 10-Meter Contest
Feb 4-5	South Carolina QSO Party
Feb 18-19	America Radio Club International DX Contest

RESULTS

1982 AMERICA RADIO CLUB INTERNATIONAL DX CONTEST

1.	Angel Romero WD4CPS	4450 points
2.	Elpidio Padilla WD4GZI	3475 points
3.	Tony Pineda WD4MXF	2700 points
4.	Juan B. Huarte KA4BBR	2600 points
5.	Guillermo Cabrera WD4FHM	2525 points
6.	Roberto Suarez KI4S	2150 points
7.	Orestes Falcon WD4HZR	2125 points
8.	Lily Suarez N4DJI	2100 points
9.	Idelfonso Martinez WD4EMB	2025 points
10.	Milton Romero WD4ELB	2000 points

OCCUPATION CONTEST
Starts: 1800 GMT August 27
Ends: 2400 GMT August 28

The Radio Association of Erie PA is sponsoring their third annual contest. The contest is open to all amateur radio operators. The rules have been changed this year so that individual occupations will be of greater importance. This change should make this year's contest less confusing and more enjoyable.

EXCHANGE:

RS(T); occupation; and state, province, or country.

FREQUENCIES:

CW—40 kHz from the bottom of the ham bands. Phone—1820, 3920, 7250, 14300, 21400, and 28600.

SCORING:

Score 3 points for each new occupation worked, one point for all similar occupations worked, and 2 points for all retirees worked. There are no multipliers.

AWARDS:

A plaque will be given to the top-scoring station. Certificates for the top stations in each state, province, and country.

ENTRIES:

Mailing deadline for logs is October 1st. They should be sent to: Chris Robson KB3A, 6950 Kreider Rd., Fairview PA 16415.

RESULTS

1983 NEW HAMPSHIRE QSO PARTY

State	Call	QSO × 5	Multipliers	Score
AL	WB4VEK	10	1	10
AR	WB5RYB	110	5	550
AZ	AK7J	45	4	180
CA	N6CPQ	25	2	50
NFL	K4DDB	180	5	900
SFL	N4FBY	55	6	330
ID	WB7EUI	15	2	30
IL	W9QWM	10	1	10
IN	W9XD	5	1	5
IA	KØHQE	45	6	270
KS	NØCLY	75	4	300
LA	W5WG	205	7	1435
EMA	K1BA	130	9	1170
MD	WA3EOP	60	6	360
MS	W5UCY	75	5	375
NNJ	W2CJJ	105	7	735
NM	KB5DQ	45	4	180
ENY	N2BFG	190	9	1710
WNY	KC7QE	30	3	90
OK	N5AFV	70	4	280
PA	KA3DSW	120	7	840
SD	KCØZU	80	5	400
TN	KD4PP	40	3	120
NTX	WA5DTK	70	2	140
STX	W5PWG	185	6	1110
VT	K1HKI	120	7	840
VA	N4GTU	50	7	350
WA	KN7L	35	5	175
ONT	VE3KK	35	4	140

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

RADIOS WE HAVE KNOWN

Do you remember the first rig you ever owned? Of course you do. To a ham, that first transceiver, transmitter, or receiver is like a first love—a memory to be nurtured and cherished forever. I'll never forget my first rig. Unlike most old-timers, my initial radio was a VHF job—the venerable Heathkit* Sixer. I can still remember gently cradling the package in my arms as I rode the subway home from the old Heathkit store on New York's West 45th Street. Tossing homework and other chores aside, I constructed my first rig during a single weekend orgy of soldering and wiring. I still bear a one-inch scar on the spot where I tried to solder a diode to my left arm. Ah, memories.

The only unpleasant experience I ever had with that radio came at the moment I unveiled it to my "Elmer." He laughed. Never having heard of VHF construction techniques, I had oscillator caps and resistors dangling on two-inch leads and enough cold solder joints to make a Heath technician cry. Still, with some help, I eventually got my Sixer running and made quite a few DX contacts during the terrific sunspot summers of 1968 and 1969.

I have no idea whatever happened to that wonderful old rig. It was lost while moving during the spring of 1972. Today, I use a Kenwood TS-520 and a transverter on six. You know, I miss the roar of that old super-regenerative receiver.

ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

Across

1) Commercial-made boat anchor
7) Crystal oven entrance
8) Ham antenna maker killed by CB boom
11) Interference type (abbr.)
12) Fellow ham (abbr.)
16) Dry
17) Kit brand formerly sold by Allied
19) Another kit maker
21) Book publisher or bill
24) Cornell-________
26) KP4-land city: San________
27) Operator (abbr.)
30) Ø-land state (abbr.)
31) Nationwide electronics chain (2 words)

Down

1) Last great kit seller
2) Month before Field Day
3) Former tube maker
4) Ø-land state (abbr.)
5) Canada's radio authority (abbr.)
6) Prototype surfaces
8) Telegraphic laugh
9) Northern Ireland prefix
10) Negative reply
13) Two connectors that join
14) 8-U, 59-U
15) Telegraphic thank you
18) Stand by
20) Telegraphic query
22) Rig type
23) Grid________meter
25) Take one rig and another
26) Slang for tube
28) Canada prefix
29) Current type (abbr.)

ELEMENT 2—MULTIPLE CHOICE

1) Sonar Radio, the former famous maker of VHF ham transceivers, currently manufactures:
1) HF rigs
2) CBs
3) antennas
4) computer peripherals

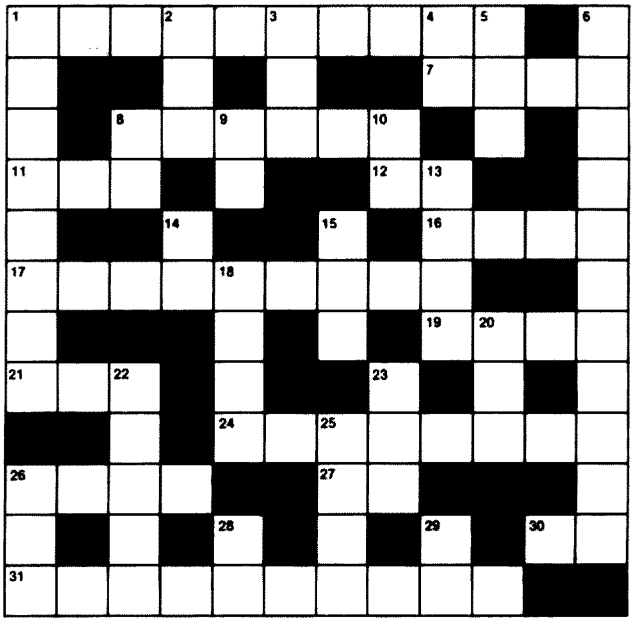


Illustration 1.

2) The first popular 2-meter transceiver was the:
1) Galaxy Hightopper
2) Clegg Odin
3) Gonset Communicator
4) Kenwood TS-520

3) An "audion" was:
1) a type of amplifier
2) a tube
3) an old-fashioned oscillator
4) a musical instrument

4) Which of the following was NOT a Hallicrafters rig:
1) SX-111
2) HT-17
3) HT-220
4) Super-Skyrider

5) E. F. Johnson's HF transmitter kit was known as the:
1) Viking
2) Signal Slicer
3) Comet
4) Q5er

ELEMENT 3—MATCHING I

Match the former ham manufacturers and distributors in Column A with their QTHs in Column B.

Column A	Column B
1) Sideband Engineers	A) Oceanside CA
2) Sonar Radio	B) Brooklyn NY
3) LTV-University	C) Burbank-Anaheim CA
4) Squires-Sanders	D) Chicago IL
5) Regency	E) Jamaica-Syosset NY
6) Galaxy	F) Millington-Watchung NY
7) Terminal Radio	G) Buchanan MI
8) Burstein-Applebee	H) Indianapolis IN
9) Lafayette Radio	I) Jersey Shore PA
10) Amperex	J) San Francisco CA
11) Greenlee Tool	K) Hicksville NY
12) Gonset	L) Harrison NJ
13) Hallicrafters	M) Council Bluffs IA
14) RME-ElectroVoice	N) Kansas City MO
15) Alltronics-Howard	O) Mars Hill NC
16) Uncle Dave's Radio Shack (Fort Orange Radio)	P) Albany NY
17) Atlas Radio	Q) Oklahoma City OK
18) Hammarlund	R) Boston MA
19) E. F. Johnson	S) Waseca MN
20) RCA Electron Tubes	T) Rockford IL
	U) New York NY

ELEMENT 4—MATCHING II

Match the current ham manufacturers and distributors in Column A with their QTHs in Column B.

Column A	Column B
1) Spectrum Communications	A) Urbana IL
2) Larsen Antennas	B) Buffalo NY
3) Macrotronics	C) Miami FL
4) GLB Electronics	D) Miamisburg OH
5) Communications Specialists	E) San Diego CA
6) Antenna Specialists	F) Turlock CA
7) Hustler	G) Cedar Rapids IA
8) HAL Communications	H) Norristown PA
9) MFJ Enterprises	I) Steadhemp NY
10) Kantronics	J) Lawrence KS
11) Amateur-Wholesale Electronics	K) Kissimmee FL
12) R. L. Drake	L) Bristol PA
13) Cushcraft	M) Lynnwood WA
14) Advanced Electronic Applications	N) Lancaster PA
15) Collins Radio	O) Vancouver WA
16) Robot Research	P) Morgan Hill CA
17) Clegg Communications	Q) Cleveland OH
18) KLM Electronics	R) Manchester NH
19) Ham Radio Center	S) St. Louis MO
20) Barker & Williamson	T) Mississippi MS
	U) Orange CA

ELEMENT 5—TRUE-FALSE

	True	False
1) The famous Drake 2-meter portable—the TR-22C—was actually made by Kenwood.	___	___
2) A famous semi-automatic keyer was known as the Blitz Bug.	___	___
3) Arthur A. Collins W9CXX was the founder of Henry Radio.	___	___
4) During its entire history, International Crystal has manufactured only one type of product—crystals.	___	___
5) The first transmitter offered by Heath was the Mohican.	___	___

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1—4 1975: Ham makers turn to CB. 1983: Ham makers turn to computers. 1990: Automobile makers turn to ham radio?
2—3 The year was 1952 and the mode was AM. Could the first jammer be far behind?
3—2 Lee DeForest's revolution in electronics; the audion was the first triode.
4—3 The HT-220 is Motorola's popular VHF hand-held transceiver.
5—1 More than one Novice's first rig.

Element 3:
1—J, 2—B, 3—Q, 4—F, 5—H, 6—M, 7—U, 8—N, 9—E, 10—K, 11—T, 12—C, 13—D, 14—G, 15—R, 16—P, 17—A, 18—O, 19—S, 20—L.

Element 4:
1—H, 2—O, 3—F, 4—B, 5—U, 6—Q, 7—K, 8—A, 9—T, 10—J, 11—C, 12—D, 13—R, 14—M, 15—G, 16—E, 17—N, 18—P, 19—S, 20—L.

Element 5:
1—True It was almost identical to Kenwood's own TR-2200, except that the Kenwood model had additional channels.
1—False Vibroplex's bug was called the "Lightning Bug." The "Blitz Bug" is Cushcraft's lightning arrestor.
3—False How about Arthur Radio? Collins Radio.
4—False The company has, from time to time, made and sold receivers, oscillators and other products.
5—False The AT-1 in 1953.

SCORING

Element 1:
Twenty points for the completed puzzle, or one-half point for each question correctly answered.

Element 2:
Four points for each correct answer.

Element 3:
One point for each correct match.

Element 4:
One point for each correct match.

Element 5:
Four points for each correct answer.

Have the mists of nostalgia dimmed your memory?
1-20 points—First rig was a CB.
21-40 points—Can't remember your first rig.
41-60 points—Your first rig was your only rig.
61-80 points—Still own every rig you ever used.
81-100 points—First rig was a Collins.

H	A	M	M	A	R	L	U	N	D		B
E			A		C			D	O	O	R
A		H	Y	G	A	I	N		C		E
T	V	I		I			O	M			A
H			R			T		A	R	I	D
K	N	I	G	H	T	K	I	T			B
I				O		S		E	I	C	O
T	A	B		L			D		M		A
		R		D	U	B	I	L	I	E	R
J	U	A	N			O	P				D
A		N		V		T		D		K	S
R	A	D	I	O	S	H	A	C	K		

Illustration 1A.

NEW PRODUCTS

NEW CRYSTAL CATALOG AND CROSSOVER LIST

A new 32-page crossover list and custom crystal catalog is now available from International Crystal Mfg. Co., Inc.

A comprehensive crossover listing of the most popular types of commercial two-way equipment is featured. This listing provides the user with the ICM crystal catalog number referenced to the manufacturer's equipment number.

A complete listing of ICM custom crystals featuring charts to establish ICM catalog numbers along with available holder dimensions is included.

To obtain your copy, write to *International Crystal Mfg. Co., Inc., Dept. G, PO Box 26330, Oklahoma City OK 73126.* Reader Service number 480.

BASE 2 SYSTEMS' "MUFPLOT"

Base 2 Systems has released software which for the first time enables shortwave listeners and amateur radio operators to predict band openings at the start of each day instead of relying on one- to three-month-old estimates from periodicals. The program also computes the great-circle bearing and distance to a target area.

Dubbed "Mufplot" because it plots Maximum Usable Frequency, the program is versatile and easy to use. After being customized to the latitude and longitude of the purchaser, it computes the best frequencies for a 24-hour period to any country or US state, or to any of eight world regions. Plots of MUF to ships at sea, DXpeditions, or other special locations are obtained by entering the appropriate latitude and longitude instead of a radio prefix. Graphs can be in either the user's local time or UTC.

Computation of MUF is accomplished by inputting daily solar flux data from reports of WWV or others into the program's analog of an ionospheric emulation developed through US naval research.

Output to either video display or printer consists of a graph of MUF and text. Mufplot is available now for the Commodore VIC-20 with 16K expansion and the Commodore 64, and a Radio Shack Color Computer version will soon be available.

For more information, contact *Base 2 Systems, 2534 Nebraska St., Saginaw MI 48601; (517)-777-5613.* Reader Service number 476.

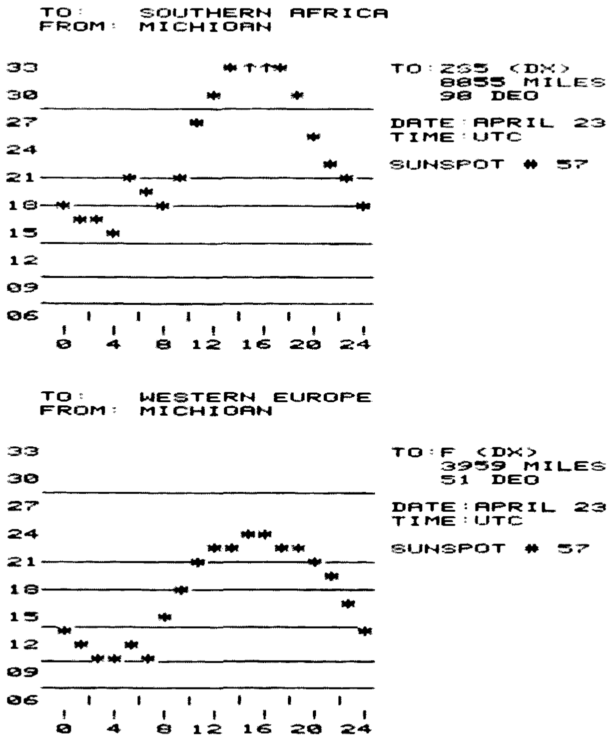
EASY-TO-SHIP SATELLITE DISH

A 16-foot satellite antenna aptly named "Silver Max" is the latest offering of Continental Satellite Systems of Clackamas, Oregon.

The Silver Max was developed and manufactured to solve the problems of those who require maximum power of a large dish but are in locations like Hawaii, Alaska, Puerto Rico, Colombia, or the Bahamas, where normal shipment of big antennas is difficult or impossible. The Silver Max can be shipped by UPS or air freight.

The 16-foot model joins Continental's 12-foot "Silver Feather," the 10-foot "Silver Star," and the 8-foot "Silver Edition."

For more information, contact *Continental Satellite Systems, PO Box 648, Oregon City OR 97045; (503)-656-2774 or (800)-331-2774.* Reader Service number 481.



Sample Mufplot printout.

AMATEUR TV RECEIVING CONVERTER

Communications Concepts has announced its new ATV-2 amateur television receiving converter. The ATV-2 has two super-sensitive rf preamplifier stages using the low-noise MRF-901 (1.7 dB NF) transistors. The ATV-2 tunes from 420-450 MHz and downconverts to channels 2, 3, or 4 on your standard TV set. The circuit uses durable microstrip design for stability and simplicity. The combination of a dual-rf stage, the microstrip design, and the hot-carrier diode double-balanced mixer reduces UHF TV intermod problems. The local oscillator is varactor-controlled for ease of tuning. An additional feature not found on other ATV downconverters is the incorporation of a post-amplifier stage (6 dB minimum gain) following the double-balanced mixer. This post-amplifier stage is used to overcome the conversion loss of the mixer. It also delivers a signal level that is acceptable to the TV set to overcome the TV set's sensitivity threshold. The addition of the post-amplifier circuitry is most noticeable on very weak signal reception.

For more information, contact *Communications Concepts, Inc., 2648 North Aragon Ave., Dayton OH 45420; (513)-296-1411.* Reader Service number 485.

MICROLOG'S SINGLE-BOARD TU

Microlog has announced the AIR-1, a single-board terminal unit and operating program that needs no external power supply or extras to put your VIC-20 computer on CW and RTTY. The AIR-1 features the Microlog CW-decoding algorithms and computer-enhanced RTTY detection. Plug-in jacks make connection to your radio simple and the on-screen tuning indicator and an audio reference tone make it easy to use. A Microlog feature allows you to select the size of your text buffer and 8 "HERE IS" messages from the available computer RAM. It automatically takes into account any memory-expansion cartridges you have added. Baudot, ASCII, and Morse speeds are fully adjustable and WRU and selcal routines are included.

The AIR-1 fits directly into the VIC expansion port and is compatible with popular expander boards.

For more information, contact *Microlog Corporation, 18713 Mooney Drive, Gaithersburg MD 20879; (301)-258-8400.* Reader Service number 479.

TEN-TEC 2M HAND-HELD

Ten-Tec has announced a new 2-meter hand-held transceiver designed in collaboration with Motorola. The model 2591 HT is a fully-synthesized rig using a keypad for frequency and function control. The transmitter puts out 2.5 W or 300 mW with a maximum current drain of less than 700 mA. The HT will step up or down in 5-, 10-, 15-, 25-, or 30-kHz steps, and there is room for 10 stored frequencies and repeater offsets. The scanning feature allows for a progammable band scan or a memory scan, with special lockout provisions for unwanted frequencies. Standard accessories for the 2591 include a rubber-ducky antenna and a wall charger.

For more information, contact *Ten-Tec, Inc., Sevierville TN 17862.*

MFJ'S VHF CONVERTER

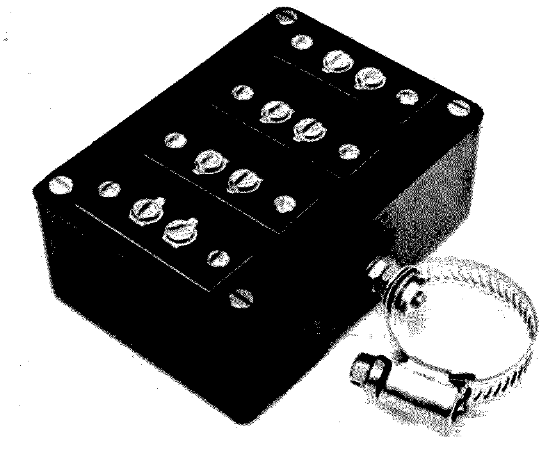
Triple the usefulness of your 2-meter handie-talkie with this new MFJ-313 police-, fire-, and weather-band converter. The compact VHF converter mounts between your handie-talkie and rubber ducky antenna and turns any synthesized rig into a public-service band receiver. The converter also will give you direct frequency readout and allow simultaneous scanning of both 2 meters and police bands. A high-pass input filter and a 1.0-GHz transistor give you very high uniform sensitivity over both the 154-158-MHz and 160-164-MHz ranges. Each band is crystal-controlled for excellent stability. An automatic bypass allows transmitting through the converter without burnout.

For more information, contact *MFJ Enterprises, 921 Louisville Rd., Starkville MS 39759; (800)-647-1800.* Reader Service number 478.

POLYPHASER PROTECTION

With X PolyPhaser's new rotor-cable lightning protector, you can obtain proper protection for your shack's rotor control box. The 8-conductor model IS-RCT is designed to have a fast response time with 50-nanosecond, three-element crowbar gas tubes. You can mount it on a ground pipe or tower leg, and the case is made with UV stabilized plastic and stainless-steel grounding hardware.

For additional information, contact



The PolyPhaser rotor-cable lightning protector.

PolyPhaser Corporation, 1500 West Wind Blvd., Kissimmee FL 32741. Reader Service number 477.

AEA'S AMT-1 AMTOR TERMINAL UNIT

Advanced Electronic Applications, Inc., has released the AMT-1 AMTOR terminal unit which offers full AMTOR error-correcting data communications plus RTTY, ASCII, and CW modes as well. The AMT-1 will operate with most HF recievers, home computers, or data terminals, and both the mode and configuration may be controlled either from the terminal keyboard or by computer program. This terminal unit offers both ARQ and FEC AMTOR modes, RTTY from 1 to 100 baud, CW transmission from 1 to 99 wpm, and ASCII communications to 110,300 baud. An RS-232 interface is used to connect the terminal unit to a computer, and the modem offers an active 4-pole receive bandpass filter feeding into an audio discriminator. The frequency shift is 170 Hz using standard tone pairs. The AMT-1 will operate from any external power supply providing 12 V dc regulated at .85 A.

For more information, contact *Advanced Electronic Applications, Inc., PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.* Reader Service number 482.

AEA's AMT-1 AMTOR terminal unit

REVIEW

WHAT I THINK ABOUT DGM'S SRT-3000

Having spotted the box on page 116 of the May issue ("What Do You Think?"), I feel inspired to submit the following account of my experiences with one of the products advertised in *73*, shown on page 51 of the same issue.

My initial contact with DGM Electronics, Inc., located in Beloit WI, was when I wrote to inquire about the SRT-3000, a "high-performance RTTY communications send-receive terminal," to quote the company's advertisement. Brochures arrived in a few days, and although some were Xerox copies of typewritten originals, the information was pertinent and well-presented. (The fact that some material was Xeroxed posed no problem; rather, it told me that this was a new organization doing its best to get started on a small budget.)

My second inquiry brought a personal letter from Dennis G. Makovec WA9CIY, along with a copy of the instruction manual for the SRT-3000. I assume Dennis's initials form the company logo. The manual proved to be superbly-assembled and well-planned, including 28 pages of explicit instructions purely on the operational capabilities of the terminal.

An order was placed with DGM for an SRT-3000 and a video monitor around March 1, and UPS delivered two well-packaged cartons about two weeks later. The keyboard and monitor were connected to my two-meter transceiver with a minimum of trouble. Both a discussion and a block diagram are provided in the manual for the various connections and options. Yes, RCA phone jacks are used, but they are of high quality and a positive "feel" is obtained when plugging in the cables. The unit has been used daily, and no connection problems have been encountered.

When turning on the power, a status line appears on the monitor, displaying the mode, amount of frequency shift, transmit buffer status, speed, and a real-time clock that can be set by keying in the correct time followed by whatever one chooses, such as the date. Then, whenever the appropriate command code is issued, the unit will transmit the time and other information as was entered previously. A very handy feature for logging during QSOs, assuming one still maintains a log! Other information presented by the status line includes a tuning bar along with various receive options.

Since anyone can read the various features in the ad, I'll elaborate a bit on some of the aspects that are not mentioned specifically, but which are examples of how well-planned this device was. For instance, selcal (selective calling) is a feature which prevents the unit from displaying on its screen and/or on an associated printer unless a certain sequence of characters is received first. This sequence is most often the callsign, or at least the suffix of the station call. The ending sequence is usually NNNN, which is programmed into the SRT-3000 (although it can be reprogrammed by the user). What this means is that the screen remains blank and a printer (if used) remains quiet unless someone sends your station call. Then the screen and printer become active, displaying all incoming characters until NNNN is received. (See "The New Communications: VHF Mailboxes," by AF2M, page 48, May, for details.)

A great idea, right? If no printer is used, selcal can save messages to you rather than having them scroll off the screen, while in cases where a printer is used, appreciable amounts of paper are saved. But the DGM SRT-3000 also has W-R-U ("who are you"), which has its own activation code, that in turn triggers a response from the terminal that turns on the transmitter and sends a canned message. The idea here is that others can verify that you are, in fact, monitoring. My concern was that the selcal code (again typically the station callsign) and the W-R-U code (usually the staton's call plus ZW or something similar) would pose a problem: If someone sent the station call, the terminal would accept the incoming call if it happened to be in the selcal mode but would reject the incoming call if left in the W-R-U mode, since the W-R-U requires the additional characters. In other words, how should one leave the unit? In selcal and get all calls but not provide a response? Or in W-R-U and get only those calls that included the ZW tacked onto the end of the station callsign, but provide confirmation?

Well, the people at DGM thought of that: what it amounts to is that the terminal is both in selcal and W-R-U when in the W-R-U mode, which of course means that it will dutifully record incoming messages addressed to the station callsign only and/or record messages and respond to those which contain the extra characters. What more could you want?

As a matter of fact, a "break" feature would be nice, and the SRT-3000 has one. Imagine yourself having just loaded its thousand-character transmit buffer with a response message to the chap you're in QSO with, when all of a sudden he asks a question that deserves an immediate response. What to do? Ignore his question until you have run the contents of the buffer, or clear the buffer, answer the question, and then start all over again? No problem with this terminal: Simply hit "control-break," "transmit," and answer the question. Then hit "escape," and the buffer, safe and sound, will also be transmitted.

A word about modes: The SRT-3000 transmits and receives Morse, Baudot, and ASCII at a variety of speeds. It generates both high and low tones, including "modem" tones for those wishing to use the many bulletin boards available on telephone circuits.

Mode, speed, and tone changes are only a couple of keystrokes away, which is a joy for an old teletype* hack like me. I am accustomed to opening up a printer, unbolting the typing unit from its base, lifting it off, and exchanging a pair of gears, followed by reassembly and a thorough hand-washing to remove ink and grease each and every time a speed change was desired. Now I change speeds electronically, in the length of time it takes to type three or four characters. To go from Baudot at 60 wpm to ASCII at 110 baud, I hold "control" and type A110 and then release "control." Other speed and mode changes are equally simple: M for Morse, B for Baudot, etc.

Anyone who (a) is learning Morse code or (b) is teaching others will find the random code generator a joy. With a cassette tape recorder attached to the SRT-3000 cassette port, and a printer, the terminal generated beautiful Morse in five-character random groups, either letters only, or letters, figures, and the four required punctuation marks (period, comma, slant bar, question mark). The cassette machine gets the Morse characters, of course, and the printer types the groups in perfect columns. What a great way to produce practice material! And speeds are in 1-wpm increments, as determined by the operator, from 1 to 99 wpm. You want clear text in Morse? Type it into the transmit buffer (1000 characters maximum), turn on the cassette machine and printer, turn off the transmitter unless you want it to go over the air, and proceed. Perfect copy is the result. I taught a licensing course for several years at the local community college, and how simple it would have been to generate practice cassettes for my students had I owned an SRT-3000! Mr. Green is probably glad I didn't, because my recommendation was that students purchase the *73* code practice tapes, hi.

Something else you should know: the SRT-3000 has a printer port that can be programmed by keystrokes to any of the standard speeds in either ASCII or Baudot. The port will stay in that mode regardless of the incoming and outgoing language being used. For example, I am using a teletype model 35 which is an ASCII printer running at 110 baud. I have the printer port set for that mode, and no matter what I'm using to communicate over the air, the model 35 gets it all. You read it right: I can be using Morse, Baudot, or ASCII over the air, and the SRT-3000 translates it all to ASCII at 110 baud and sends it to the printer. So don't give that model 15 or 28 away quite yet; it's just as easy to program the printer part of them. Why am I using a model 35? Because it gives me the extra ASCII characters and

The DGM Electronics SRT-3000.

higher speed that the Baudot machines cannot accommodate. But a Baudot printer would still serve as well, except at higher speeds.

If I had to find fault with the SRT-3000, it would be this: DGM does not presently provide an annunciator to serve as the signal bell. The terminal will transmit the "bell" code just fine, but it ignores it when received. Perhaps something can be added. A gentle "peep" upon receipt of a bell code would be nice, and maybe it could even be toggled on and off. But considering all aspects, I think the SRT-3000 is superb. The price is $1144 including a video monitor. 73 and happy RTTYing.

For additional information, contact *DGM Electronics, Inc., 787 Briar Lane, Beloit WI 53511.*

Stanley Coutant AA6SC
Sierra Madre CA

QZX

A newsletter? How do you review a newsletter for *73*? It doesn't beep, light up, plug in, or charge your batteries.

But *QZX*, the newsletter for hams who own Sinclair/Timex computers, does transmit. It transmits a lot of very good information, and we thought the best way to bring it to our readers' attention would be through a close look at what it does provide.

First, let's start out with the products it serves—the ZX-80, Micro Ace, ZX-81, and TS-1000. With an average $50 price tag, these are among the best computer buys a ham can make. A low-end computer is one of the best ways to get on RTTY or packet radio, costing less than many a model 33 in the flea market. A small extra investment in time to write software and build an interface with your rig is all you need—and that's time you would spend cleaning grease off the gears of an old Teletype® machine.

Ham applications for computers differ from many others in that they do not require large amounts of memory, rapid storage-medium access, or complex mathematical calculations. What they do require is easy access to I/O ports and simplicity of real-time programming. The Sinclair, with its TTL interfacing, meets the first requirement, and the plethora of Z-80 assembly-language manuals makes learning the Timex/Sinclair computers' native language that much easier.

In addition to communications uses, you can develop the extras—like an electronic logbook, dupe sheets, or even a rotor controller. These models, with very accessible innards, seem to be designed with the hardware hacker in mind.

The Need For Support

Unless you are a super-fast designer with an endless stream of creative ideas and lots of time on your hands, you need assistance in developing uses for your computer. Computer dealers are notorious for knowing little about ham/computer interfacing, and the staff in the department stores which offer you the best prices on Sinclair/Timex computers know even less about computers in general, much less amateur radio.

This is where *QZX* comes in. As a system-specific publication, everything in the magazine pertains to your computer. As an amateur-radio publication, it offers the additional advantage of focusing on a specific area of computer use.

Published by Alex F. Burr K5XY and edited by Ambrose Barry W4GHV/5, each month's *QZX* is literally jammed with programs and circuits. For example, the April issue contained programs to compute antenna headings, manage net rosters, and calculate propagation, as well as a RTTY send/receive program. Circuits included a simple terminal unit and an interface for the Sinclair computers.

In addition to the program, a brief synopsis of each is provided. Explanations of algorithms and special instructions are included as well. And the listings are reproduced directly from the author's printout, eliminating the possibility of typing errors.

Another regular feature of *QZX* covers reviews. The publishers are up front about their policy; in one recent issue, they said "if you have objections to us doing reviews of products advertised in *QZX*, let us know. We intend to present objective comments on them. If an item advertised in *QZX* is obtained for review and found to be less than 'OK' in our opinion, we will simply decline to print that review. A rather polite way of avoiding a 'cut throat.' Those not advertised but reviewed will receive our honest opinions and will be printed."

A useful column in the newsletter is "Bits & Bytes," a compendium of useful tips similar to *73*'s "Circuits" feature. Subjects ranging from power-supply problems to photographing program listings from your video monitor are all addressed here. And if you miss a juicy topic, information on it may be recovered via the *QZX* Net, an almost nightly gathering of the Timex/Sinclair faithful, the schedule for which appears in the newsletter.

The newsletter is printed on plain paper and graphics are limited to schematics. All of this adds up to savings in production costs—savings which are passed on to subscribers. At $12 for a one-year subscription, *QZX* is much cheaper than a slick magazine, and in terms of applicable material, you probably get a lot more for your money.

From programs to reviews and advertising, *QZX* is a perfect solution to one of the great problems of owning a computer—what to do with it. As amateurs, we have the unique ability to generate new *ideas and practical uses* for *almost any* piece of electronic equipment. But newsletters such as *QZX* are necessary for us to share all of that knowledge.

For more information, contact QZX *Newsletter, 2025 O'Donnell, Las Cruces NM 88001.* Reader Service number 484.

Avery L. Jenkins WB8JLG
***73* Staff**

RADIO ELECTRONICS BUYERS GUIDE

Almost every ham, whether or not a confirmed builder or modifier of radio equipment, someday will need a part or component to fill an exact requirement. Maybe it will be something as rare as a tube socket or as common as a lamp bulb or fuse holder. The home-brewer, of course, will need IC sockets, circuit boards, capacitors, resistors, displays, inductors, transformers . . . and all the rest.

Now put yourself in either pair of shoes: Where would you look for the exact part you need? Sure, you're gonna say *73*, right? Well, okay; I'll go along with you to a point . . . but suppose you have dozens of parts and items that you need. Doesn't that mean that you'll have to look through maybe dozens of ads, searching for all the things on the parts list? Right; see what I mean?

Enter the *Radio Electronics Buyers Guide*, a stupendous compendium of electronics goodies listed by type of component in alphabetical order. This beaut of a book lists it all . . . and not only one source but dozens of sources. Here, let's take a look at how it works. Suppose you need a 9900-series microprocessor—an IC. You look up IC and then the series . . . ahhh, here it is on page 46. The listing gives two sources: Active Electronics and Jameco Electronics. Active stocks a variety of 19. Now, you turn to page 88 and find Active Electronics. Their address and telephone number, as well as information about catalog cost and minimum order, is listed for your convenience. Same thing for Jameco Electronics on page 90.

Let's take a different component and try it again. What about a mechanical digital counter for a project that you have been working on? Yep, there it is on page 23, sold by BCD Radio Parts. What about a marine-band crystal for the VHF frequencies? There it is on page 24. Rolin Distributors has 'em. And so it goes, for hundreds of items.

Even if you don't build but have a friend who does, get this neat little book for him or her. It makes a wonderful present and will really be appreciated. If you're the kind of ham who has a library of needed info, get the book. Hallward Products, publisher of the *Guide*, has required that a supplier be willing to sell in small quantities to individuals by mail order. Each one has been contacted by the publisher and has agreed to the terms. The information in the *Guide* is contained in a computer and therefore can be edited and added to as the market changes.

The 1983 *Radio Electronics Buyers Guide is available from Hallward Products, 32 Sunset Court, St. Louis MO 63121.* Reader Service number 483.

Jim Gray W1XU
***73* Staff**

ICOM's IC-490A.

ICOM'S IC-490A 430-MHZ TRANSCEIVER

Even newly-licensed hams quickly gain an appreciation for the amazing number of knobs, readouts, microprocessors, Watts, and features being crammed into smaller and smaller radios these days.

As a long-time resident of the UHF bands, I was happy to learn of ICOM's latest multi-mode radio for the 420-450-MHz band, the IC-490A, and to get an opportunity to try one out. Actually, calling the "490A" a multi-mode rig may be a bit misleading. The rig covers the 430-440-MHz portion of the band only, and in the US and Canada this does not include the portion used for FM according to the current band plan. However, if you're interested in OSCAR satellite work in the 435-MHz range or weak-signal work at 432 MHz, you'll find this rig packed with useful features.

Designed primarily for mobile use, the radio was also found to be quite acceptable for home use as well when powered from an optional 12-V-dc supply. A battery back-up option is available to maintain memory channels when the rig is removed from its power source.

When I first sat down to operate the radio, my initial impression was that there weren't nearly enough controls to operate all the features which the radio offered according to the manual. A well-thought-out control system, however, places non-routine adjustments such as scanning-speed timing, stop timing and full or programmed segment scanning internally. These adjustments are often a matter of personal preference; once these decisions are made, further adjustment is usually not necessary. In addition, many front-panel controls have multiple uses.

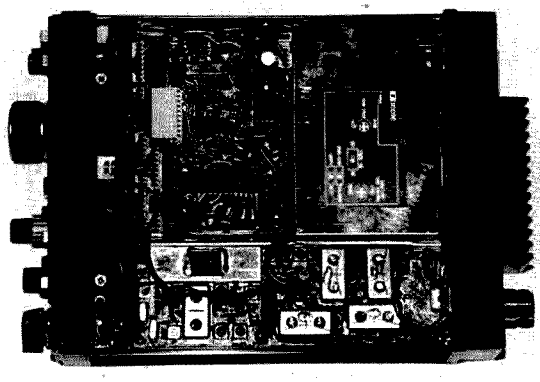
Frequency Control Features

The IC-490A's frequency control is typical of many ICOM radios. A detent-type main tuning control is used for either of two vfo's. Designated "A" and "B", each vfo is selected by a push-button switch. Vfo "A" can be used to dial up frequencies for subsequent storing in one of four memory positions. Those interested in both weak-signal work and OSCAR work as described earlier will find it useful to leave one vfo set for each range.

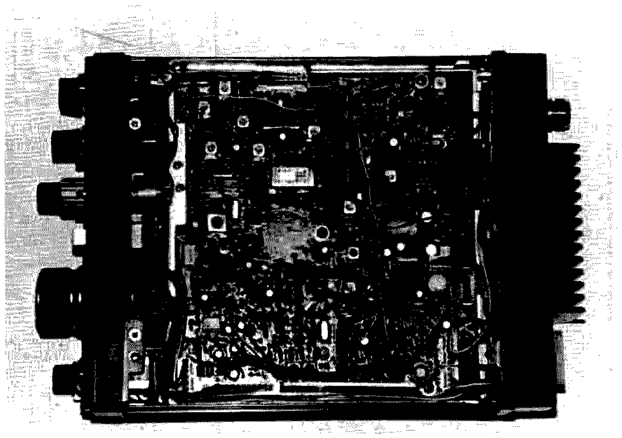
QSYing anywhere within the 10 MHz provided was actually faster than with many 144-MHz rigs I've operated. There is a "1 MHz up" button which increases the currently-selected frequency in 1-MHz steps up to 439 and then restarts at 430. In addition, four tuning spreads are provided (although it's not obvious without studying the manual). In the SSB or CW modes, each tuning step is 100 Hz. There are two FM mode positions called FM1 and FM2. Position FM1 provides tuning steps of 25 kHz, while FM2 steps the frequency 5 kHz per tuning-knob click. These are the normal tuning speeds for each mode. In addition, a "1 kHz" button overrides the tuning speed of any mode in favor of a 1-kHz-per-click rate. This scheme is a little tricky to get used to and, even after a couple of months, I still have to think about it a bit more than I'd like. It does get you around the band quickly with a minimum of extra controls, though the mode switch also permits changing the repeater offset frequency to virtually any frequency desired. Upon powering up, the radio normally comes on with a 5-MHz offset. Again, this radio does not cover the US or Canadian repeater band.

Scanning

Two types of scanning are provided: scanning of memory channels or scan-



Top view of the IC-490A.



Bottom view of the IC-490A.

ning of band segments up to the entire band. Band segments are determined by the frequencies stored in memories 1 and 2. Memory 1 would be the lowest frequency of the segment and memory 2 would be the highest.

The IC-490A also includes a priority channel feature to let you keep track of a favorite frequency or calling frequency while operating on another frequency. The priority frequency can be any memory channel. The microprocessor selects the priority channel for an automatic quick look every 5 seconds. It does not lock onto this channel even if in use and it will not switch the priority channel if you're in the transmit mode. In addition to all the vfo's, memories, and priority channels, there is a "calling channel" feature. Pushing a single button selects a programmed channel and overrides whatever memory or vfo had been in use. This channel is not scanned and, frankly, I haven't found a good use for it. But it's there for those who do.

Other features include a noise blanker which is quite effective in eliminating ignition and other pulse noises, and an agc (automatic gain control) to reduce fading (especially mobile "picket fencing," which is particularly rapid at these frequencies). An RIT (receiver incremental tuning) feature shifts the received frequency ± 800 Hz to follow drifting signals or change the other station's CW note to one which is more pleasing.

I was glad to see that ICOM used an "N"-type connector (UG-21/U) for the rf output. This type of connector is designed for use on UHF to keep losses at a minimum, but all too often manufacturers forget these details.

Frequency is displayed on a nice readout which is sufficient for precision down to 100 Hz (on FM, 4 digits provided precision to 1 kHz). For example, a frequency of 432.1985 is displayed as 2.198.5. Numerals are 3/8" high and are much brighter than the traditional red variety.

Light-emitting diodes are also used for a "light-bar"-type display of received signal strength and relative transmitter output. I must admit that I was a little prejudiced against such devices. "How can a readout of 7 or 8 diodes approach the precision of a meter?" Well, it doesn't, but with a little practice, a flickering diode can be interpreted pretty closely. And for conveying information at a glance, light bars to me are more useful. I became convinced of this when an intermittent ground on my mobile antenna would increase the vswr and decrease my power output. Since the problem was intermittent, I might have blamed my varying signal strength on normal propagation, not noticing the slight movement of the meter needle. However, the blinking diode on the light bar was immediately obvious and the antenna problem was quickly located and corrected.

Circuit Description

The IC-490A uses a 39.38-MHz phase-locked-loop local oscillator for both transmit and receive. A rotary encoder driven by the main tuning knob controls a microprocessor which in turn determines the frequency of a voltage-controlled oscillator (vco). In the SSB/CW modes, the receiver is dual conversion with i-f's of 39.38 MHz and 10.75 MHz. In FM, an additional i-f of 455-kHz is used for triple conversion.

When transmitting in SSB, a carrier frequency of 10.7485 MHz for USB and 10.7515 MHz for LSB is fed to a balanced modulator. After filtering of the appropriate sideband, an SSB signal of 10.75 MHz is obtained. For CW operation, the USB carrier is shifted +800 Hz. This was found to be convenient when frequent mode changes take place between USB and CW. If you are in the CW mode and tune in an SSB station, you don't have to return when you change mode.

In FM, a separate crystal oscillator produces a 10.75-MHz signal which is modulated separately. A 28.68-MHz second local oscillator and an approximately 390-MHz first oscillator controlled by the microprocessor and vco puts you in the band. Rf power output is 10 Watts.

The manual is 45 pages in length, of which 13 pages are devoted to the circuit-description portion. For those wishing to get into the "nitty-gritty" of how the 490A does its thing, this section is certainly clear and concise (with liberal use of block diagrams, charts, and schematics). The largest section is the 14-page "operation" part which is, in my view, required reading. Only a page or two is needed to get you on the air, but to fully explore the intricacies and capabilities of this radio, time should be spent with this section and several pages devoted to control functions.

The manual was very complete, with extra information on satellite operations, drawings illustrating mobile installation, and two foldout inserts. One is a schematic diagram large enough such that every component can be seen clearly. The second insert is a large board layout which shows each circuit board full size, with several colors indicating all circuit paths on double-sided boards.

Likes and Dislikes

Only a few things bothered me about the radio. First, there is no rf gain control, although I must admit that it was several weeks after I began using the radio before I missed it. I have yet to find any multimode rig which includes provisions for a narrow CW filter even as an option. The agc recovery time was a little slow even in the fast position. The radio's front end tends to get "crunched" a bit by strong locals and the agc can pump somewhat and mask weak signals.

On the positive side, this is really a "fun" radio to use, especially after I gained some proficiency in making my way about the band using the memory channels and other features to their fullest. I used the radio during the Spring Sprint Contest and I attribute several contacts and sections to the radio's ability to quickly switch between a number of frequencies and keep tabs on the band.

Even at home, I found myself increasingly using the 490A instead of the "big rig." CW operation was very pleasant, with a nice sounding CW sidetone. Excellent on-the-air reports were received on both CW and SSB. Receiver sensitivity was very good.

In summary, I found the IC-490A an excellent radio as a primary station or as a secondary station for those who have already gone the "transverter route." So be careful—the IC-490A may become your primary station.

For further information, contact *ICOM America, Inc., 2112-116th Ave. NE, Bellevue WA 98004; (206)-454-8155.* The retail price is approximately $650.00.

Dave Mackey K1KA
Amherst NH

LETTERS

FUN FRACAS

I'm writing in reference to the Fun! poll results that were published in your May, 1983, issue. My complaint is about John Edwards' comments on questions 31 and 32. On question 32 he agrees with the majority opinion by saying "Free speech lives!", thus saying that politically-oriented nets are OK. But on question 31, he wants to deny the right of free speech to those who like to talk about ideas of a religious nature. He does this by saying "amen" to the majority who said no to religiously-oriented nets.

This is a very hypocritical viewpoint. If Mr. Edwards or anyone else doesn't like to listen to religious viewpoints or discussions about the Bible, they can employ their own form of censorship, tune to another frequency, or turn off their radio.

Well, Wayne, that's my viewpoint on the subject. Except for this one minor point, you have a great magazine. Please keep up the good work.

Mark Regan
Reynoldsburg OH

TERRIFIC TEN-TEC

Ten-Tec treats me very well. They make quality gear. Dick Frey and company are quick to keep it running. They care about their customers and are always more than fair. I have had two, and my next one will be a Ten-Tec also.

Bob Solon WD8LKI
Toledo OH

SCAPEGOATS

It appears that every time someone loses touch with reality, they blame the steel and auto workers for the economic plight of their industries. The workers' wages are always compared to those of the Japanese, and the conclusion is made that the Americans are getting paid too much.

How about comparing the US executives to their Japanese counterparts? They get 4 or 5 times as much, not just 10 or 15 percent. Another thing is taxes; 35 to 45 percent of our wages go to pay some kind of tax. If these taxes were eliminated, we could live on the same pay and benefits as the Japanese. By the way, I wonder what

nagazine editors are paid in Japan. Maybe by their standards, you're overpaid, too!

H. W. Lueck WB9IRH
Western Springs IL

AMERICAN TRAGEDY

I would like to know if you could give me some information. I bought a Swan 700 CX and 117 XC power supply about seven years ago. I really liked it and always had good reports with it. Several months ago, I went out and forgot to ground my antenna and it was hit by lightning.

Well, I could not get any of the elec-ronics service places to repair it. They all told me that they don't service Swan any more. Finally, I got a couple of hams to ook at it and they told me it was damaged too badly to fix. I sent the power supply all the way out to New Mexico and had it re-paired. Now I am stuck with a power supply and no transceiver.

I was laid off at Piper Aircraft in Vero Beach FL just about a year ago. So I can-not afford a new set or a second-hand rig or cash. all of the amateur electronics stores only have Master Charge, Visa, or American Express cards.

I would like to know if you know of any amateur stores that do their own financ-ng anymore. At least maybe my wife could get financing so that I could buy omething.

I have had my license since 1964, and I ure miss being on the air.

If you read this and have the time for any information, I would like to say thank ou very much.

Jim Player WB4WED
Box 247
Malabar FL 32950

BATTLE SCARS

I was listening on 20 recently to a cou-le of hams discussing their radio clubs. One was putting his talents on display with an outstanding choice of words poken with excellent diction. He was de-cribing not only the interesting meetings ut also the public-service involvement. He told of their emergency communica-ions equipment and training, the gigantic Field Day, and their participation in arades and other public-service events. When I thought of the efforts of our local lub, they looked pale in comparison, and urs is a "working" club.

Then the excellent speaker turned it ver to the other ham—to his opponent, I hould say. I don't know how sensitive the irst guy's ego was, but the second ham was out to smash it. Now, the second ham was no slouch at expressing himself ither, but the extremely bassy voice and he "We have all that plus. . . ," etc., ounded to me like the old put-down. Both ad beautiful signals. Too bad it had to be ension, instead of relaxation and fun.

When I was growing up, I was known to ave quite a temper. I'd get so mad I ouldn't see straight. My big brother liked o tease me because he said I looked cute hen angry, and when I was angry I could ever land a punch on him, only an occa-ional shin kick. Instead of letting off team, afterwards I always felt guilty and shamed. There was just no winning. It ook a lot of living and several changes of nvironment before I learned that you can atch more flies with honey than with negar.

Battles on the air do happen. They're un to monitor. Did you ever participate in one? One time I was working a phone patch from overseas. We did the usual fre-quency check, asking "Is this frequency busy?" No answer, so we began the patch. "Hey, the frequency up 1 kc is busy, can't you guys move someplace else?" So move we did. The same thing happened once more. Then we found a frequency that sounded pretty good so we again started the patch. This time it was much worse. We had landed on someone's pri-vate frequency. The screaming went on during and after the patch and pretty well ruined our efforts, but his unkindest cut was, "How did you manage to get a li-cense?" Somehow, I managed not to an-swer that one.

Once, after tuning the bands for a half hour looking for a CQ, and another half hour of calling CQ without result, I decid-ed to call in on this good old boy net. One member asked another "Did you hear that weak signal in there?"

"Yeah, Barney, let's let him in. Go ahead breaker."

"Hi, Fellas, thanks for letting me in. This is W9HD, W9 Hot Dog. The name is Paul. You're all coming in good here in Bloom-field, Indiana, today."

"Stan, do you know W9 Hot Dog?"

"Nope, I sure don't. Edna says she wants me to put a new bedroom on the back side of the house. . ." Well, they did let me in, but that was as far as it went.

Just a few days ago, I was again working an overseas phone patch. We landed just a kc away from the "Brown Sugar Net," and I was asked by Pete K6EDV to move. I promptly asked him to please wait, adding that this was to be a short call. Believe it or not, Pete got his net to stand by for a few minutes while ND4JPK and I handled a beautiful interference-free patch. After-wards, Pete said, "Being nice to people, isn't that what ham radio is all about?"

Paul L. Schmidt W9HD
Bloomfield IN

IMPRISONED

As you know, more and more hams are finding themselves "confined" to apart-ments, townhouses, and condos. As such, we are severely limited to the amount of wire we can string up.

I know there must be a lot of innovative designs being used for indoor/invisible antennas. But most articles (of what few there are) represent only a few various designs.

How about a general request by you to the ham community to submit designs for said antennas? It would be most ap-preciated.

I love your magazine; its worth to the ham world is heartily appreciated.

A. Reid Maertz KD5SI
Houston Tx

CALL FOR PAPERS

Papers are invited for the 1983 VHF Conference sponsored by the Electrical Engineering Department of Western Mich-igan University in Kalamazoo. The prin-cipal emphasis will be placed on engi-neering developments applied to radio communication, design, and construction on the frequencies of 30 to 1200 MHz.

One of the basic purposes of this con-ference is to provide a maximum oppor-tunity to present findings by those ex-perimenting, designing, constructing, testing, and inquiring into problems and methods applicable to VHF radio. Practic-ing engineers who are radio amateurs find this conference made for them.

This is an opportunity for beginning or mature researchers to report their find-ings to their peers. We expecially en-courage the inexperienced inquirers to obtain some experience by presenting a paper at our VHF Conference.

Authors wishing to present papers should send a synopsis or abstract (typ-ically one or two pages with diagrams) describing the paper to Dr. Cassius Hes-salberth W8FLH, Chairman, Department of Electrical Engineering, Western Michi-gan University, Kalamazoo MI 49006. For-eign authors are requested to have a US contact.

The deadline for submission of synopses is August 15, 1983. Speakers will be notified of acceptance by August 20, 1983. A reproducible copy for the printed proceedings should be mailed to the chairman one month prior to the day of the conference.

C. A. Hessalberth W8FLH
Kalamazoo MI

WEEKDAY WARRIOR

OK, Wayne, I've unloaded on New-ington and now you're next. You're just as bad as the ARRL when it cmes to major contests. Why do all of you think that everyone works Monday through Friday and is off on the weekend? What about the shift worker, whose weekends off are few and far between? What about the ones who work six days and are off only one? Or the preacher who may be avail-able on Saturday but not on Sunday? Some of us like to contest, too, Wayne, and you're not being fair to all of your sub-scribers. Your format could remain the same—just add a category for those of us who are available for only limited opera-tion (say a 6-, 8-, or 10-hour limit). That way, we can shoot for some top honors also, in our own category. Why should we participate and submit an entry when we know ahead of time we can't be compet-itive with those who were available all weekend. I managed to work six hours of the ARRL 10-meter contest even though I was working that weekend. In six hours, I had 203 contacts (not great) with 98 multi-pliers (damn good). However, I did not sub-mit an entry because there was no way that score could compete with the full weekend operator. It probably would have been a decent score in a limited-operation category.

Why should we play, Wayne, if we can't play to win? Give us weekend workers a category in the big contests also. I would even consider being a contest committee volunteer if I thought you were being fair to everyone.

Butch Lutz N5ACU
Silsbee TX

RIGHT ON, FCC

I am glad to see that the FCC has decid-ed to make the no-code license a reality. It's something that has been needed for a while. Maybe now we will see some real growth in amateur radio.

There have always been two main rea-sons given for not having a code-free li-cense. One is that the code requirement keeps the loonies off the amateur band. This just isn't so. Here in the Houston area, just listen to a few of the 2-meter repeaters. There is foul language, argu-ments, and jamming. You can hear the same type of thing on 40-, 75-, and 80-meter phone, nationwide. The second reason is that "I had to learn the code, so do they." This is really a silly reason to have a code requirement. This reason is for the self-centered person who only thinks of what he had to do to get a license.

I believe that having the Technician license as the entry to amateur radio is also good. If a person should get inter-ested in learning the code, he can and thus upgrade himself. But if he is happy with phone only and using the VHF and UHF bands, then he can stay where he is. I believe this will work well for everyone and hope that the FCC will not be swayed from carrying out this program.

Michael Friedel
Deer Park TX

SPIKE WARNING

Something happened to me last sum-mer that cost me a lot of time and effort. Perhaps some others may benefit from my experience.

I was at my well-lit workbench working on a converter circuit for the VHF region: a xtal oscillator and a frequency-dou-ble/tripler chain to get up that high. I was using my frequency counter to keep track of what each stage was doing, but I kept getting wild readings on the counter. I suspected self-oscillation and did all the standard cures: etched new boards using shorter runs, more attention to shielding, decoupling, etc. Still, erratic readings on the counter. Sometimes I would despair and put the thing aside for a while.

Then one day I had occasion to turn off my workbench light while the oscillator and counter were going, and the counter settled down to a nice, steady count, right where it should have. The culprit causing me to spend so many hours on such a sim-ple circuit was the noisy fluorescent fixture above my workbench. It was radiating a bunch of "spikes" into the counter, which was faithfully counting them along with my oscillator frequencies!

Jim White
Sacramento CA

HAM HELP

I need the manuals or schematics for the Canadian RCA Wireless Field Set #19, Mark II and Mark III. I will pay a reasonable fee for copies or originals.

Charles Di Cecca KA1GON
909 Hancock St.
Quincy MA 02170

To complete my collection of *73* maga-zines, I need the first issue—October, 1960. If anyone knows where I could locate this issue, please let me know.

Lyle Johnson WA7GXD
5971 S. Aldorn Dr.
Tucson AZ 85706

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

DARC DX AWARDS

Representing the Deutscher Amateur Radio Club (DARC), Eberhard Warnecke DJ8OT informed us about the three major awards made available to DXers by this well-known German group.

All DARC awards are based on the European Countries List. To qualify, all contacts must be made from the same country. QSL cards must be submitted with each application. All cards must be in their original form and an appropriate postage fee must be included to ensure the safe return of your cards.

The service charge is 2 US dollars per award, 1 US dollar per endorsement. $2.00 US is sufficient for the postage and handling of your QSLs.

European Countries List: C31, CT1, CT2, DL, DM, EA, EA6, EI, F, FC, G, GC (Guernsey), GC (Jersey), GD, GI, GM, GM (Shetland), GW, HA, HB9, HBØ, HV, I, IS, IT, JW (Bear), JW, JX, LA, LX, LZ, M1, OE, OH, OHØ, OJØ, OK, ON, OY, OZ, PA, SM, SP, SV, SV (Crete), SV (Rhodes), SV (Athos), TA, TF, UA1346, UA Franz Josef Land, UA2, UB5, UC2, UN, UO5, UP2, UQ2, UR2, YO, YU, ZA, ZB2, 3A, 4U1, 9H1.

Europa Diploma

To qualify for the Europa Award, applicants must provide evidence of having contacted European countries and obtaining at least 100 QSO points by utilizing the following points system: Confirmed contacts made during the current and two preceding years count 1 point. Older contacts are devaluated by a quarter point per year (i.e., .75, .50, .25). The sum of all confirmed European countries on different bands in a calendar year is multiplied by the respective multiplier points earned from making individual contacts. Contacts over 5 years prior do not qualify. See the example in Table 1.

	1977	1976	1975	1974	1973	1972	1971
Confirmed QSOs	32	48	52	44	38	36	71
Multiplier	1.0	1.0	1.0	.75	.50	.25	.00
Annual Score	32	48	52	33	19	9	0
Total Score	32	48	52	33	19	9	0 = 193

(Date of the sample application was December 31, 1977.)

Table 1.

Worked All Europe Award

WAE certificates are awarded to amateurs in three operator classes: Class WAE III—40 different countries in Europe and 100 minimum points; Class WAE II—50 different countries in Europe and 150 points earned: Class WAE I—55 different European countries and 175 points earned.

To score points, each European country counts one point on each of the six (1.8 through 28 MHz) bands. Only four bands per country, however, may be utilized for point scores. If the same station is worked on all five of the six bands, five points per country is earned. Two additional points are earned for making contacts on one of the VHF-UHF bands. Stations outside Europe may claim 2 points per European contact on 1.8 and 3.5 MHz.

The WAE series of awards is made available for either All Telegraphy or All Telephony.

EU-DX-D

This award has been claimed annually since 1964. It is issued for mixed operation, all CW, and all phone. For the mixed class, at least 30% of the contacts must be made in a different mode.

The basic idea of the award is for applicants to work all the required contacts within a single calendar year. A minimum of 50 points must be earned each year. 20 points must be made with European countries, while the other 30 points may be non-European.

All amateur bands may be used; however, a country may be contacted only once in the effort to achieve the requirements of this award.

The countries qualifying the applicant for this award appear in the European Countries List shown above. Stickers are available for each additional block of 4 European plus 6 non-European countries within the same year, ending December 31st.

The EU-DX-D may be claimed anew every year. Each year's score may be added to achieve EU-DX-D 500 and EU-DX-D 1000. A seal of merit depicts the 500 award; a special awards trophy is awarded to anyone who accumulates 1000 points.

All applications, QSLs, and awards fees should be sent to: Eberhard Warnecke DJ8OT Postfach 101244, 5620 Velbert 1, Federal Republic of Germany.

Representing the Diploma Interests Group of Germany (DIG), DJ8OT also provided me with very detailed information about the awards program being sponsored by this very unique group of radio amateurs.

Worked DX Stations Award

The WDXS Award issued by DIG is available to amateurs with no band or mode restrictions. To qualify, all contacts must be made after January 1, 1964.

This award is issued in 4 classes of operating achievement:

Class 4: DX stations must work 200 European stations, 10 of which must be on 40 and/or 80 meters. European stations must work 200 other European stations, 20 of which must be on 40 and/or 80 meters.

Class 3: DX stations must work 500 European stations, 25 of which must be on 40 and/or 80 meters. European stations must work 500 other Europeans, 50 of which must be on 40 and/or 80 meters.

Class 2: DX stations must work 1,000 European stations, 50 of which must be on the 40 and/or 80 meter band. European stations must work 1,000 other Europeans, 50 of which must be on the 40 and/or 80 meter band.

Class 1: DX stations must work 2,000 European stations, 100 of which must be on the 40 and/or 80 meter band. The requirement is the same for Europeans.

No QSL cards are required. General certification rules apply. Should all your contacts be on CW, DIG will provide a special "CW Award" sticker for this accomplishment. Fee for the WDXS Award is US $5.00 or 10 IRCs.

European Prefixes Award

The EU-PX-A is issued by DIG for contacts of 100 different European prefixes on or after January 1, 1969. There are no band or mode restrictions. Endorsement stickers are awarded for 150, 200, 250, and 300 prefixes claimed.

Should all your contacts be on CW, the sponsor has made a special "CW Award" sticker available to recognize this achievement.

GCR apply and award fee is US $5.00 or 10 IRCs.

The One Million Award

The 1,000,000 Award is issued by DIG to those amateurs who can accumulate one million points by adding together the postal codes of each German station contacted. The same postal code may be claimed only once.

In making application for this award, your list of contacts would look something like that shown in Table 2.

As you will note, the list of contacts is made in order of the postal code numbers in the right-hand column. Some postal codes may appear on your QSL or in the *Callbook* as one-, two-, or three-digit numbers. In these instances, add zeros to make four-digit codes (i.e., a postal code may appear as 41; add zeros to make it 4100).

GCR apply and the award fee is the same as with other DIG awards—$5.00 or 10 IRCs.

Worked DIG Members Award

The W-DIG-M Award is issued to those amateurs who submit proof of working DIG members on any band or mode with no restrictions as to date.

Three classes of this award are issued:

Class 3: DX stations work 15 DIG members; European stations work 50 DIG members.

Class 2: DX stations work 30 DIG members; European stations work 75 DIG members.

Class 1: DX stations work 50 DIG members; European stations work 100 DIG members.

A "CW Only" sticker is available for making all contacts on CW. GCR apply and the award fee is $5.00 US or 10 IRCs.

International Airport Award

The IAPA will be issued for contacts with amateur radio stations in 50 different cities which have international airports. All 6 continents must be worked and the applicant may claim only one contact from his or her own country. All contacts must be made after January 1, 1973, and there are no band or mode restrictions.

Fee for this diploma is US $5.00 or 1C IRCs.

Call	Date	Band	QTH	Postal Code
DL7IG	18/8/69	80	Berlin	1000
DL7TZ	12/11/68	20	Hamburg	2000
DL9KP	11/10/69	40	Duisburg	4100
DJ8OT	27/11/69	80	Velbert	5620
DL2JB	13/1/68	40	Laudenbach	6941
DL9XN	15/6/67	15	Boblingen	7030
			Total at least	1,000,000

Table 2.

CORRECTIONS

Several countries were inadvertently omitted from *73*'s Work the World DX listing on page 120 of the June issue. Contacts with the following countries are also valid QSOs for WTW:

S8	Transkei	3B9	Rodriguez Island
S9	Sao Tome and Principe	3C	Equatorial Guinea
ST	Sudan	3D6	Swaziland
STØ	South Sudan	3V	Tunisia
SU	Egypt	3X	Republic of Guinea
TJ	Cameroon	3Y	Bouvet Island
TL	Central African Empire	5A	Libya
TN	Congo	5H	Tanzania
TR	Gabon	5N	Nigeria
TT	Chad	5R	Malagasy Republic
TU	Ivory Coast	5T	Mauritania
TY	Banin	5U	Niger
TZ	Mali	5V	Togo
VKØ	Heard Island	5X	Uganda
VQ9	Aldabra Island	5Z	Kenya
VQ9	Chagos (Diego Garcia)	6O	Somalia
VQ9	Descroches	6W	Senegal
VQ9	Farquhar	7P	Lesotho
XT	Upper Volta	7Q	Malawi
ZD7	St. Helena	7X	Algeria
ZD8	Ascension Island	8Q, VS9	Maldive Islands
ZD9	Gough Island and Tristan da Cunha	9G	Ghana
		9J	Zambia
ZE	Rhodesia	9L	Sierra Leone
ZS1, 2, 4, 6	South Africa	9Q	Republic of Zaire
ZS2	Prince Edward Island	9U	Burundi
ZS2	Marion Island	9X	Rwanda
ZS3	Southwest Africa (Namibia)		
3B6, 7	Agalega and St. Brandon		
3B8	Mauritius		

Avery L. Jenkins WB8JLG
73 Staff

Two Modes Award

This award requires the applicant to work 50 different countries on CW, including Germany and all six continents, and again the same 50 countries on phone. All contacts must be made on or after January 1, 1962, to qualify.

GCR apply and award fee is US $5.00 or 10 IRCs.

Worked German Large Cities

The WGLC Award is available in three classes. There are no restrictions as to modes. There are no band endorsements. All contacts must be made by using more than one band. Each city may be claimed only once regardless of band. All contacts must be made on or after January 1, 1962.

Class 3: DX stations work 10; Europeans must work 20 cities.

Class 2: DX stations work 20; Europeans must work 40 cities.

Class 1: DX stations work 30; Europeans must work 60 cities.

Should all your contacts be made on CW, DIG has prepared a special "CW Only" sticker made available upon your initial application.

German Large Cities are: Aachen, Augsburg, Berlin, Bielefeld, Bochum, Bonn, Bottrop, Braunschweig, Bremen, Bremerhaven, Darmstadt, Dortmund, Dusseldorf, Duisburg, Erlangen, Essen, Frankfurt/Main, Freiburg, Furth, Gelsenkirchen, Gottingen, Hagen, Hamburg, Hannover, Heidelberg, Heilbronn, Herne, Kaiserslautern, Karlsruhe, Kassel, Kiel, Koblenz, Koln, Krefeld, Leverkusen, Lubeck, Ludwigshafen, Mainz, Mannheim, Monchengladbach, Mulheim/Ruhr, Munchen, Munster, Neuss, Nurnberg, Oberhausen, Offenbach/Main, Oldenburg, Osnabruck, Recklinghausen, Regensburg, Remscheid, Rheydt, Saarbrucken, Salzgitter, Solingen, Stuttgart, Trier, Ulm, Wanne-Eickel, Wiesbaden, Wilhelmshaven, Witten, Wolfsburg, Wurzburg, Wuppertal.

GCR apply and award fee is the usual US $5.00 or 10 IRCs.

As you can see, both DARC and DIG have very extensive award programs made available for you and me. Should you wish to inquire or for that matter submit application for one or more of the awards shown in this column thus far, may I suggest that you write our good friend DJ8OT directly: Eberhard Warnecke DJ8OT, Postfach 101244, 5620 Velbert 1, Federal Republic of Germany.

There remain two additional awards being sponsored by DIG; however, I wish to caution you not to apply for them through DJ8OT. The following awards have separate award custodians.

Action 40 Award

This diploma can be applied for only by licensed amateurs having proven contacts with at least 100 different amateur stations within one calendar month after November 1, 1977, on the 40-meter amateur band only.

All modes are accepted. Contest QSOs and crossband QSOs do not count. Split-frequency QSOs do count, however.

Your application must show the callsign worked, the name and QTH of the operator, mode, and date and time GMT. GCR apply and award fee is US $5.00 or 10 IRCs. Mail your application and fee to: Klaus Kleine DJ1ZP, Fasanenweg 22, D-4714 Selm-Bork, Federal Republic of Germany.

DIG Diploma 77

This diploma requires the applicant to work at least 77 DIG members from at least 7 different countries, but only 7 × 7 (49) DIG members out of one's own country, after January 1, 1977. The award is made for phone only, and mixed modes or bands are accepted. Fee is US $5.00 or 10 IRCs. For further explanation of this award or for submitting application, write to: Henry Bielinski DC6JG, Werftstr. 245, D-2300 Kiel 14, Federal Republic of Germany.

HUNTINGTON COUNTY 4-H FAIR

The Huntington County Amateur Radio Society will operate a special-event station at the Huntington County 4-H Fair on August 1st through August 3rd. The station will be operating from 2100 GMT to 0300 GMT each day using the call KC9GS. The operating frequencies will be 3900-3930, 7230-7260, 14280-14310, 21350-21380, and 28600-28630. QSL information will be given when contacts are made.

OYSTER CREEK NUCLEAR GENERATING STATION

The Jersey Shore Amateur Radio Society will operate KF2T at the Oyster Creek (NJ) Nuclear Generating Station between 1800Z, Saturday, August 6, and 1800Z, Sunday, August 7. Phone operations will be near 3930, 7230, 14260, 21260, and 28560 kHz. CW/Novice will be 30 kHz from lower band edges; VHF on 146.58. RTTY may be used on 3640, 7085, and 14085. QSLs to JSARS, 619 17th Avenue, South Belmar NJ 07719. Enclose an SASE for a commemorative QSL.

LONGEST PORCH IN THE WORLD

The Tri-County Wireless Group will operate N8COY on Aug 13, 1500-2300Z, from the famous Grand Hotel's "Longest Porch in the World," in Mackinac Island, Michigan. SSB frequencies: 7.280, 14.280, 21.380, 28.580, and FM 147.480. QSL and regular SASE to N8COY for a special QSL. DXers via Bureau.

MOUNTAIN STATE AWARD

The Logan County ARC will hold its third annual "Mountain State Award" expedition from 1600 UTC, August 20, until 0400 UTC, August 21, 1983. The callsign will be KC8NR. Operations will take place on a West Virginia mountaintop in Logan County, which is located in the heart of southern West Virginia's billion-dollar coal fields.

Phone operating frequencies will be approximately 25 kHz from the low end of the General phone bands as propagation allows. Novice band frequencies of 3725 and 7125 should be checked each hour.

A handsome 8" × 10" certificate will be awarded to all contacts submitting a QSL and a legal-size SASE to Basil Napier WD8KWC, RFD 1 Box 198, Chapmanville WV 25508.

CAMP GOOD DAYS AND SPECIAL TIMES

Ed Holdsworth N2EH, president of the Rochester (NY) Amateur Radio Association (RARA), has announced that the club will operate an amateur radio station on the site of Camp Good Days and Special Times, located at Camp Onanda on Canandaigua Lake, New York. The dates of operation will be Saturday, August 27, and Sunday, August 28, between approximately 11 am and 5 pm. The frequencies and bands are as follows: 80 meters, phone, between 3.900 MHz and 3.925 MHz, and CW, between 3.525 MHz and 3.550 MHz; 40 meters, phone, between 7.230 and 7.250, and CW, between 7.025 and 7.050; 15 meters, phone, between 21.350 and 21.375, and CW, between 21.025 and 21.075. In addition, 2 meters FM will be operated locally.

Camp Good Days and Special Times is a special camp for children who have cancer. It was established in 1980 by Gary Mervis of Rochester, the father of Teddi Mervis, a 9-year-old girl who had incurable brain cancer. Teddi passed away last year but Gary has kept the camp going and it has grown each year.

RARA members will operate the radio station, using their club callsign, K2JD. For a special certificate, confirmation of contact and an SASE should be sent to RARA, PO Box 1388, Rochester NY 14603. Camp Good Days and Special Times is a registered not-for-profit organization in New York State.

CLEMMONS UNITED METHODIST CHURCH

Throughout the month of September, WB4TAL will operate as a special-event station from within the Clemmons United Methodist Church, in Clemmons, North Carolina. The occasion is the celebration of the 200th anniversary of the church. Operation will be in the general portion of the HF phone bands and on 2 meters FM. CW will be available upon request. For a commemorative QSL card send an SASE to WB4TAL, PO Box 366, Clemmons NC 27012.

ELMER AWARD

Named in honor of all the "Elmers" who, since Marconi, have given of their time and talents to help others become amateur radio operators, the Northern New Jersey Chapter of OCWA has established its Elmer Award. The award will recognize as "Elmer-of-the-Year" the radio amateur in northern New Jersey who has done the most to pass on the knowledge that he or she has gained over the years to the next generation of amateur radio operators. The award will consist of two appropriately engraved plaques. The first will carry the name of each year's winner and rotate annually; the second will carry the name of the current year's winner and may be kept permanently. The winner will be selected by a panel of five judges, three of whom shall be members of the Northern New Jersey Chapter of QCWA; two will be prominent local amateurs. Presentation of the award will be made to the 1983 winner at the chapter's annual meeting, the evening of Friday, November 18, at the Burns Country Inn, Clifton NJ.

Rules

1. Nominations for the award may be made by any licensed amateur radio operator in northern New Jersey.
2. Nominees must be licensed amateur radio operators who reside in northern New Jersey.
3. Each nomination shall be accompanied by a statement (of 500 words or less) detailing the reasons the nominee is deemed worthy of the award.
4. All nominations must be received on or before September 1, 1983, by the chairman of the chapter's Elmer Award Committee.

Please direct all communications to: Gordon S. Gregory N2IN, 8 Winding Way, Denville NJ 07834; (201)-627-4426.

MISS AMERICA PAGEANT

The Southern Counties Amateur Radio Association plans to have a special-event station during the Miss America Pageant from September 13-17, 1983. Last year, they made 1,800 contacts in 49 states and 5 foreign countries with 800 confirmed. Due to more advance planning, they hope to surpass those figures this year.

NORTHWEST CORNER OF THE WORLD

The Wisconsin Valley Radio Association, of Wausau (Marathon County), Wisconsin, is pleased to announce the following special-event station: the second annual "If The World Is Round, Then How Come It Has Corners?"

Marathon County, Wisconsin, is located in north central Wisconsin. Besides being the largest county in Wisconsin (somewhat larger than the state of Rhode Island), it also contains the intersection of the 45° north parallel and the 90° west meridian. This point occurs near the city of Wausau, Wisconsin. This places Wausau exactly halfway between the North Pole and the Equator, and halfway between the Zero Meridian at Greenwich, England, and the International Dateline. It is the "Northwest Corner of the World."

The other three 45°/90° "corners" are located as follows: in the Pacific Ocean west of Chile, in the Indian Ocean southwest of Australia, and in a remote northern area of the Chinese province of Sinkiang, near the Mongolian border.

The Wisconsin Valley Radio Association will operate on the exact site of the 45° N/90° W intersection on September 18, 1983, using the club station callsign, W9SM. Operation will be from 7:00 am to 7:00 pm CDT. Frequency of operation will be dependent upon band conditions but will be 25 kHz up from the bottom of the General phone portion of whatever band is being used.

Send an SASE for a QSL card. Send an SASE and $1.00 for a certificate to: Wisconsin Valley Radio Association, Inc., Box 363, Wausau WI 54401.

UNIONTOWN PA

The Uniontown Amateur Radio Club W3PIE of Uniontown, Pennsylvania, will be operating a special-event station on September 24, 1983, to celebrate Fayette County's 200th anniversary. Operations will be conducted from 1300Z to 2100Z, on or about the frequencies of 7.235, 14.285, and 21.360 on SSB; also 146.52 simplex between 2300Z and 0100Z for local contacts. An 8 × 10 certificate will be issued for contacts made during these times. Please send a large SASE and QSL to W3PIE, c/o John T. Cermak WB3DOD, PO Box 433, Republic PA 15475.

ANNO SANTO AWARD

The Anno Santo Award (Holy Year Award) is sponsored by the Rome section of the Associazione Radioamatori Italiani. The award is printed on deluxe paper and is about 19 × 13 inches (47 × 33 cm). It represents an engraving of St. Peter's Basilica. The same artwork is printed on the special QSL that will be used by most of the hams of Rome during the Holy Year.

WHITE TAIL DEER AWARD

The Mid-Michigan Amateur Radio Club has announced the first of a series of awards featuring the wildlife of Michigan. The certificate is available to all licensed amateurs and shortwave listeners. The White Tail Deer Award requires contacts with two Mid-Michigan Amateur Radio Club stations, or contacts with one MMARC station and three White Tail Deer Award certificate holders. For Novice applicants, the requirements are one contact with an MMARC station or one con

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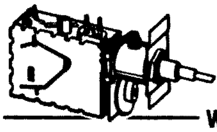

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1. The first thing GILCO does is change the standard diode to a **hot carrier diode**.

2. The tuner's output is then measured on our JERROLD field strength meter and compared to a computer derived chart from which we determine the correct value coil to add across the IF output for ***maximum pre-peaked gain***.

3. The tuner is then fed a standard 10db 300 ohm antenna input and while monitoring the output on our HEWLETT PACKARD spectrum analyzer, the tuner is tuned to the desired channel and its oscillator is offset for the desired output frequency as follows:

Channel 2: 58 Mhz, Channel 3: 63 Mhz, Channel 4: 68 Hhz

We call this step peaking because the tuner's output looks like a peak on our spectrum analyzer and the highest point of that peak is actually adjusted for the desired output.

4. The last step is one more measurement on the field strength meter which is again compared to our performance chart to calculate the correct value of the second coil which is added to the tuners internal connections.

This procedure was developed by GILCO and it is our computer derived performance charts that make our tuner better, that's because ***almost every tuner gets a different value coil*** before it's peaked and again a different value coil after it's peaked. The combinations are endless and ***the way we determine the values is our secret...***

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- **Requires NO Modification to Your Television**
- ***Individually Packaged and Labeled Parts Save Guesswork***

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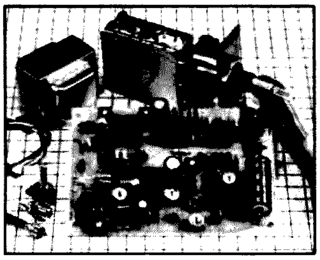
- This kit was designed to take advantage of the GILCO high gain tuner which means its circuitry is ***simpler and more efficient*** than those circuits that require inferior varactor tuners.



Pre-drilled, pre-screened, plated through the holes P/C board. All hardware, connectors, 22 page illustrated instruction manual, & Gilco Hy-Gain tuner. Kit assembles in just 4 hours.

FREE 22 Page Instruction Book included with each P/C Board or Parts Kit. This instruction book will guide the builder through every step of the assembly. ***Nearly every page is illustrated.*** With this instruction Book, estimated assembly time is 4 hours.

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1. This Printed Circuit Board uses ***only one jumper, others use nine.***
2. ***The component layout is screen printed*** on the component side of the P/C board.
3. The solder side of the P/C board is covered with high temperature solder resist. This prevents solder bridges.
4. ***Newest Addition:*** **the P/C board is plated through the holes.** This allows for easier and more positive soldered contact between the parts and the P/C board.

Part No. B22 Complete Electronic Parts Kit $80.00

All resistors (30), Potentiometers (1-5K, 3-10K), Panel Mount Potentiometer (10K), Electrolytic Capacitors (6), Ceramic and Mylar Disc Capacitors (35), Variable Capacitors (4), All Integrated Circuits (7), Voltage Regulator, Heat Sink, Diodes (4), IC Sockets (4-8 pin, 3-14 pin), Power Transformer (24V, 1A), Coil Kit with No. 26 wire (4), Speaker (4", 3oz.), Standoffs, Coaxial Cable, All Miscellaneous Harware, Etc. All parts are individually packaged and labeled.

All components including the Wire, Hardware, Coaxial Cable and Heat Sinks are included in the parts kit. This means your assembly time from start to finish is just 4 hours.

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#A03 New 1 stage, low noise, 14db gain RF amplifier .... Kit $10.50

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#B20, B21, B22 Complete P/C Board and Parts Kit (all three)	$110.00	
#A02 Two stage, 28 db gain, Amplifier Kit	$18.50	
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Name ______________ **Total** ______

Address ______________ **Tax** ______

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tact with a White Tail Deer Award certificate holder. For shortwave listeners, the requirements are one MMARC station heard or one White Tail Deer Award certificate holder. A detailed list showing name, call, and QTH of the station or stations worked or heard should be accompanied by one dollar US to cover postage and printing costs. Payment may be made by cash, check, money order, IRCs, or USA postage cards, and photocopies of QSLs will be accepted. Contacts may be made over any period of time, so dig back through your logs. Also, note any special endorsements that you want on your award. Repeater contacts cannot be used, but satellite contacts can. Send applications and information to: Gary Lorenz WD8JFF, Awards Manager, MMARC, 3210 N. County Line Rd., Farwell MI 48622.

NEW AWARD FROM PARS

The Poway Amateur Radio Society (PARS) has announced that a handsome new certificate, known as the "Distinguished PARS Communicator," is now available. The certificate has been issued to promote amateur radio contacts between PARS members and the amateur community at large. To qualify for the PARS certificate, operators must contact 5 PARS members (25 for San Diego County residents) and then submit their list of contacts in log form with an SASE to: Operations—PARS, PO Box 996, Poway CA 92064.

ULSTER COUNTY AWARD

I received a very complimentary letter about our Awards column from Harold Twiss WA2RXF, who represents th Overlook Mountain ARC in Lake Katrin New York. In his letter, Harold enclose details of a very nice award being offere through his club.

This award requires applicants to co tact other amateurs residing in the Ne York county of Ulster.

To qualify, DX stations must conta two amateurs in Ulster County, whi amateurs in the continental US mu make three contacts. There are no band mode limitations, and there are no dat restrictions.

To apply, submit a list of contacts gi ing the usual logbook data in addition t the award fee of 50 cents or 4 IRCs t Harold Twiss WA2RXF, Country Lan Lake Katrine NY 12449.

WORKED A SHEBOYGAN AWARD

With activity on 10 meters at an all-tim high, now is your opportunity to earn th very attractive WAS (Worked A Shebo gan) Award.

All that is required is that a contact b made with any station in Sheboyga County, Wisconsin, on the 10-meter ban

To apply, merely send your logbook i formation to the Awards Manager, Sh boygan County ARC, Inc., Farnsworth J High School, Sheboygan WI 53081. As gesture, should you find that earning th award is impossible, why not drop the J High School a letter and arrange for schedule with one of their amateurs Their club station is K9ERO.

SATELLITES

Amateur Satellite Reference Orbits

	OSCAR 8		RS-5		RS-6		RS-7		RS-8		
Date	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Dat
Aug 1	0113	104	0142	17	0107	14	0048	6	0038	360	1
2	0117	105	0136	17	0052	11	0038	5	0035	1	2
3	0121	106	0131	17	0036	9	0028	4	0032	1	3
4	0126	107	0126	17	0021	7	0019	3	0029	2	4
5	0130	108	0120	18	0006	4	0009	2	0027	3	5
6	0134	109	0115	18	0149	32	0000	1	0024	4	6
7	0139	110	0110	18	0134	29	0149	30	0021	5	7
8	0000	86	0104	18	0118	27	0139	29	0018	6	8
9	0004	87	0059	18	0103	25	0130	28	0015	6	9
10	0009	88	0053	19	0047	22	0120	28	0012	7	10
11	0013	89	0048	19	0032	20	0110	27	0010	8	11
12	0017	90	0043	19	0017	18	0101	26	0007	9	12
13	0022	91	0037	19	0001	16	0051	25	0004	10	13
14	0026	92	0032	19	0144	43	0041	24	0001	10	14
15	0030	94	0027	19	0129	41	0032	23	0158	41	15
16	0035	95	0021	20	0114	38	0022	22	0155	42	16
17	0039	96	0016	20	0058	36	0013	21	0152	43	17
18	0043	97	0011	20	0043	34	0003	20	0149	44	18
19	0048	98	0005	20	0028	31	0152	49	0147	45	19
20	0052	99	0000	20	0012	29	0143	49	0144	45	20
21	0056	100	0154	51	0155	57	0133	48	0141	46	21
22	0101	101	0149	51	0140	54	0123	47	0138	47	22
23	0105	103	0143	51	0125	52	0114	46	0135	48	23
24	0109	104	0138	51	0109	50	0104	45	0132	49	24
25	0114	105	0133	51	0054	47	0054	44	0130	49	25
26	0118	106	0127	52	0038	45	0045	43	0127	50	26
27	0122	107	0122	52	0023	43	0035	42	0124	51	27
28	0127	108	0117	52	0008	40	0026	41	0121	52	28
29	0131	109	0111	52	0151	68	0016	41	0118	53	29
30	0135	110	0106	52	0136	65	0006	40	0115	54	30
31	0140	112	0101	52	0120	63	0156	69	0112	54	31
Sep 1	0001	87	0055	53	0105	61	0146	68	0110	55	1
2	0005	80	0050	53	0049	58	0136	67	0107	56	2
3	0010	89	0045	53	0034	56	0127	66	0104	57	3
4	0014	90	0039	53	0019	54	0117	65	0101	58	4
5	0018	91	0034	53	0003	51	0107	64	0058	58	5
6	0023	92	0029	54	0146	79	0058	63	0055	59	6
7	0027	94	0023	54	0131	77	0048	62	0053	60	7
8	0031	95	0018	54	0116	74	0039	62	0050	61	8
9	0036	96	0012	54	0100	72	0029	61	0047	62	9
10	0040	97	0007	54	0045	70	0019	60	0044	63	10
11	0044	98	0002	54	0029	67	0010	59	0041	63	11
12	0049	99	0156	85	0014	65	0000	58	0038	64	12
13	0053	100	0151	85	0157	92	0149	87	0036	65	13
14	0057	101	0145	85	0142	90	0140	86	0033	66	14

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PROPAGATION

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EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	14	7	7	14	21	21	21	21A	21
AUSTRALIA	21	14	14	7B	7B	7B	7B	7B	7B	7B	14	21
CANAL ZONE	21	14	14	7	7	7	7A	14	14	21	21	21
ENGLAND	14	7	7	7	7	7	14	14	14	14A	14A	14
HAWAII	21	14	14B	7B	7B	7	7	7	14	14	14	14A
INDIA	14	14B	7B	7B	7B	7B	14	14	14	14	14	14
JAPAN	14A	14	7B	7B	7B	7B	7B	7	7	7A	14	14
MEXICO	14A	14	7A	7	7	7	7	14	14	14A	14A	14A
PHILIPPINES	14	14	7B	7B	7B	7B	7B	7B	14	14	14	14
PUERTO RICO	14	7A	7	7	7	7	7A	14	14	14	14	14A
SOUTH AFRICA	7B	7B	7	7B	14	14	14A	14A	21	21	14	14
U. S. S. R.	7	7	7	7	7	7A	14	14	14	14	14	7B
WEST COAST	14A	14	7A	7	7	7	7	14	14	14	14	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	14	7	7	7A	14A	21	21	21A	21
AUSTRALIA	21	21	14	14B	7B	7B	7B	7B	7B	7B	14	21
CANAL ZONE	21	14	14	7	7	7	7	14	14	21	21	21
ENGLAND	14	7	7	7	7	7B	14B	14	14	14	14	14
HAWAII	21	14A	14	7	7	7	7	7	14	14	14	14A
INDIA	14	14	7B	7B	7B	7B	7B	14B	14	14	14	14
JAPAN	14A	14	14B	7B	7B	7B	7B	7	7	7A	14	14
MEXICO	14	14	7	7	7	7	7	7A	14	14	14	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	7B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7B	7B	7	7B	7B	7B	14	14	14	14A	14	14
U. S. S. R.	7	7	7	7	7	7B	14B	14	14	14	14	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7	14	14	14
ARGENTINA	21	14A	14	14	7	7	7B	14	21	21	21A	21
AUSTRALIA	21	21	21	14	14	14B	7B	7B	7B	7B	14	21
CANAL ZONE	21A	14A	14	7	7	7	7	14	14	21	21	21
ENGLAND	14	7B	7	7	7	7B	7B	7B	14	14	14	14
HAWAII	21A	21	14A	14	14	7A	7	7	14	14	14A	21
INDIA	14	14	14	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	14A	14	14	14B	14B	7B	7	7	7	7A	14	14A
MEXICO	14A	14	14	7	7	7	7	14	14	14	14	14A
PHILIPPINES	14A	14A	14	14B	7B	7B	7B	7B	14	14	14	14A
PUERTO RICO	14	14	14	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7B	7B	7	7B	7B	7B	7B	14B	14	14	14	14
U. S. S. R.	7	7	7	7	7	7B	7B	14B	14	14	14	7B
EAST COAST	14A	14	7A	7	7	7	7	14	14	14	14	14A

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G = Good, F = Fair, P = Poor. * = Chance of solar flares.
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NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

AUGUST

SUN	MON	TUE	WED	THU	FRI	SAT
	1 F/G	2 F/G	3 F/G	4 P/F	5 P/F	6 F/G
7 F/G	8 F/G	9 G/G	10 G/G	11 G/G	12 G/G	13 F/F*
14 F/F*	15 P/F*	16 F/F	17 F/G	18 G/G	19 G/G	20 G/G
21 G/G	22 F/F	23 F/F	24 F/F	25 P/F	26 F/F	27 F/F
28 F/F	29 F/F	30 P/F	31 P/F			

International Edition

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Issue #276

Amateur Radio's Technical Journal

A Wayne Green Publication

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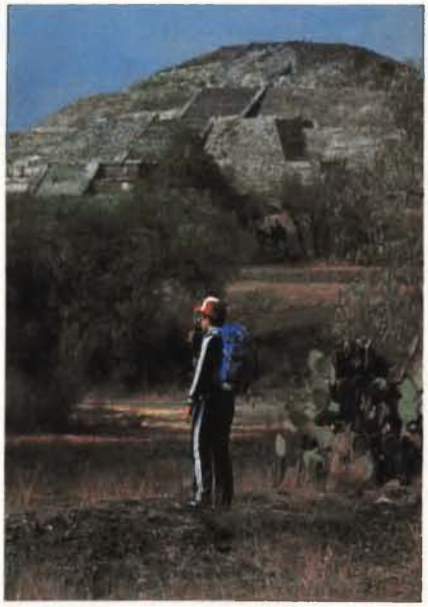
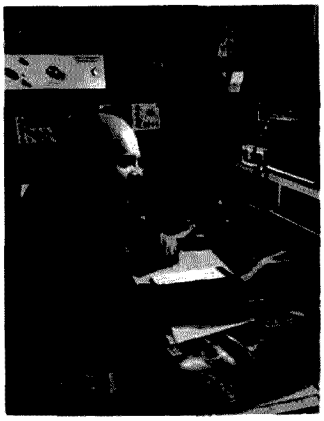


Your Own Apple—40

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



GREEN SELLS OUT

In a way, I suppose you might say that I sold out, but I plead guilty with an explanation.

It all started last spring when some chaps from one of the bigger banks called saying that they had a large foreign publisher who was looking to acquire something like my micro publishing empirette. I wasn't much interested because I enjoy what I'm doing more than anything else I can imagine. But what would it cost to listen, right?

So they came to visit and looked over our place. I showed them our growth in sales, which has run around 50 percent a year for the last eight years. They mumbled vaguely about $50 million, which I have to admit got my attention. I'd really never given much thought to what the whole mess might be worth.

The word that I was thinking of selling began to spread, and new suitors started calling every few days. The more I talked with these firms, the more I realized that this probably was a good time to merge with a larger firm so that I would have the money to invest in some new projects. I have never had much of a personal need for money, so selling out for a big bundle of cash had little attraction.

No, it would be worth merging if I could get the money to start magazines at a faster rate and thus be able to keep up better with the needs of the microcomputer industry. And I had an idea for a new type of magazine I wanted to try out. If it worked, I'd have a way to get perhaps 50 more like it going, each with expected sales on the order of $5 million a ear or more.

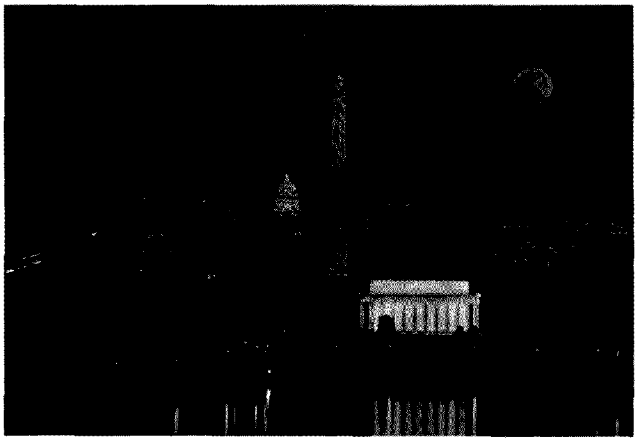
Then tl ɜre was my idea for a new type of school, a business/technical institute geared to the needs of the 80s. The more I thought about it, the more ideas for new divisions of Wayne Green, Inc., came to mind. With some cash available for getting these new businesses and publications going, we could step up our growth enormously. I did some sales projections and I could see us growing to a billion in sales within ten years just on the plans already in mind.

As I talked with the firms interested In merging, I found several of them excited about my ideas and plans. I'd had a good record of coming up with innovative ideas in the past, so there wasn't much skepticism about my new ideas. After all, I'd had the idea to start the first magazine for micros: *Byte*. And then I started the first system-specific magazine: *80 Micro*. And I'd pioneered mass-produced software. As I talked with people, I realized that I have a pretty good track record.

The final choice of a merger partner was most difficult. Several large firms put it bluntly: They needed me and I could name my price. Now I want to tell you, that is fantastic for the ego. I really wasn't Into shopping around for the highest offer because the difference between $50 million and $100 million means a lot less than the compatibility of the merger. And numbers like that don't mean anything, anyway; they're just very big numbers.

On May 22nd, I signed a preliminary agreement with Pat McGovern, the publisher of the

Continued on page 116



QSL OF THE MONTH

This month's QSL card winner depicts a nighttime scene from the nation's capital, viewed from the Virginia side of the Potomac River. The Lincoln Memorial is in the foreground, with the Washington Monument and the Capitol in the background. Tom Dorset WB4J makes this card distinctive by using lowercase letters for his callsign, giving a modern feel to this traditional scene. Opposite Tom's callsign, a faint moon looks serenely over the entire panorama.

To enter *73*'s QSL of the Month contest, put your card in an envelope with your choice of book from *73*'s Radio Bookshop and send it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes and without a book choice will not be considered.

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"10. . .9. . .8. . ."

Be ready when the Space Shuttle Columbia *carries aloft the first astro-ham. Here's the best way to contact this historic DXpedition.*

Alan Kaul W6RCL probably said it best about a year ago when he wrote, "Get ready for the greatest DXpedition ever. An astro-ham in space on 2 meters." Alan, who produces NBC Nightly News for the west coast, did not pen those words for that vehicle. Rather, they were the lead-in to a 2-minute special report by Roy Neal K6DUE which aired on my Westlink Radio News Service.

It was a story that took the world of amateur radio by storm, and one which will hopefully unfold on September 30, 1983. That is the day when NASA plans to launch the STS-9 shuttle mission into orbit. On board the orbiter *Columbia* will be the European Space Agency's "Spacelab," manned by an international crew including Dr. Owen Garriott of the United States.

It is Dr. Garriott, the radio he will take with him, and the type of operation planned that will open a new chapter in space-to-Earth communications. Dr. Garriott is a ham—W5LFL. The radio is for the 2-meter amateur band, operates on FM voice, and with it W5LFL hopes to contact amateurs around the world, making this the first time any form of private radio has been used from space.

Background

If you think it's easy to convince NASA to let you operate an amateur station from one of their space vehicles, then try to get yourself permission to do so. In the case of W5LFL/Space Mobile, it has taken a decade and a half. The idea originated shortly before Dr. Garriott was rocketed into space to serve duty on *Skylab*. He had approached NASA with the idea of taking along a 2-meter radio back then, but it was nixed because of power requirements and other technical considerations.

Since that time, the thought of operating from space has stayed with Dr. Garriott, and several years ago with the assistance of members of the Space Center ARC in Houston (W5RRR) and NBC news correspondent Roy Neal, another proposal to carry amateur radio on a shuttle mission was made. The flight would be the STS-9 using the orbiter *Columbia* and carrying the ESA Spacelab. This time the response was positive, with General James Abramson giving the project the green light earlier this year.

About three years ago, two other amateur radio organizations, the ARRL and AMSAT, were brought into the planning of this event. As plans progressed, it was recognized that for the operation to be successful, it would take the full cooperation of amateurs around the world. A radio that could meet the critical requirements of the space shuttle was needed. Specific operating protocol had to be developed to ensure a maximum number of QSOs to be held in the allotted operating time periods. Publicity had to be planned. A QSL manager or bureau would be needed to handle the expected torrent of requests for commemorative cards, and much, much more.

It was obvious that only an organization with the resources of the ARRL could handle such a chore, besides which Dr. Garriott wanted due credit given to the League for its assistance in getting the groundwork for the mission put together. The ARRL has been unofficially involved since the beginning. From the outset, this has been billed as a joint ARRL and AMSAT goodwill operation in celebration of the 1983 World Communications Year, but to us on the ground hoping for a contact with W5LFL from space, it is far more than that.

The STS-9 Radio Equipment

There have been many questions asked about the type of gear that W5LFL will be using on the STS-9. It seems that every amateur has heard a rumor that it will be this HT or that one. Officially, the radio is described as a black-box transceiver supplied by the ARRL. But the ARRL is not building the unit. Rather, its design and construction were placed on open bid to interested radio-equipment manufacturers. About six, both domestic and foreign, initially showed interest.

That number dropped off a bit after the specifications for the unit were announced by NASA. The criteria for the radio are very stringent and include the provision that the equipment cause

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absolutely zero interference to any other system on board while operating from the indoor antenna. The unit must be totally independent of the spacecraft's electrical system, yet be capable of producing at least 5 Watts continuous power for the duration of each operating period of 1 hour per day for 5 days. In addition, the unit has to be channelized to make it easy for Dr. Garriott to operate, with maximum receiving and transmitting efficiency from 144.9 to 145.8 MHz. All of this and more for the distinct pleasure of knowing that your radio has been selected to be the first in space and never really being able to prove it.

It was decided a long time ago that the term "black box" would be applied to the set by the ARRL, since it didn't want to find itself in the *de facto* position of endorsing the product of one manufacturer over another. Oh, we will all eventually know whose radio flew on STS-9. You can be sure that the manufacturer selected will take full-page ads in every amateur magazine to proclaim this, but you won't see an official endorsement from the ARRL, AMSAT, or anyone else in amateur radio directly involved in the mission. For the sake of objectivity and nonpartisanship, it has to be this way. The leaders of the amateur-radio community don't want to become involved in a "Tang" type of publicity campaign.

The unit itself will have three modes of operation. This is subject to change before this article goes to press, but this is what we have at this writing. Mode 1 will permit split-frequency transceive with Dr. Garriott transmitting between 145.51 and 145.77 MHz and listening for callers 600 kHz lower. It is not expected that this mode or mode 2, which is simplex operation from 145.51 to 145.77 MHz, will see much use (if any) during the mission. Rather, it is mode 3 that will probably be exercised the most. In this mode, the transceiver must be capable of transmitting on the same frequency range of 145.51 to 145.77 MHz, but will receive on an odd offset between 144.91 MHz and 145.49 MHz. Modes 1 and 3 will use 20-kHz inter-channel spacing, as will the channels for the simplex mode 2. More on this operation later.

The antenna will be inside the *Columbia* orbiter itself and will be an "indoor array" of some type affixed to the upper crew compartment window. Several types of antennas are being experimented with. One is a loop, another a printed-circuit resonator, and there are others. Development is taking place at the Johnson Space Flight Center and being done by NASA scientists and engineers. During the flight, *Columbia* will be flying upside down by Earth perspective and that window will be facing the ground.

What the QSOs Will Sound Like

Present estimates are that Dr. Garriott will have time for only about 500 or so QSOs while in space, so don't expect to be able to rag-chew or even speak directly with W5LFL. I hate to use the term, but what I am about to describe is going to sound like some sort of a DX list operation, with Dr. Garriott developing the list as he goes. The STS-9 orbiter, because of its sharp equatorial crossing angle (N to S, S to N), will place W5LFL in direct contact with a given geographic area for about 8 minutes on any given pass. *Columbia* will be traveling with a forward momentum of about 17,000 mph at about 160 miles altitude in what amounts to a sine-

wave pattern around the planet.

Keeping this in mind, and adding to it that during any given operating period the spacecraft will almost go full circle around the world, you can easily understand the constraints on individual QSO time. For this reason, split-frequency operation and some form of time-sharing between astronaut and terrestrial stations had to be established. When an operating period begins, you will hear W5LFL making a call-up that may be something like this:

"This is W5LFL Dr. Garriott aboard the US Space Shuttle *Columbia*. we are now approaching the west coast of the United States I'll be taking calls from the 6th call district only for the next minute this is W5LFL standing by."

For the next 60 seconds, Dr. Garriott will scan across his preprogrammed receive frequencies. During that time, ground stations (that's you and me) will simply choose what we feel is the best frequency for our use and transmit our callsign for one minute. During the next minute, Dr. Garriott will acknowledge the callsigns he hears and then announce the next zone he will be listening for. At this point, the whole process begins again and continues on a minute-by-minute basis until that particular hour's operating period has ended.

As planned now, Dr. Garriott will transmit on the even minutes starting at the top of the hour and will listen for calls on the odd minutes. Stations on the ground will have about a dozen uplink channels to choose from. Use of repeaters and remote-base systems is discouraged, and while some uplink channels may fall on known repeater output channels in the United States, a myriad of stations on the ground trying to capture a repeater to be heard above the throng will make a given channel useless. Therefore, repeater owners on affected frequencies might be wise to terminate the operation of their systems for the 10 minutes or so that *Columbia* will be within radio range each day.

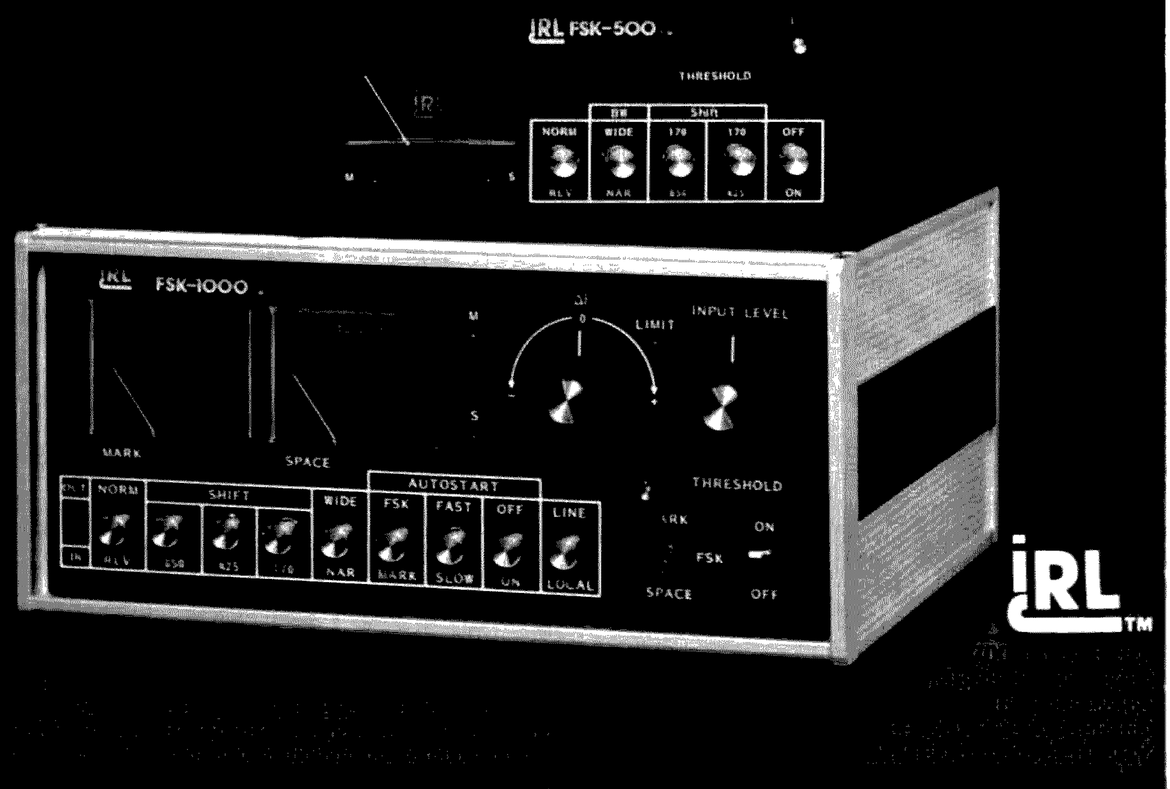
The channels selected for uplink were determined based on international spectrum utilization including ITU regions 1, 2, and 3. Dr. Garriott will not limit his contacts to US hams, but will acknowledge calls from the world over as he passes overhead. While this choice of frequencies may pose a bit of an inconvenience in some major metropolitan US cities where repeaters operate every 20 kHz in the lower subband, it is a choice compatible with the rest of the world. Now you can begin to imagine why groups the size of the ARRL and AMSAT had to be employed to coordinate the ground side of the operation. No one person could possibly do it by himself.

Your Station

Not every ham reading this will have a chance to contact W5LFL/Space Mobile. About 500 of you will be the lucky ones, but it will take more than a 1-Watt HT and a rubber duckie to get through. Stations that are equipped for the OSCAR series of amateur satellites and have the necessary expertise in making contacts through these birds will definitely have the upper hand.

If you do not have this expertise, then you are advised to steer clear of highly directional antenna arrays with small beamwidth. At 17,000-mph forward momentum, the STS-9 will not be in any one spot very long. In fact, unless your station is operating with the antenna under direct computer control with auto-tracking for both azimuth and elevation, any

THE RTTY ANSWER



sort of directional array will be a definite handicap.

AMSAT suggests that a horizontally-polarized turnstile-type antenna will probably provide the average amateur the best chance of making a contact. In lieu of this, any good-quality vertical antenna should suffice. The ARRL's *Radio Amateur's Handbook* should be consulted on design of a turnstile, since none for the amateur 2-meter band is currently marketed.

The recommended transmit-output power level is 10 Watts. Running higher power will only cause unnecessary interference to other ground stations and will gain you little. Remember, as with any DXpedition, Dr. Garriott—not you—is in charge of the operation. If there is too much QRM on a given channel because it is infested by the high-power boys, it easily can be bypassed. Dr. Garriott will only spend a few seconds monitoring any given uplink channel. And while we cannot stop anyone from running an amplifier, it is requested by all parties involved in the planning that this practice be avoided.

Because of the odd split between uplink and downlink, you will need a transceiver with split memory so that you can select your transmit frequency independently of the receive frequency. In lieu of this, two radios can be used, one for uplink and the other for receiving the downlink. Even an HT with a ¼-wavelength antenna may suffice for the latter, since Dr. Garriott will be easy to hear from almost 200 miles overhead. If you have an older, crystal-controlled radio sitting in the closet, it might be used for receiving by feeding a stable vfo signal of the proper frequency into the receiver's L/O chain. Designs have appeared in this magazine and elsewhere that might be readily adapted for the purpose. The receiver will then have to be realigned for maximum sensitivity in the region from 145.0 to 145.6. Again, super sensitivity of ground stations is not essential, since W5LFL won't be hard to hear.

So, then, in review: You will need a station running 10 Watts or so of FM on 2 meters with 20-kHz incrementation in the 144.91-145.49 band to uplink to Dr. Garriott. You will have to be able to listen for him on 1 or 2 frequencies in 20-kHz steps from 145.51 to 145.77 MHz. You should avoid highly directional antennas unless you are skilled in their use for satellite-communications purposes, and you should avoid the use of high power to make life easier for both W5LFL and the other ground stations who will be vying for contacts. Omnidirectional antennas in general, and the turnstile in particular, are recommended.

As the plans for Dr. Garriott's historic mission move forward, there will doubtless be many changes taking place. For example, the exact list of frequencies for you to use may not be known until just prior to liftoff. His daily operating schedule, which begins on the third day of the mission, will not be publicized until the vehicle is safely in orbit. It will be announced, hopefully a day before but possibly only hours before an operating period begins. Each operating period is subject to last-minute cancellation with little or no notice should some more urgent activity concerning the overall STS-9 mission itself come up.

While we in amateur radio probably consider W5LFL/Space Mobile as being very important, to the folks at NASA it is the lowest priority on the mission. We are their guest and no

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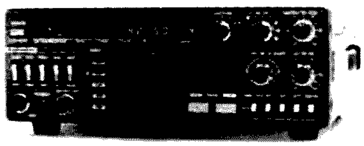

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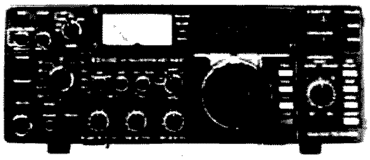

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more. If we handle ourselves with the proper decorum, we might be invited back again. If we make fools of ourselves, you can count on never being invited back in the door.

Since timely, up-to-the-minute information will be crucial, the planning of this has been included in the overall scheme. First, there is the AMSAT Launch Information Service Net that covered the successful AMSAT/OSCAR 10 launch on June 16. Readers are advised to keep an ear on their local AMSAT nets for further information on what type of network will be established for the STS-9

The League's W1AW will carry updates daily, but it is unknown if this will occur at regular times as published in *QST* or at any and all times applicable during the STS-9 mission. This will be announced by the ARRL shortly. Finally, the Westlink Radio Network's automated newsline in Hollywood, (213)-465-5550, will be devoted exclusively to information on the STS-9 mission starting September 1. This will be a weekly tape until September 29; one day prior to the scheduled liftoff of STS-9, it will be updated daily or whenever pertinent information is available. Hopefully, it will carry the day-to-day operating schedule of STS-9. Finally, the *ARRL Letter*, the *W5YI Report*, and *The Westlink Report* newsletters will carry the timely information that can be gathered before presstime.

Amateur magazines such as this, with their longer lead time of about 2 months, cannot bring you up-to-the-minute information on STS-9. We are doing our share by giving you as much background material and technical advice as we can. For up-to-the-minute information, you should consult one of the previously-mentioned news services starting about 10 days before the flight and

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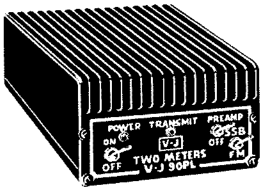

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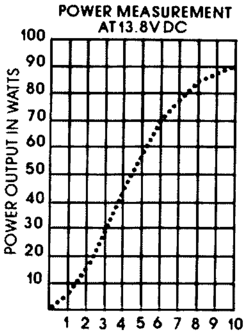

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staying with it until the mission terminates.

Public Relations

The public relations of this first "Ham in Space DXpedition" have not been overlooked. As Steve Mendelsohn WA2DHF of CBS in New York has aptly pointed out, this will be one of the very few times when amateur radio will be in the news as the main event, not just the carrier of the message. For the duration of the STS-9/Spacelab mission, the eyes of the non-amateur world will be on us, in sharp focus and high-contrast living color, knowing the way that modern television journalism works.

To help plan for this, two teleconference meetings have been held. They were sponsored by the ARRL and hosted by Peter O'Dell KB1N of the ARRL Public Information Office. The first of these was a briefing primarily for members of the national/international press corps and included representatives of CBS radio and television news, NBC radio and television news, UPI, AMSAT, *The Westlink Report*, and the *W5YI Report*. After this session, another was held for the amateur-radio media and included participation of every major amateur publication and news service. Other such meetings are planned, including the possibility of a group interview with Dr. Garriott prior to the mission, if NASA gives the go-ahead for it.

Radio, television, and printed-media coverage of the amateur-radio aspect of the STS-9 mission is expected to be extensive. Pool video of part of the operation is expected to be supplied to the networks, so it's remotely possible that you might see your own contact being made on your own television screen. More likely, this video will be integrated into scheduled news programs on a tape-delayed basis, intercut with pictures of local hams trying to make the contact. Don't be too surprised to get a call from a local TV station asking if they can send over a crew to tape you making the attempt. A press kit to cover this and any other eventuality is being prepared by the ARRL for field distribution through its field organization structure. This writer and many others are contributors to it, and it will be very detailed on how you should handle this eventuality or any similar one that may occur. Contact your local ARRL Public Information Assistant or Division Director for more details.

Finally, the ARRL is sponsoring the production of a new videotaped presentation entitled "Amateur Radio's Newest Frontier." It will detail the flight of STS-9, amateur radio's involvement in it, and the way in which our service performs a marriage between computer technology and space-age communications. Its producers are Roy Neal K6DUE and this writer; it will be taped in early July on location at the Johnson Space Flight Center, Marshall Space Flight Center, Kennedy Space Center, AMSAT's laboratory, and ARRL Headquarters. Editing will be done at CBS Television City in Hollywood with initial release anticipated around September 1 directly through the ARRL.

The hope is to have the tape in every school in the United States prior to the STS-9 liftoff. On termination of the STS-9/Spacelab mission, the master tape (1" type C for those interested) will be re-edited using actual NASA footage of Dr. Garriott operating from the *Columbia* and a second release will be made.

Also, the presentation will

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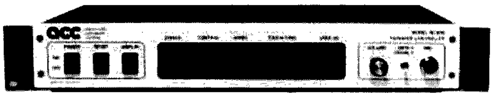

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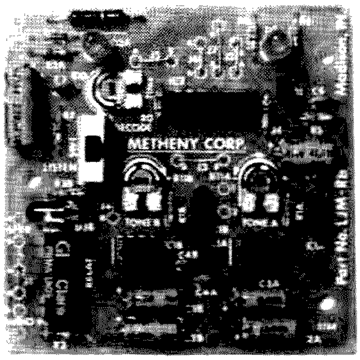

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be made available to television stations interested in airing it prior to or during the mission. Its running time will be between 10 and 15 minutes, with availability on the following tape types: Broadcast 1" type C, Broadcast 2" Quadraplex, 3/4" U-Matic, VHS-SP Speed, and Beta II.

The tape will be recorded using the NTSC 525-line standard, but both PAL and SECAM dubs will probably be made available at additional cost.

Again, contact the ARRL directly or through your Division Director for availability of this tape. Initial copies will be distributed on both U-Matic and VHS to all directors as soon as the project is completed. Please do not bother them prior to early September, since I know that it won't be finished until around that time.

Summary

Barring the unexpected, such as a delay in the STS-9/Spacelab mission itself, the US Space Shuttle *Columbia* carrying the ESA Spacelab will be launched into orbit from the NASA facilities in Florida on September 30. Sometime on October 2, at an exact time to be announced, the amateur-radio aspect of the mission should begin. Dr. Garriott will be operating as W5LFL, either Portable *Columbia* or Space Mobile. He will operate for one hour per day in the frequency span discussed earlier. Ground acquisition from any given geographic location will be about 8 minutes per pass. It is estimated that Dr. Garriott will be able to make about 500 contacts during the mission.

Finally, there is the all-important QSL information. ARRL Headquarters will be the QSL manager for the operating event. Since, as stated, only about 500 of you will make that lucky contact, a decision has been made to honor SWL reports that can be verified against operating times contained in both the written and voice-recorded logs. A system has been developed to prevent dual contacts while at the same time make legitimate QSLs for contacts made with STS-9 easy to prove. However, this also means that anyone, ham and non-ham alike, who sends a verifiable report to ARRL Headquarters will be eligible to receive a commemorative card in return.

This information is already being widely disseminated by SWL programs on many international shortwave stations and will probably be reported by the US mass media during the flight. The ARRL staff may be burning the midnight oil on this one for many days to answer all of the QSL requests.

There, then, is the story of what to expect on the STS-9/Spacelab mission. Again, I have to stress that much of this is subject to change with little notice. The best way to keep up to date is by turning to one of the daily, weekly, or bi-weekly amateur-radio news operations mentioned earlier. During the mission itself, one of the amateur-radio broadcast services supplied by the ARRL, AMSAT, or Westlink will be your best source of information since they can literally update at a moment's notice. In the meantime, we trust that many of you will enjoy the aspect of getting prepared to try to contact Astronaut/Dr. Owen Garriott W5LFL on 2-meter FM as he spins around the world. Whether you make the contact or not, getting ready for the event will be half the fun. Hearing W5LFL from space and knowing that he is one of ours will be the other half. Making a contact is literally the frosting on the cake. ■

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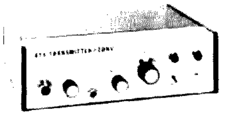

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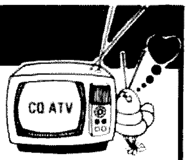

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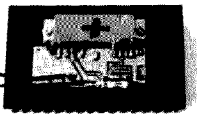

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Join the Packet-Radio Revolution

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Radio amateurs in Canada, Sweden, and the United States have recently been experimenting with a new system of communications that:

- can provide 100% copy under adverse band conditions (QRN),
- is virtually immune to interference from others on-channel (QRM),
- typically runs at about 1200 wpm (and can go *much* faster),
- is highly efficient of spectrum use,
- ". . . contribute(s) to the advancement of the radio art" (FCC Rules and Regulations, Part 97.1(b)—Basis and Purpose), and
- is inexpensive (surprise!).

This mode is called packet radio, and it opens the door to a new world of computer-based communications for the amateur community.

Imagine having a QSO with an amateur a continent away via a low-power 2-meter FM rig, or handling emergency traffic without worrying if you correctly copied the spelling of Solzhenitsyn, or leaving a message at a friend's shack if he is out. Then there are possibilities for bulletin-board systems, remote programming of computers, file transfers, and even multi-player computer games! The list of potential applications goes on and on.

This article is written to give the reader a practical look at packet radio, including a description of the equipment needed to use this new communications mode. Subsequent issues of *73* will carry details on hardware, software/protocol, and application. While the reading should prove interesting, the application of packet radio in *your* ham shack is the primary goal.

What Is Packet Radio?

Packet radio is a method of communications that encodes information digitally and in such a manner as to virtually ensure error-free copy at the receiving station. While this is quite a step forward from the present vulnerability of amateur radio operations to such things as QRM and QRN, it is only part of the picture. Packet-radio techniques also provide efficiency in spectrum usage by packing multiple calling and working channels on the same frequency.

If you've ever operated RTTY, you are very aware of the problems of selective fading, static crashes, and so forth—garbled copy is the usual result. The solution to selective fading generally means clever TUs and/or diversity reception, and this usually implies either a great deal of time or money or both. ASCII adherents will no doubt confess that they, too, are subject to the same problems. In fact, many RTTY operators have resisted switching to ASCII for this very reason.

In RTTY operation, operators will typically call a CQ on a calling frequency, then QSY to a working frequency to carry on their QSO so that other RTTYers may use the calling frequency. If a number of stations attempted to hold independent QSOs on the same frequency, chaos would result.

Packet radio overcomes the first of these problems by employing a technique called "handshaking," along with a computed error-detection value called a "Frame Check Sequence" (FCS) to ensure data integrity. The sending station expects an acknowledgment (ACK) to its transmission within a certain period of time or it retransmits. Upon accurate reception of a packet, the receiving station sends this ACK and the sender then continues about its next task. The handshake is done automatically.

Due to the structure of a packet, which contains certain information regarding the destination station, multiple users can be accommodated on a single frequency, holding separate QSOs without causing noticeable interference to each other! This means that the calling and working frequencies may be the same. This ability to selectively receive messages

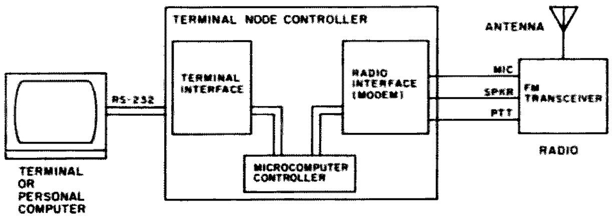


Fig. 1. Typical packet-radio equipment.

from a packet station on-channel is called "connectivity" and is a major contributor to the efficiency of packet radio.

Packet radio also takes advantage of the fact that most communications are "bursty." This simply means that a user does not require the entire channel bandwidth most of the time. Consider an operator typing a message to another station. It may take him as little as 10 seconds or as long as a minute to type a line, but it takes packet radio less than a second to get that data out. The packet system operates in bursts and leaves the dead time available for other packet stations (time-domain multiplexing). On a lightly-loaded channel (only a few users), you may not even be aware of the other stations! On a heavily-loaded channel, you may notice an increase in delay time before getting your reply back. Again, the packet-radio equipment takes care of all of this for you, automatically.

While packet radio requires the use of a computer-based controller at each station, it does not require that each operator be well-versed in computer technology, nor that the operator be a programmer. In fact, it does not require that the station have a personal computer; just a terminal will do.

Requirements

There are four primary components in an amateur packet-radio station: (1) a licensed amateur radio operator, (2) a user terminal, (3) a Terminal Node Controller (TNC), and (4) an amateur radio station.

Operator—The amateur operator is you! No special training in computer science, electronic engineering, nor digital communications is needed. All that is required is an interest and a little time. Packet radio does not run your station;

A complete packet-radio station. The TAPR TNC is below the HT.

you run it. (Note that amateurs possessing personal computers and a certain amount of expertise may be able to program their computers to control their packet stations.)

Terminal—The user terminal can be as straightforward as a simple Cathode-Ray Terminal (CRT), a personal computer, or an ASCII-speaking TTY, or it may be as complex as a commercial computer installation. A keyboard should be available for the operator to enter messages and to control the station. A screen or printer should be available to present information to the operator. No doubt, some packeteer will design a speech-synthesizer interface and use a speaker for output! (After all, our radios talk to us now, don't they?)

Most terminals, like RTTY and ASCII systems, encode the characters they send in an asynchronous format. This means, due to the "burstiness" of typing a message, that each character has a little flag to mark starting and ending points. The method employed is to encode a single space before the character and end the character with one or more mark value levels— see Fig. 2. This way, whenever a character is started, a transition from mark to space occurs. This, along with some timing information, makes the data easily decodable. In the case of RTTY, 7½ "bit-times" are used per character, and ASCII uses 10 or 11, depending on the baud rate (note that a baud and a bit are not the same thing, but in amateur use, one bit per baud is encoded, so the terms have become blurred.

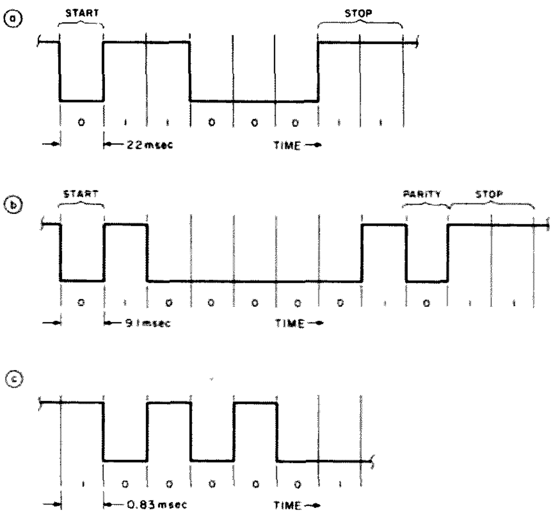


Fig. 2. (a) Typical RTTY (Murray) code for letter "A", 60 wpm. Note that in asynchronous formats, as used by amateurs, each character has one start and one or more stop bits. (b) Typical ASCII code for letter "A", even parity, 110 baud. (c) The ASCII letter "A" within a packet at 1200 baud. Note that a 1 is sent as "no change in state" while a 0 is sent as "a change in state." This is referred to as NRZI (non-return to zero, inverted) coding and is used by virtually all packet stations.

If you have a terminal or computer, you can use it. If not, terminals and computers that use TV sets for the display are readily available for less than $100. Nothing complicated is necessary.

Terminal Node Controller—The TNC is a device which connects the terminal and the radio system together. One port connects to the operator's terminal (or personal computer), communicating via the asynchronous serial or parallel method required by the terminal. (Note that the terminal baud rate has no relationship to the packet-channel baud rate.) The TNC converts the asynchronous data stream from the terminal into packets and vice versa—see Fig. 3.

The header contains an address to indicate where the packet's going and control information telling the network certain details regarding the packet. The FCS calculation ensures the integrity of the data, and flags mark the beginning and end of the packet.

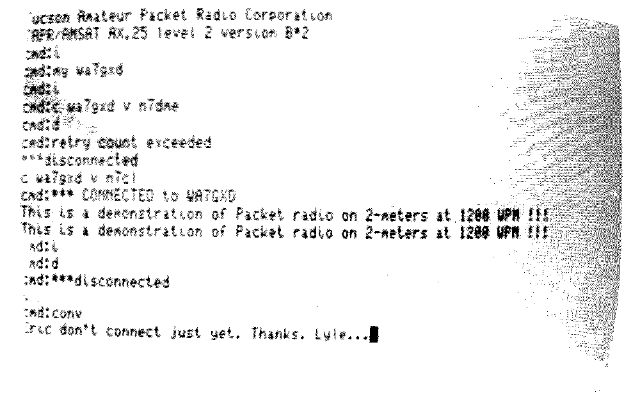
The other port of the TNC is the radio interface, which connects to the microphone audio, PTT, and speaker/phone audio lines. The modulation method most often used in packet radio is AFSK. This simply involves the application of one of two tones

to the microphone input on a voice-grade radio, one tone corresponding to a mark, or digital 1, and the other to a space, or digital 0. By switching between these tones, the data is passed to the radio, which handles it like any other audio signal. The receiving station then decodes the audio tones coming from the speaker or headphone connector on the radio and recovers the data, which is then processed. The advantage to this method is simplicity; the disadvantage is the use of a wider-than-necessary channel.

RTTYers will recognize this method since they have used it for years. They will also recognize the need for a terminal unit (TU), a device used to translate between the logic levels (data) and the tones. In packet radio, the TU is called a "modem" (Modulator-DEModulator) and serves the same function. (Note that some TNCs have the modem built in, while others require the use of an external modem.)

The usual packet-radio modem operates at 1200 baud (about 1200 wpm) and uses tones of 1200 Hz and 2200 Hz. This particular combination of tones is also used in the Bell 202 standard, which allows compatibility with surplus modems. In fact, some of the first packet stations used surplus 202 modems. Note that the tone combination is the only feature needed in a packet-radio modem to ensure compatibility with 202 users. The other aspects of the 202 standard (handshaking, timing, reverse channel, etc.) are not used in the rf environment.

Radio—The radio system can be whatever you have. Most packeteers use a 2-meter FM rig, such as a handheld or even a simple crystal-controlled "hamfest special." In light of the increased channel efficiencies that can be obtained with specially optimized radio design, we can expect to see rigs designed especially for packet radio in the near future.



High-speed transmission is possible with packet radio.

Note that the AFSK tones used in packet radio aren't compatible with the audio-frequency response of some radios: If the 2200-Hz tone is too severely attenuated, minor surgery may be required on the radio itself. With this one limitation, a radio suitable for voice communications can also be used for packet radio. (Duty cycle is not a factor, due to the previously-mentioned burstiness of a packet.)

In addition to the radio, an antenna system and a power supply for the radio are necessary.

Why Use a Terminal Node Controller?

The heart of a packet-radio station, next to the operator, is the TNC. The TNC is actually a special-purpose microcomputer, and it contains the necessary programs (software) to handle the radio, pass information between your station and other packet-radio stations, connect or disconnect your station from other stations, and so forth. These functions and the way they are implemented are part of packet "protocol." While protocol is much more than just the above, the job of the TNC is to effectively implement the protocol.

Many potential packeteers ask why a TNC is needed if they already have a personal-computer system. It doesn't appear too efficient in terms of dollars, at least at first glance. Indeed, there are some stations using packets that have modified their personal computers to act as TNCs, with varying degrees of success. The problems arise from two primary sources: protocol and real-time programming.

Protocol—Protocol is defined by Webster as "the highly formal procedure in official society." While packet radio is not an official society, it does require very formal, precise, well-defined, and (at least locally) standardized procedures in order to transfer data reliably.

In order for a number of stations to be on one frequency at one time with a variety of transmissions, ACKs, and so forth all going on, a computer network, not unlike a typical amateur net, must be established. This must be done rapidly and—in typical net fashion—according to procedures. If a station fouls up, it can cause a lot of confusion on the net. Stations must be able to check in and out of the net at will. The entire system becomes highly complicated, and the effort required to program the protocol is substantial. To handle these procedures, special hardware is needed, not found on any presently-made personal computers. The TNC is designed to handle all of the physical protocol (radio and terminal interfacing) as well as local networking.

Programming—Most computer hobbyists are familiar with some version of the Basic language and do much, if not all, of their programming in it. Calculation of an OSCAR satellite position, logbook entry, and other typical amateur applications run just fine in Basic. Basic is usually implemented as an interpreter, which slows things down during execution but allows the computer system to be interactive ("user-friendly") during programming sessions. To speed up things that must occur quickly, such as graphics or special I/O, some programs resort to assembly-language routines.

In packet radio, the TNC is required to perform many simultaneous tasks. It must check for activity on the frequency, examine all messages for certain data, accept operator input in the form of messages and commands, output data to the operator, handshake, initiate and respond to control within the network, perform FCC-mandated CW ID at prescribed intervals, ACK to certain transmissions, determine if some other packet-radio station interfered with its transmissions (called collision detection), and so forth. This is enough to keep one microprocessor very busy, especially at high data rates. To also be refreshing a video display, doing disk accesses, and handling general-purpose computing is beyond the ability of most personal-computing systems.

The type of software required to do this multitasking is different than normal software, and it requires a very different approach in design than that required by other types of programs.

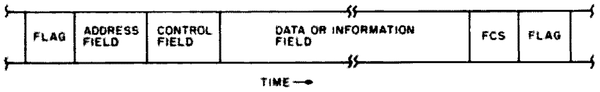


Fig. 3. A typical packet frame. Flag=01111110=1 byte. ADDR=1 to 24 bytes (protocol dependent). CNTL=1 or 2 bytes. DATA = 0 to 128 bytes typical. FCS = 2 bytes. Flag = 01111110 = 1 byte. All bytes are sent least-significant bit (LSB) first except the FCS, which is sent most-significant bit (MSB) first.

Most personal computers are not designed to support this sort of programming, nor to efficiently support the special type of interrupt-driven hardware systems needed to run in this sort of real-time environment.

In many commercial-computing systems, multiple CPUs are employed to speed things up—a technique called multi-processing. A TNC gives the amateur with a personal computer some of the same benefits. While your computer is doing disk I/O, the TNC can be doing what it must do to support the packet-radio activity. The TNC, then, is nothing more than a "smart" peripheral device for your personal computer, much like a disk drive or a printer. It does its task well, allowing your personal computer the time it needs to do its general-purpose tasks well.

What Is a Packet?

Again referring to Webster, a packet is "a small, compact bundle or portion." In packet radio, messages are broken up into small pieces and sent to the receiving station where the pieces are put together to rebuild the message. Naturally, some information is appended to the message so the receiving station will be able to sort things out. On a busy channel, there may be packets flying around between dozens of stations, but only a few are for you.

The operator generally just types in the message he wishes to send. Once the TNC has been told where to send the message, it starts breaking the text into packets which are then sent out on the network. While the size of a packet may vary, most are limited to 128 bytes (or characters, if sending text information) in the data field to allow channel access by multiple users. Typically, when the operator hits the RETURN or ENTER key on his terminal, the TNC formats and sends a packet. Thus, as the operator types the message, the receiving station immediately displays it.

Since packet radio is designed to handle any form of digital data (not just ASCII or Baudot, but also binary, EBCDIC, or whatever), a special method of formatting the data is employed. Most packet systems use a protocol based on High-Level Data-Link Control (HDLC) standards. HDLC is a Bit-Oriented Protocol (BOP) that enables the "transparent" (unmodified) passing of information within the system. One of the nice things about using HDLC is that the complex functions it uses to do its tasks are available integrated on a single large-scale integration (LSI) chip, which reduces the complexity of the TNC hardware and software, as well as TNC cost.

A packet is enclosed in an HDLC *frame*, which may be represented as shown in Fig. 3.

The *flag* is something the HDLC controller looks for (when receiving) or adds (when transmitting) to the packet to mark the beginning of a packet frame. It is a totally unique pattern of 1s and 0s for easy detection.

The *address field* contains information as to where the packet is being sent and possibly who sent it. Some schemes use the amateur callsign in this field (14 or more bytes), while others use a mapping system that requires only 1 or 2 bytes. Don't worry about how packet radio can support different addressing methods and still allow the stations to communicate—this is handled by the protocol and will be explained.

The *control field* tells the network certain things about the packet and includes sequencing, acknowledgment, and other control functions. This field may be one or two bytes in length.

The *data field* contains the actual message being sent. Unless the message is less than one packet in length, multiple packets will be required to send it, due to the current 128-byte data-length limit. The information in the data field is almost always user-provided.

The FCS provides the receiving station (node) with the information it needs to determine whether or not the data is valid. If the FCS calculated by the receiving node doesn't match the FCS it receives from the sending node, the receiving TNC throws away the packet.

The packet is closed by a second flag.

The flags, address field, and control field are all generated by the TNC and are used within the packet-radio network to implement the protocol used. The operator does not need to concern himself with the coding of these fields to use packet radio since the TNC does it all for him.

Since HDLC utilizes flags to mark the beginning and ending points of the entire packet, it is very inefficient to further require that each chararacter also have flags, so packet radio uses a synchronous protocol, removing the start and stop bits. This reduces the length of Baudot characters to only 5 bits and ASCII characters to 7 (parity is redundant due to the FCS). This means greater on-channel throughput.

How Is a Packet Network Organized?

At present, packet radio consists of several unconnected local area nets (LANs) that usually run on 2 meters or 220 MHz. Since this implies local coverage, it is only necessary that a station use the protocol being used in its vicinity. The advantages here are many, including the fact that it allows widespread experimentation with protocol optimization. This in turn leads to more efficient operation and allows each group the freedom to try various approaches for their own unique requirements.

An LAN may include a packet repeater, although using a repeater is not always necessary. The time-sharing nature of packet radio allows using a half-duplex (single-frequency) repeater. No splits or cavities are needed, so any packet-radio station can be a "digi-peater." Having a station act as a digi-peater requires no special effort on the part of the operator, who may continue to use it as a standard packet-radio station. Further, a normal full-duplex, split-frequency repeater could be used.

Naturally, VHF is limited in coverage (no one has successfully had a packet QSO with moonbounce yet), and most packeteers would like to communicate with others in other LANs. To this end, several packet stations are becoming operational on HF, and the unique challenges presented by HF operation are being met. However, another mechanism is being explored, called gateway operation (see Fig. 4).

A gateway station is a good example of shared resources, another packet advantage. To communi-

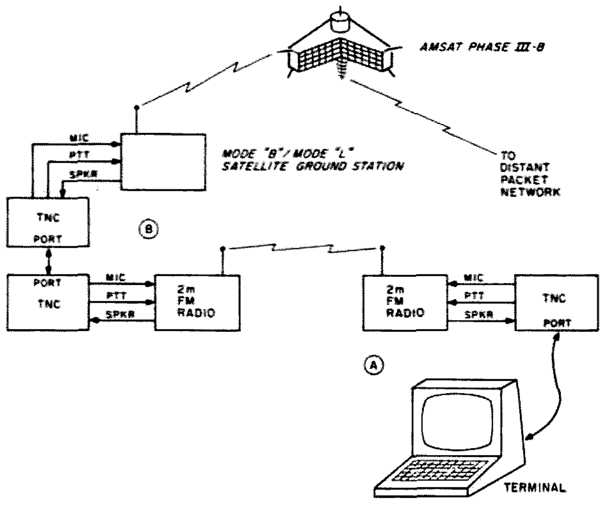


Fig. 4. Typical packet gateway system. Station A uses a simple 2-meter HT. Station B provides linking to other packet networks via satellite. Similarly, an HF link could be established.

cate outside the LAN, a gateway station receives the packet and does a "link" via a gateway channel and with another protocol (actually another layer of protocol). It translates the LAN protocol into the protocol used by the inter-network linking system. The gateway at the receiving end retranslates the protocol into its LAN protocol. Due to the continuing experimentation that is being conducted within packet radio, it is likely that the gateway system will be used for a long time.

Gateway stations allow the user in an LAN to communicate with other packet-radio stations far beyond his normal range. To allow this, three primary gateway paths are being developed:

TERRACON will be a high-speed UHF and/or microwave-based linking system that will form a so-called backbone network. This will enable any packet station to communicate with any other packet station that is also linked into TERRACON. This system could handle the bulk of long-distance packet-radio communications in North America, and it may find its way into other high-population areas such as Europe. Packet groups are working on this development; it will probably be a few years before a useful system is implemented, and a few more years before it links the continent.

AMICON is AMSAT's (Radio Amateur Satellite Corporation) initial Phase IIIB satellite-based network that will allow the linking of LANs via gateway stations equipped to use this high-orbit satellite. When working, AMICON will allow both intercontinental linking and connection with isolated areas. High data-rate experiments are now being planned for the 23cm/70cm (Mode L) translator aboard Phase IIIB that could point the way for a special high-speed packet-radio transponder package aboard a future AMSAT satellite.

SKIPCON is AMRAD's (Amateur Radio Research and Development Corporation) acronym for an HF-based network of LAN gateways. Due to the vagaries of HF propagation, data rates will be slower here, on the order of 50 to 600 bits per second with forward-error-detection and -correction protocol to ensure data integrity and minimize retransmission. Experiments have been conducted with these techniques since the winter of 1981-1982.

COMMON PACKET-RADIO ABBREVIATIONS

ACK—An acknowledgment from the receiving station indicating that the data was received correctly.
BOP—Bit-Oriented Protocol. This method allows unmodified transmission of information.
CRT—Cathode-Ray Terminal.
FCS—Frame Check Sequence. Method of detecting reception errors.
DLC—High-Level Data-Link Control. This is a BOP protocol which most packet-radio systems use.
LAN—Local Area Network. A network of stations in close geographic proximity.
TAPR—Tucson Amateur Packet Radio.
TNC—Terminal Node Controller. Connects the terminal to the radio system and implements packet protocol.

Where Can I Get a TNC?

At present, there are two TNC designs in common use: the Vancouver TNC and the TAPR TNC.

The Vancouver board is produced by a Canadian group called the Vancouver Amateur Digital Communications Group (VADCG), a nonprofit organization. VADCG is a pioneer in packet radio (the DOC authorized packet use in 1978), and the VADCG TNC is widely used by packeteers. This TNC is supplied as a "bare board." It requires a 4-voltage power supply, an external modem, and the necessary parts to populate it.

Notes are included in the instruction sheets that come with the board for designing the power supply, and VADCG makes a modem kit that is specifically designed for radio use.

The Vancouver TNC design is based on the Intel 8085 CPU and 8273 HDLC controller, 4K bytes of 2114 RAM, and 4K bytes of 2708 EPROM. An 8250 (for serial port) or an 8255 (for parallel port) is needed to interface the station terminal. Contact VADCG or other groups using this TNC for software. It is up to the user to work up the actual radio interface.

A group of amateurs met in Tucson in November, 1981, and decided to get involved in packet radio. Since many in the group were microprocessor hardware-design engineers, as well as real-time programmers, they decided to form a nonprofit organization and design a TNC with the modem, radio interface, and power-supply (exclusive of transformer) circuitry on a single board, for significant cost savings over existing designs. This resulted in the formation of Tucson Amateur Packet Radio (TAPR), a nonprofit corporation, and the development of the TAPR TNC.

The TAPR TNC is based on the 6809 microprocessor and can hold a total of 48K bytes RAM and ROM on the board. It uses the 1933 HDLC chip (fully compatible with the 8273 HDLC format—aren't standards nice?) and has both serial and parallel ports on the board for terminal or computer interface. The TAPR TNC is assembled, tested, and calibrated with all software in place and includes circuitry to interface to most radios. Software sources are listed in the manual that comes with the TNC for running in popular personal computers (to make them act like terminals), along with hardware interconnection information.

I would like to express my sincere thanks to Den Connors KD2S and Chuck Green NØADI for their comments, criticisms, and technical advice. ■

Be a RTTY Rembrandt

Put that award-winning shine on your RTTY pix with these tips from a RTTY artist's sketchbook.

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As I always liked art as a hobby, it was natural for me to adapt to RTTY art when I was bitten by the RTTY bug. Knowledge of art techniques need not be a requisite to the creation of good RTTY art. For the benefit of the few who may not know, RTTY pix is the transformation of any picture into a similar image us-

Preparing the cartoon for RTTY.

Close-up of typewriter technique.

The author with a pre-drawn cartoon, set up for RTTY transfer.

The author checking a completed picture.

ing only the upper- and lowercase printout of a hard-copy RTTY machine for transmission on the ham bands. There are new concepts being introduced with the use of computers, but that is an innovation that will develop in a class by itself.

When selecting a picture for copying, select those that have a minimum of detail and are of a north and south composition. Horizontal work is done occasionally, but the vertical format is much easier considering the direction that the paper is flowing from the machine, be it an old Model 19 or a later Model 28. There are many cartoons being transmitted on the bands because of the simplicity of design and elongated format.

Most RTTY artists select a picture from a magazine or newspaper and simply photostat it for insertion into the machine for reproduction by typing over the image. This usually works quite well except for the difficulty of obtaining an image that is long enough. I prefer to use the box method of enlarging as it gives more control over image dimension. Another method is to utilize the artist in the family to make a long skinny drawing. If you are not blessed with such an artist, fear not. You need not be a great artist to accomplish this task.

The typed area on most Teletype® machines averages about seven and one-quarter inches across with a total of 73 characters. Therefore, use seven inches as the width measurement and the up-and-down measurement is unlimited. Pull out five feet of paper from the roll and square it into one-inch spaces allowing the same space on the left-hand margin that your machine allows. Find an illustration that is at least four times longer than it is wide. Cartoons are suggested for early work. Divide the distance across the selected picture into seven segments. The size of one of these segments will be the dimension of all your squares. Now simply copy whatever is in each segment into the one inch squares on your paper. Eliminate as much detail as possible. Pay no attention to the jagged appearance. When you have completed all the squares, you will retrace the rough lines into smooth lines.

Step back from the completed drawing and visualize the dark, light, and medium sections and decide which letters or figures will best accomplish your objective. Try to hold overlines to two passes as this should prove sufficient for most work. Contest rules usually limit overlines to three.

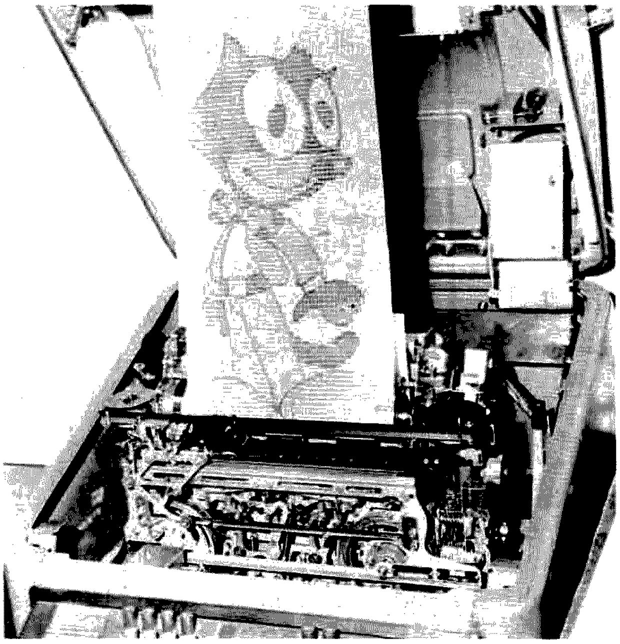
Now we come to the biggest time-saver of all. If you have or can obtain an old vintage typewriter, you will discover that most of them have the same spacing as the RTTY machine. Many old typewriters can be picked up at attractive prices.

If you decide to buy a typewriter, bring along some typed copy from your radioteletype machine. Make a similar copy on your intended purchase and hold both copies up to the light for comparison. Let the light shine through both sheets held together. If only half a letter is lost by the end of a line, you have a good selection, but line-to-line spacing must be very close. Small differences can be made up as I will explain later.

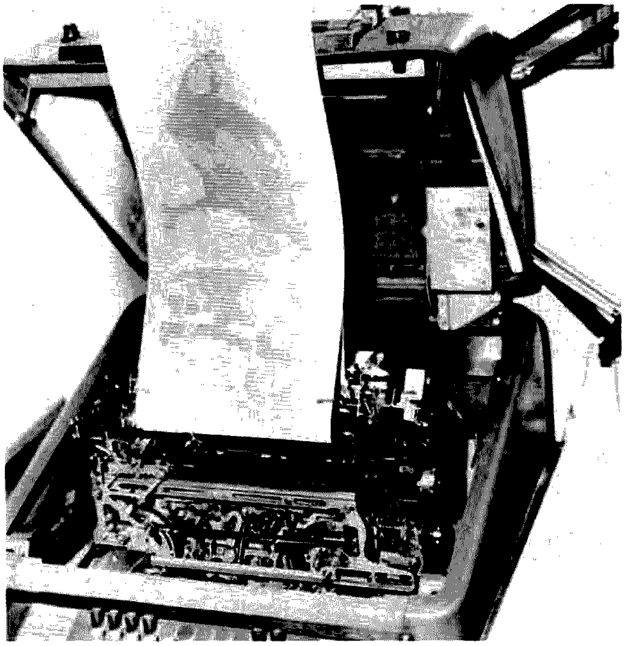
Insert your drawing in the typewriter and type across the top, about six inches down, the numbers 1234567 890 and repeat until you reach 73 numbers. Then do the same down the left-hand side for the length of the sketch. These are reference points for use when you make corrections later and are not copied on the final print. Before you start your print, it is a good idea to make several copies or tracings on additional sheets in case you make too many errors on your first try.

Now insert your sketch into your old nail-buster and start typing right on top of your art work using the letters, numbers, and characters you have selected. Most errors can be erased or typed over. It is best that the ribbon not be too fresh. If an error is too bad, indicate changes with red pencil so you can pick them up later.

When you reach the bot-



A completed picture after RTTY transfer.



Sample copy of a picture as received over the air.

tom, add your title and credit line, transfer the finished work to your machine, and simply type over the copy as your reperf records your pix. You will still make errors, but only a fraction of those that would occur if you typed directly over an original print. You will have to make slight corrections when your print box does not hit the letters directly, adjusting the print accordingly. When I approach more than ½-letter mismatch, I throw up the paper release and gently grasp the paper on either side and make the slight correction by moving the copy. Practice will make these adjustments a quickly solved problem. Do not seek a perfect character match as long as you do not lose a complete space on one line of travel.

It may be more comfortable for you to operate your machine with the cover open for closer viewing of your tape alignment over the typewritten copy. Instead of letting the paper flow over the top of the machine, hang it up over a wire and lightly weight it so you will be able to view the print as a whole as it exits from the rollers.

Here are some suggestions:

- Follow the basic rules of pix-making that are outlined in most contest rules.
- Use no more than 73 characters in one line.
- Use at least ten line feeds at the beginning and end of your picture.
- Use three functions at the beginning of every line. When overlining, use any combination of carriage return, FIGS, or LTRS so as to provide three functions without using line feed.
- Don't forget the guy whose machine does not downshift on space and make sure you add this function or his pix may end up with a lot of 2s where you wanted Ws.

After you have made your tape, print your first playback. Take a red pencil and mark off all the hits and glitches that need correcting. Rerun the tape and correct each error as you are punching your new tape. Unlike the typewritten copy, this time you will have to repunch another tape for any error that you let slip.

If you are going to enter any contests, it is best to make sure you do not have any hidden errors that do not appear in the print, such as unnecessary shift functions or going over a line to add a missing letter. This could cost you points with some judges. You will have to watch for these errors visually as the tape is being run. I have a friend who picks these up on his computer, but this is sneaky.

Finally, when you have all your corrections made, stand back from your print. It will never appear as great as your original typewriter copy, as the outlines of your drawing will no longer appear, but it will develop a character of its own. If at this time you decide that there is either not enough or too much contrast between sections, make another tape and add or subtract characters to these areas.

When you arrive at your final copy and wish to make a print for display, you need not settle for the paper available for teletype machines. Your local art shop has good bond paper in large sheets that you can cut in lengths the same width as your paper roll, providing you have friction feed. Sprocket feed will limit you to sprocket paper. Roll-feed machines have a fine-grade white paper available at stationery supply houses that will produce fine prints for contests and display.

Use a new or re-inked ribbon for final prints. If your reperf produces a chadless-type tape, try to get a chad tape made by a friend for easier storage and mailing. Send your contest print entries in a roller container or neatly rolled in a shoe box to avoid folds. Wrap your prize-winning tape in newspaper to prevent shifting in transit. Of course, you should keep a master copy as there will be no return of your tape or print.

Stop printing everyone else's pix. Make one of your own that will have your call letters on the final line. It is worth the effort. Discover your own little pix tricks. When you create that winner, you can display it on the shack wall with pride. You may even want to copy it on high-contrast line film and make your own unique photographic QSL cards. Let's see your pix on the page soon. ■

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How to Increase Your QSOs

N6HYK's seasoned advice will add spice to your CW contacts—even if you aren't a Novice.

Ten students were in the fall, 1981, 10-week course at Pacific Grove Adult School in California, studying to take the tests for licensing as Novices. The instructor, Paul Herrschaft KQ6G, presented excellent instruction—70% of his students passed the FCC test on the first try; the rest passed soon after.

But today, more than a year later, only one of those students is on the air. Why?

There are several reasons, of course. But many Novices tell me there's one big problem that stands out above all others in keeping them off the air: the lack of practical, specific tips on just how to handle CW contacts.

That's no criticism of KQ6G's course, nor, probably, of other typical Novice classes offered around the country. Rather, there is a severe shortage of the specific information every Novice needs immediately after he or she has passed the FCC tests: the tips and techniques about actual on-the-air operation.

But Novices are not the only hams who can benefit from the following details. I've heard many General-class operators, and even a good many Advanceds and Extras, making basic operating goofs, sounding as if it were their first day on a key.

Yet the tips in this article are seldom seen in print or heard from fellow hams. Search, as I have, the standard operating manuals, handouts, instructional guides, and such, and you'll find very little of this kind of information. Mostly all you'll read in the publications and hear from other hams are generalities. "Be patient," reads one. Another suggests, "Be persistent." Such vague words are of little real help.

Here, then, are nitty-gritties about how to search a band, how to increase the number of your QSOs, and how to be a better operator. Here are 11 practical, QSO-tested techniques.

These tips are based on two sources. Most came to me the hard way, from my own on-the-air experiences. But I'm not passing myself off as an expert operator. Rather, I'm a Novice who's disappointed with the limited help available to beginners and aware of the need for experienced hams to be better operators. So, as I began operating my station, I took detailed notes of the problems—and solutions—I met.

That system paid off. It took me just 53 days on the air to contact all states. The last one, Domenico Procida KAØMEI, in McLaughlin, South Dakota, came on the 15-meter band at 1929 UTC, shortly before noon my time, in California, on Tuesday, November 2, 1982. Now, I'm not suggesting that's any kind of record. Rather, I offer such specifics to show you that by using these techniques you can indeed improve your own on-the-air successes.

This is my shack. Here I learned the hard way, through on-the-air experience, the basic tips and techniques presented in this article, not to be found in existing manuals, guides, etc. As I operate, I can glance at stick-on notes posted as reminders: "7,228: Hawaii Storm Net"; WA6IRZ Stan Bringer sked, 3900, 10 pm"; "VE districts needed . . ."

A beginner's collection of QSL cards can grow surprisingly fast. As cards come in, the XYL often gets interested in them.

Referring to my log, I find added pleasure in hamming by pinpointing the location of a station soon after completing a QSO. This one, Jim Wesseling KA9MXO from Spring Grove, Illinois, will have a red dot added to the map to help me keep track of the spread of my QSOs throughout the nation.

The other source for these tips was the 96-member U.S. Naval Postgraduate School Amateur Radio Club in Monterey, California. At one of its monthly meetings, I asked members to tell me specifics they thought would help improve operating skills.

Here's what I learned.

1) *Headphones*: This tip stands out far above all others for two reasons. First, it is absolutely essential. Second, it is rarely mentioned in any of the usual lists of operating tips.

Get yourself a really good set of communication-style headphones. Tell that to the typical ham who's been on the air a month or so and he, or she, may stare at you as if you'd just announced that people need air to breathe. The need, the value, of headphones is apparently so obvious it's almost never mentioned. But there are some rank beginners—I, for one—who need to be told about the need for a headset.

Good phones increase the volume. They focus your attention. They sharpen your listening. They reduce other sounds. They improve, greatly and immediately, your operating. They're indispensable. Absolutely.

How to choose your phones is, frankly, beyond my technical knowledge. I just went to a major dealer of ham equipment and said, "Show me your very best phones." He offered three. I found one felt heavy. Another looked like inferior workmanship. As I picked the third, the salesman said, "That's the set I've found best." My selection: Kenwood HS-5. I have no idea how they measure up with other phones technically. But they fit me, sound great, feel good, and significantly increase my operating skills.

The rest of these tips are not in any order of priority. You should pick out the ones which will help you most at the level of on-the-air operating you're at right now, then make mental notes to use the other tips as the need may arise.

2) *Listen around the "Big Guns."* They're those superpowerful stations. Often they pour out CW at 15 or more words a minute, somehow expecting Novices to answer. Once you hear one of them, tune carefully, slowly, intently, just above and just below their signals. A great many times I've found those powerhouses come on the air and hide, but not completely block, some smaller, less powerful, slower CQer. Often, that modest-sounding station is much more interesting to QSO. He, or she, may often be more eager, receptive, and considerate of your slower, less skilled, less confident operating.

3) *Listen at a "hangout."* That's what I call a spot on the band where stations gather. When 40 meters is open, for example, it's usually at the very lowest end of the band. Then, often, up around say 7.110 to 7.120, there may be a relatively open space, followed by another hangout. If there are but, say, five or so hams operating in those groups, you might be able to catch a CQ quickly and easily. But if ten or more stations are working the hangout, singling one out may be difficult. According to my ears, they just beat each other up, block each other, cut out each other, and interfere with themselves and with potential contacts. They may become a pileup. So I tune elsewhere. I search for another group, but a small, responsible, orderly group. There, often, I can find a good station that is "contactable," if that's a word.

4) *Listen where there's no action.* Chris Thais NQ6Q of Monterey, California, told me, "When I turn my transceiver on, I generally check out the overall sound that's on the air. If I don't hear any traffic, it doesn't necessarily mean the band is down." He sends out a CQ anyway, and, surprisingly often, he says, he gets a contact.

5) *Consider the problems of that old tip, "Send your CQ and your call at the speed you want to copy."* Generally, that's a good technique. But sometimes it may help to send it slower than you can or want to copy. If you're cautious, as I am, you could figure a slower CQ may help make sure someone hears you clearly and correctly.

On the other hand, you'll increase your CW speed if you extend yourself a bit now and then. At least once a day, I give a call to a key that's buzzing along three or so words faster than my present best speed. You, too, should push yourself into copying faster than you feel is comfortable, at least now and then. Sure, you may miss some copy. But you don't have to send "SOLID" after every listen. I find that in a few days of copying somewhat over my speed, I can then move my rate of CQing up a bit and copy most of what comes back with comfort.

6) *When you fumble, slow down!* Don't let yourself fall

into that bad habit you hear often from "Super Fists," those who send over their skills, make fumbles, then speed up still more. Almost always, they just make more and still more errors. You'll be much more successful by slowing down when you can't get your key away from stuttering. Then, after just a half-dozen more words or so, at a slower sending rate, you'll usually get your rhythm back. You'll regain your cool and reduce, sometimes even eliminate, your errors. And then you can start to increase your speed again.

7) *Make your on-the-air time important to you.* One member of the Monterey ham club told me, "Don't try to slip your QSOs in between your other scheduled chores. That will raise your tension level and can leave you with a bitter taste for CW." My experience confirms that advice. Turn on your station and operate your key when you're relaxed, confident, and ready. Consider your time on the air as something special—which, of course, it is.

Still, other hams turn to air-time when they are a bit uptight. They find relaxation in their QSOs. As in all these tips, select what's best for you. Try different tips and techniques. If they work for you, keep them; if they don't interface with your own interests or skills, forget them.

8) *Don't bother with stations which "don't sound right."* Earlier today I was on the air, searching. I heard a faint CQ, so faint I had to struggle to catch the call. "What the heck," I told myself, "give the guy a call—maybe he'll get stronger." Sometimes they do. And, of course, sometimes they get weaker. Then the contact may become frustrating for you. You may get more out of your hamming if you let doubtful calls go by.

Another example of contacts which don't sound right is the ham who fumbles his own call more than once or twice in a CQ. When there's apparently no other signal on the air, I sometimes figure, "Well, maybe he'll settle down once we make contact." Sometimes he does, indeed, become a textbook version of good sending. But often the errors just keep piling up. And I keep getting more and more uncool in trying to read him.

Beginning operators, until they get a fair number of QSOs, often find it hard to think up the words to use and then spell them. To help solve such problems, I refer to a notecard prepared with key phrases on it.

Photos by Steven Ybarrola

9) *Know how to tune up.* This is another elementary technique, yet from what I hear on the air, many hams with years of experience have still to learn how.

I'd read and believed all that literature that says, "Never tune up on the air." But some experienced operators told me, "You have to tune up on the air to make sure your swr is down where it should be." Finally, Tim Wheelis KQ6V, an Extra-class ham living in Pacific Grove, California, came to my shack and showed me just how to do it—*on my equipment*. My problem was that everyone who was telling me what I should do had gear that was different from mine. KQ6V has the same Heathkit equipment as I have. His tips were clear, specific, and relevant. They worked! So you, too, should avoid using tips about gear other than your own.

10) *Check the action on the other bands regularly.* I make it a practice to do that about every hour I'm on the air—after about every two contacts. I might be happy with plenty of contacts on 15 meters, for example, but I want to be there when 10 opens!

11) *Learn to live with QRM and QRN.* A friend of mine, a non-ham, visiting my shack heard the Russian woodpecker. You may not have met that bird yet. It's a loud, harsh, steady, persistent pecking sound. It comes from some Soviet electronics project and is not intentional interference, I'm told. It may last just a few seconds, yet other times it may go on for an hour or longer. Sometimes it settles on just a small part of a band; other times it will range up and down quite an expanse of frequencies. On hearing that horrible sound, my friend asked, "Is he paid by the makers of headache pills?" I doubt that. Still, you should learn to live with it, and with other interferences, static, and distractions. Don't become one of those operators who CWs "I must QRT (stop sending)" as soon as listening gets a bit difficult. Try a bit harder and a bit longer when rough stuff gets on the air, and you'll soon find you can copy through a lot more QRM and QRN than you might have thought.

There, then, are tips and techniques which can help every Novice fill up his or her logs faster than ever. And for you old hands, reviewing such basics just might get you, too, into stations you've never reached before. ■

Novice or experienced: Please send me the tips you've discovered, the techniques you use to improve your on-the-air skills. Include your call, name, and QTH so you might be mentioned in a future article rounding up still more specifics.

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Saugerties NY 12477

Home-Brew an Apple Computer—and Save!

In this 73 exclusive, KB2GA reveals the secrets of Apple construction. From keyboard to motherboard, it's all here.*

Photos by KB2GA

Component	European Quantity	Domestic Quantity
555	2	2
558	1	1
741	1	1
2513	1	1
Character Generator	0	1
6502	1	1
9334	0	1
8304	0	1
8T28	2	0
8T97	3	3
74166	2	1
74LS00	1	1
74LS02	3	4
74LS04	1	1
74LS08	2	2
74LS11	1	1
74LS20	1	1
74LS32	3	1
74LS51	1	1
74LS74	2	3
74LS138	4	4
74LS139	1	1
74LS151	0	1
74LS153	4	4
74LS157	1	0
74LS161	4	4
74LS174	2	2
74LS194	2	3
74LS251	1	1
74LS257	5	5
74LS259	1	0
74LS283	1	1
74S74	1	0
74S86	1	1
74S151	1	0
74S175	2	1
74S195	1	1
4116 (RAM) (48K)	24	24
ROM Set	4	4

Table 1. Apple integrated circuit list.

Lately, many amateurs have been using personal computers in the shack. There have been many fine articles in amateur publications describing some of the uses of home computers as a valuable station accessory.[1,2,3,4,5]

This article will describe a method of obtaining an equivalent to one of the better computers on the market today at a cost well below the normal price. Enough information will be presented to enable you to obtain parts and then build and test a computer using a preassembled board.

System Features

There are many variables that should be considered when selecting a microcomputer system. We can oversimplify a bit and say that the two most important considerations are functionality and price. Or, how can we get the most bang for the buck?

As with other station accessories, we could consider building a computer. There are many articles about how to make a small computer using various microprocessors, but after all the effort of gathering parts, wiring, assembly, and testing, you may be left with a system that has no readily-available software and is without a lot of flexibility.

An easier way is to obtain an assembled board for one of the more popular computers. There are motherboards available for the Apple II computer from legitimate sources.[6,7] Since the entire computer is on a single board, connecting the power supplies, an ASCII keyboard, and a monitor results in an operational system. An ordinary tape recorder can be used to store programs.

Other than the obvious cost savings, there are other advantages to doing it yourself. First, you will have an understanding of what is inside the system should it ever need service. Second, the package can be made more RFI tight than the factory model. All computers generate a certain amount of rf, and when you are trying to pull in a rare DX station out of the mud, each dB of attenuation around your computer (the rf generator) is important. Third, the package can be customized

***Apple is a registered trademark of Apple Computer, Inc.**

to your particular liking. (Three possibilities are rack mounted, table top, or a portable package.) You may even want to leave room for interface circuitry such as a keyer or RTTY. Also, there is the pride and satisfaction of doing it yourself.

Before getting into the actual construction, let's consider some of the advantages/disadvantages of an Apple compared to some of the other personal computers on the market today. The large base of Apples that have been sold means that there is a lot of good software written for it. Application software is available through local users' groups, computer stores, and via mail order from many vendors. The Apple documentation is well written, informative, and easily available. That is important for a project like this.

The graphics capability is very good—at least as good as the other machines in its price class. With the addition of a disk drive and a printer, you could have the makings of a small business system capable of being used for such things as inventory, accounting, tax preparation, and other functions. A word-processing system is one of the most useful applications for a home computer, and you may find yourself waiting in line to update your logs as one of the junior ops finishes a book report. And don't forget the inevitable and captivating video games.

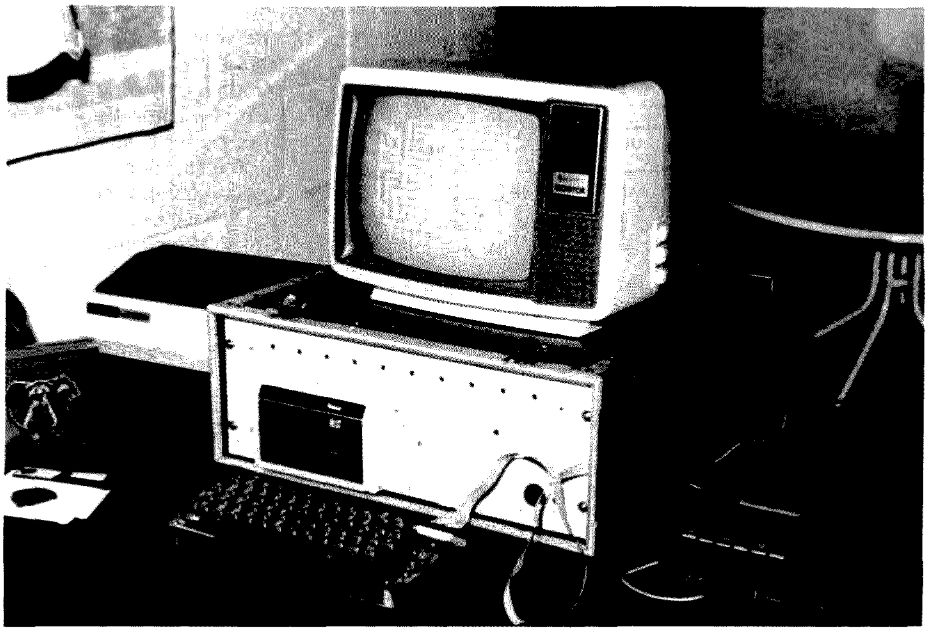

Photo A. Front view of the case with the system in operation. The hole pattern to the right of the disk drive is for the speaker.

Construction

Obviously, the first step in this project is to obtain a motherboard. The boards are available in three different configurations: a bare board, an assembled European version, and an assembled domestic board.[6,7] Assembled and tested boards can usually be obtained for $350 to $450. The bare board typically sells for $100 to $200.

The bare board requires installation of the sockets, I/O (input/output) connectors, discrete circuitry, and, of course, the integrated circuits. The integrated circuits (ICs) required are a 6502 microprocessor, support ICs—mostly 74LS series—and the Apple ROMs (read-only memories) which contain the Basic program and the monitor. Table 1 shows the required integrated circuits.

With the available documentation, assembling a bare board is not much harder than building a kit. (However, I would not recommend the approach for anyone without some experience with digital circuits.) All the IC locations and types are silk-screened on the top of the board, along with the discrete component values. The schematic for the domestic board is in the Apple II *Reference Manual*. This book is highly recommended for all Apple users and is mandatory if building is contemplated. The *Reference Manual* is published by Apple Computer Inc., Cupertino, California (Apple Product #2L0001A).

This book and the Apple ROMs are available from your local Apple dealer (the ROMs must be ordered specially by most dealers). The books and ROMs are available via mail from Applied Invention.[8] Electrovalue[6] also sells the entire integrated circuit package (minus the ROMs) for $60.00 to $75.00 depending on the board configuration. They also have packages that include connectors, the crystal, speaker, etc. Another good source for ROMs and other Apple ICs and manuals is Component Sales.[13] A set of four ROMs (Integer Basic version) can be obtained for $35.00 to $45.00.

The European version of the Apple board can be used without modification except for the high-resolution-graphics mode. This version sells for less than the domestic version and may be easier to find. If you are interested in the hi-res

Photo B. Front of the case with the cover removed. Note the position of the disk drive and the motherboard. The terminal strip on the right is for distribution of the ac power. The copper-clad printed-circuit material can also be seen.

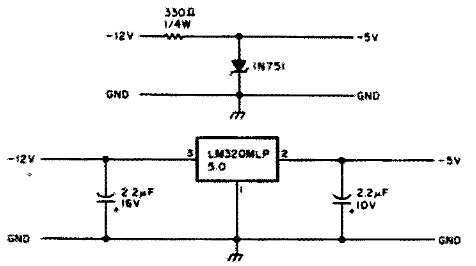

Fig. 1. −5-volt power supply with zener diode (top) or 3-terminal regulator.

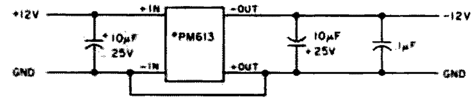

*Fig. 2. Typical circuit for generating −12-volt supply using dc-to-dc converter. (*Available from Power Products, 1400 N.W. 70th St., Fort Lauderdale FL 33309.)*

graphics, modifications can be made. This requires about twenty cuts to the printed circuit board and a similar number of jumpers to be added. Specific instructions for this modification are available from the vendor. (Again, you should have some experience before attempting the modifications.) Without making the modifications, the board is still usable for most applications. Note: If a European board is obtained, test the board for operation in Basic and low-resolution graphics before making the modifications for hi-res.

If you obtain an assembled and tested domestic version, connect the correct power supplies and a monitor and you will be "on line."

Power Supplies

The standard Apple uses a switching power supply. This supply as well as other switching supplies are available from various vendors.[6] Other than the disadvantage of taking more space and some more power, linear supplies are perfectly acceptable. They are more readily available and have less high-frequency noise on the output than the switchers.

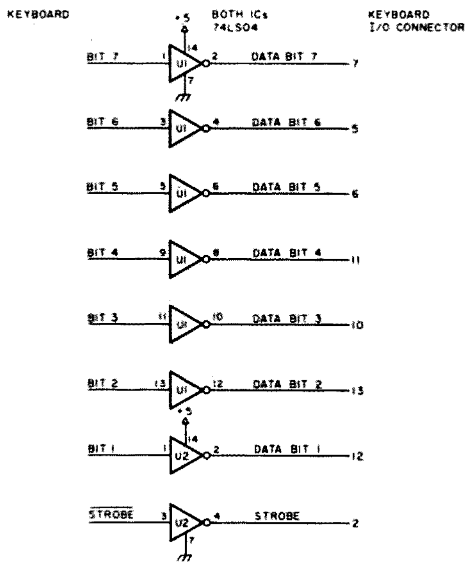

Fig. 3. Inverter circuit schematic.

Table 2 lists the voltages and current requirements for the supplies as well as a typical commercial supply. There have been a lot of articles in this magazine covering the design and fabrication of 12-volt regulated supplies for use with mobile 2-meter equipment, and also articles describing 5-volt logic supplies. Also check your local surplus outlet; I was fortunate enough to find suitable 12- and 5-volt supplies.

Another good source of reasonably-priced supplies is Jameco Electronics, 1355 Shoreway Rd., Belmont, California 94002; (415)-592-8097.

If you are contemplating adding expansion boards and other circuitry, consider using supplies with extra current capability. A word of caution: Linear supplies with more current capability can be used, but beware of multiple-output switching supplies with more capacity than needed. Some models require a certain minimum load on one or more outputs to operate correctly.

The power supplies get connected to the motherboard using a six-pin connector. The connector is an Amp #9-35028-1. The connector is available from Electrovalue or can be ordered specially by your local Apple dealer. If you can't wait for the Amp connector, solder six wires to the back of the board and put another connector between the supplies and the board. I used a Cinch six-prong connector pair. The connector coming from the board should be the male. The connector is wired as follows:

Pin	Function
1	GND
2	GND
3	+5 V
4	+12 V
5	−12 V
6	−5 V

Since the −5-volt supply requires very little current, it can be generated from the −12-volt supply using either a zener diode or a three-terminal regulator as shown in Figs. 1(a) and 1(b).

The −12-volt supply can be obtained with a line-operated regulator, but low-current supplies are not as common as the higher current models. Look for dual-output +5- and −12-volt units. Another alternative is to generate the −12 from the +12 or +5 volts using a dc-to-dc converter. A schematic for a typical circuit is shown in Fig. 2. The device specified is capable of supplying 80 mA, so caution should be used if the system is expanded using function cards.

Several alternative methods have been presented to obtain the necessary power; the choice depends essentially on what is available or can be obtained easily.

Keyboard

Almost any ASCII (American Standard Code for Information Interchange)-encoded keyboard can be used. Keyboards can be obtained from several supply houses.[6] The keyboard must be wired into a sixteen-pin DIP connector. The pinout is shown in Table 3.

Some older keyboards have inverted outputs. The Apple board looks for a high output when the data is true. For example, when the B key is pressed, the output should be 1000011—where a zero (0) is ground and a one (1) is 3 to 5 volts. If necessary, two hex inverter chips can be used to convert a negative-output keyboard into an Apple-compatible unit. A schematic for an inverter circuit is shown in Fig. 3.

Monitor

Some type of video display is necessary to interface with the Apple. There are several alternatives. A surplus monitor would cost some $25.00 to $100. A

black and white TV could run from no cost to $90.00. A new monitor is around $100 to $150. A portable color TV will cost $100 to $400. A color monitor runs from $300 to $500.

Monitors can be found on the surplus market. Most of these will be black and white. Any monitor compatible with the Electronic Industries Association (EIA) and National Television Standards Committee (NTSC) standard will work. A one-volt (adjustable) composite color video signal is available at the rear of the board. This signal can be fed to the monitor via a cable, usually with two RCA-type jacks.

The new monitors on the market today are usually green on black and are much easier on the eyes than the black-and-white versions. The graphics displays also are much more vivid. These can be obtained from most computer supply outlets.[9]

A regular television set is suitable for use as a monitor. Since the Apple can generate color graphics, many users prefer a color TV. The display on a TV is not as sharp and crisp as a monitor. Of course, with a TV you can disconnect the computer and watch Mork and Mindy or Laverne and Shirley. (Note: Some may consider that feature a disadvantage.)

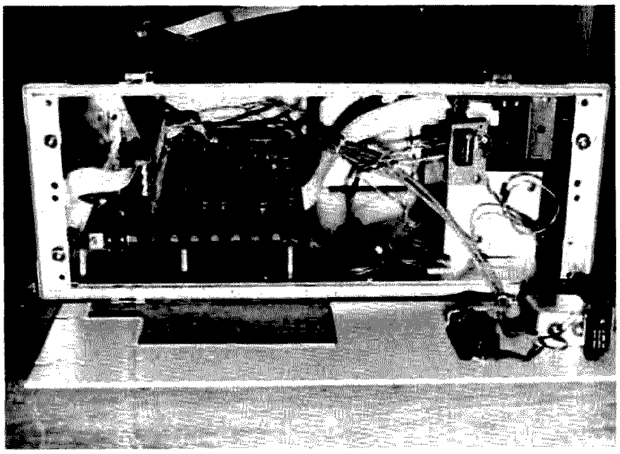

Photo C. The case with the rear panel removed. The motherboard is on the left, and the expansion connectors for peripheral cards can be seen. The power supplies are on the right; the supply mounted to the bottom is +12 V at 1.5 A, and the supply mounted above and to the upper right of the case is the +5-volt supply. The dc-to-dc converter circuit for the −12 is shown mounted to the case of the +12 supply. The components on the right are a line filter, circuit breaker, and an ac line outlet.

An rf modulator must be used between the computer output and the TV. The composite video signal modulates the output of the modulator in one of the two lower VHF television bands: 61.25 MHz (channel 3) or 67.25 MHz (channel 4). Modulators are available from your local computer dealer or Radio Shack (part #277-221).

The best monitor, and naturally the most expensive, is a color monitor designed for computer use. The display is clear and sharp like the monochrome monitors and the colors are vivid. The resulting color graphics are superior to those produced on a color TV.

Choosing the monitor is mostly a matter of taste and the thickness of one's wallet. It is easiest to start with a system using any available TV and then upgrade at a later date.

System Test

Before putting the system in a package, it is best to test it on a bench. Assuming an assembled motherboard is available, connect the power supplies as described earlier. Double-check the wiring before turning on the supplies. Connect a known good monitor or TV as described. Note that we do not connect the keyboard yet.

Now for the first test. Turn on the power to the TV or monitor, and then the system supplies. The screen should be filled with a bunch of random characters, letters, numbers, question marks, anything. This is the random turn-on pattern of what is in the screen-display memory. At the bottom left of the screen should be an asterisk. If all is well, skip the next three paragraphs.

If the screen does not show random characters, turn off the power supplies and check the connections and output voltages again. If everything is OK, turn on the power to the board. Check the power to the board by measuring the voltages on the board with respect to power ground. Check for obvious faults such as bent IC pins, shorts, loose components, etc. If there are no mechanical problems and the power is correct, make sure that your monitor or modulator and TV and connecting cables are operational by hooking them up to a friend's computer. (It is not necessary to use an Apple; several other systems use a video output.)

Voltage	Apple Supply Capability	Actual Current Required (System 1)	Actual Current Required (System 2)	Recommended Supply
+5V	2.5 Amp	1.5 Amp	1.8 Amp	Power/Mate EM-5B or equiv. 5 V at 3 A
−5V	250 mA	10 mA	12 mA	See text
+12V	1.5 Amp	400 mA	1.2 Amp	Power/Mate EM-12B or equiv. 12 V at 1.5 A
−12V	250 mA	15 mA	80 mA	Power/Mate MM-12A or equiv. 12 V at 100 mA

Notes: (1) System 1—48K Apple with no peripherals.
(2) System 2—64K Apple with disk drive and controller, printer interface, and a 16K RAM card.
(3) Power/Mate Corp., 514 S. River St., Hackensack NJ 07601; (201)-440-3100. Will sell small orders.

Table 2. Voltage and current requirements.

Pin	Function	Notes
1	+5 V	Power supply to keyboard (120 mA max)
2	Strobe	From keyboard, 10 microsec min
3	Reset	From keyboard, shorted to GND when reset
4	No connection	
5	Data 5	Part of seven-bit ASCII output
6	Data 4	Ditto
7	Data 6	Ditto
8	Ground	System electrical ground (GND)
9	No connection	
10	Data 2	ASCII output
11	Data 3	Ditto
12	Data 0	Ditto
14	No connection	
15	−12 V	Power supply to keyboard
16	No connection	

Table 3. Keyboard connector pinout.

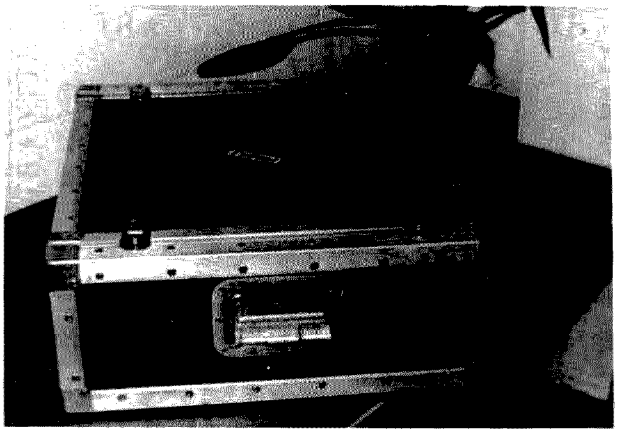

Photo D. This photograph shows the case buttoned up, ready for travel.

Photo E. The benchtop wooden "enclosure" described in the text.

If the problem still persists after the above tests, suspect a bad IC. The solution to this problem is substitution. You will need either a known good Apple from which you can substitute ICs one at a time or an extra set of components. Another troubleshooting step is to put the board into a known good Apple and try it out.

To narrow down the possible IC faults to some degree, try the following substitutions. If nothing appears on the screen, something is wrong with the clock-divider chain. Check B1, B2, C1, C2, and D11 through D14. Also check the video-generator section, A3, A5, A8, A9, A10, B4, B8, B9, and B10. If the screen is covered by a block pattern which changes in a random fashion each time power is turned on, a data line or memory chip is probably bad. Check the first memory bank, C3 through C10, and the memory data latches, B5 and B8. Check the RAM address multiplexer, C12, E11, E12, E13, and E14. Verify that the RAM select chips, C1, C12, E2, F2, and J1, are operational.

If the monitor comes up with a random character pattern, it indicates that the CPU is working, the clock gets divided down correctly, the address and data lines work, and so on. Turn the power off and connect the keyboard. Turn the power on and in response to the asterisk prompt, type a Control B. The unit will come up in Basic. If the ROM contains Integer Basic, a > sign will appear. For units with floating-point Applesoft Basic, a] prompt will appear. Once this happens, you probably have a working system. Write a small test program to further verify operation.

There are several books on Basic. The Apple II *User's Guide*[11] is an excellent reference which also covers other topics of interest such as differences between the two Apple Basics, hardware interface, etc.

To store programs for later use, some type of magnetic storage medium is required. An ordinary cassette tape recorder can be used for program storage and also can serve as a way of using commercially-available software. The Apple II *Reference Manual* describes the interface and operation.

The first peripheral to consider should be a disk drive. After working with cassettes, the convenience of a disk drive will be appreciated. Disk drives and controllers are available from several sources including Applied Invention.[8]

Packaging

As we briefly discussed earlier, there are several different ways in which a unit such as this could be packaged. I was fortunate enough to obtain at a reasonable price the case shown in the photographs. The case is open only at the back and front so that access to the board and power supplies is limited, but it is sturdy and portable. Snapping on the front and rear covers completely closes the case and provides a carrying handle.

A few trips to the local surplus outlets might turn up a similar bargain. Unlike most Apple installations, I chose to have the disk built in rather than sitting on top of the box. Using a hacksaw, I cut an opening in the front

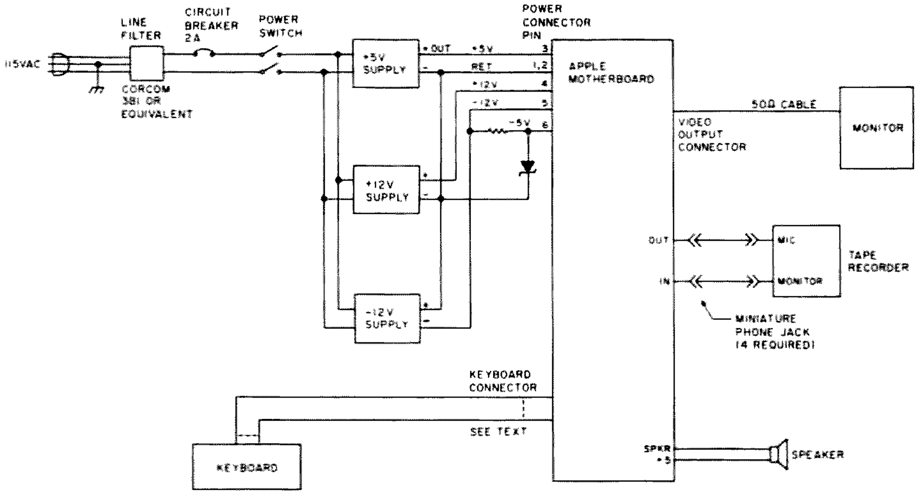

Fig. 4. Interconnection diagram.

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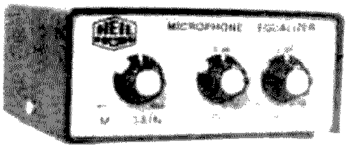

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panel for the front of the drive as shown in Photo A. The drive is screwed to the bottom of the case.

Since the case is not metal, I also took the extra precaution of covering the entire inside with double-sided copper-clad PC-board material. All the separate sheets of material are electrically tied together using solder and ground braid. This proved to be a considerable help in curing the TV interference caused by the system.

If the unit is going to stay in one location, consider the approach taken by Jules Madey K2KGJ. Photo E shows this packaging scheme. The motherboard sits on the bench and is covered by an inverted U-shaped wood structure. The wood cover supports the monitor, disk drives and various interface circuitry. The power supplies are mounted below the bench and connected via a cable. The keyboard is mounted in another wood box in front of the system. Everything in the system is very accessible, and the packaging can easily be finished in one evening. This method could also serve as an interim package until a suitable case could be located.

Some manufacturers have cases available with sloping fronts. With the larger models, the motherboard and power supplies could be mounted on the bottom and the keyboard fastened to the sloping front through an appropriate cutout. The keyboard would then be at the correct angle for typing. This package would be very similar to a factory-built Apple. Two companies that make that type of enclosure are Buckeye Stamping Co.[11] and Hammond Manufacturing.[12] (Ask for the "Desk Top Consoles" catalog from Hammond.)

Suitable cases and enclosures show up at hamfests and surplus houses, so keep your eyes open.

Conclusion

This article presented some ideas, thoughts, and actual hardware implementations of home-built computers. The techniques used by most of the manufacturers is to put everything on one board. These boards are sold also to OEM manufacturers for use in computer-based products. This makes full-function computers available if one does a little digging. Most of what was discussed here can be applied to computers other than the Apple. I hope this article inspires some other home-built computers. ■

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13. Component Sales Inc., 778A Brannan St., San Francisco CA 94103; (415)-861-1345.

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160 Memory channels with battery data retention.
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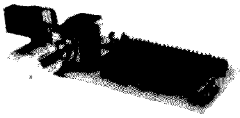

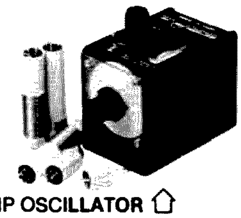

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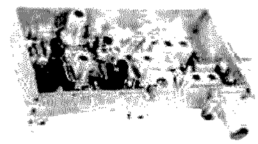

Stock No.	Input Freq MHz	IF Output (MHz) Commo	IF Output (MHz) ATV	Xtal Freq MHz
------------	432-438	144-148	722-728	96.0000 △
40-00170	434 438	144-148	724-730	96.6887
40-00270	436-438	144-148	726-732	97.3333 +
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FCC

In a flurry of activity, the FCC recently made several modifications in the amateur regulations. The change which has most likely affected amateur habits is the deletion of all logging requirements in Part 97. As of June 9, no transmissions had to be logged, unless specifically requested by the Commission. Third-party traffic is also exempt from any logging requirements.

The FCC also engaged in some housecleaning in an effort to clear up ambiguous regulations and delete outdated rules. Among those deletions was the requirement of a CW ID for amateurs using video and some common digital codes.

Finally, in an NPRM, the Commission proposed an expansion of the 10-meter repeater subband, citing the recent rapid growth in this area.

Here are the final orders and the NPRM as they appeared in the Federal Register:

Appendix

Parts 0 and 97 of Chapter I of Title 47 of the Code of Federal Regulations are amended as follows:

PART 0—COMMISSION ORGANIZATION

A.1. Section 0.314 is amended by adding new paragraph (x) as follows:

§ 0.314 Additional authority delegated.

* * * * *

(x) When deemed necessary by the Engineer-in-Charge of a Commission field facility to assure compliance with the Rules, a station licensee shall maintain a record of such operating and maintenance records as may be necessary to resolve conditions of interference or deficient technical operation.

PART 97—AMATEUR RADIO SERVICE

B.1. In § 97.79, paragraph (b) is revised to read as follows:

§ 97.79 Control operator requirements.

* * * * *

(b) Every amateur radio station, when in operation, shall have a control operator. The control operator shall be present at a control point of the station, except when the station is operated under automatic control. (Automatic control is only permitted where specifically authorized by the rules of this part.) The control operator may be the station licensee, if a licensed amateur radio operator, or may be another amateur radio operator with the required class of license and designated by the station licensee. The control operator shall also be responsible, together with the station licensee, for the proper operation of the station. (For purposes of enforcement of the rules of this part, the FCC will presume that the station licensee is, at all times, the control operator of the station, unless documentation exists to the contrary.)

* * * * *

2. In § 97.85, a new paragraph (g) is added to read as follows:

§ 97.85 Repeater operation.

* * * * *

(g) Each station in repeater operation transmitting with an effective radiated power greater than 100 watts on frequencies between 29.5 and 420 MHz, or 400 watts on frequencies between 420 and 1215 MHz, shall have the following information included in the station records during any period of operation:

(1) The location of the station transmitting antenna marked upon a topographic map having contour intervals and having a scale of 1:250,000 (indexes and ordering information for suitable maps are available from the U.S. Geological Survey, Washington, D.C. 20242, or from the Federal Center, Denver, CO 80255);

(2) The transmitting antenna height above average terrain (see Appendix 5);

(3) The effective radiated power in the horizontal plane for the main lobe of antenna pattern, calculated for the maximum transmitter output power which occurs during operation;

(4) The maximum output power which occurs during operations;

(5) The loss in the transmission line between the transmitter and the antenna (including devices such as duplexers, cavities or circulators), expressed in decibels; and

(6) The relative gain in the horizontal plane of the transmitting antenna.

3. In § 97.88, paparagraph (a) is revised, and new paragraphs (f) and (g) are added to read as follows:

§ 97.88 Operation of a station by remote control.

* * * * *

(a) A photocopy of the license for the remotely controlled station shall be posted in a conspicuous place at the station location.

* * * * *

(f) The station records shall include during any period of operation:

(1) The names, addresses, and call signs of all persons authorized by the station licensee to be control operators; and

(2) A functional block diagram of the control link and a technical explanation sufficient to describe its operation.

(g) Each remotely controlled station shall be protected against unauthorized station operation, whether caused by activation of the control link, or otherwise.

4. Section 97.90 is added to read as follows:

§ 97.90 System network diagram required.

When a station has one or more associated stations, that is, stations in repeater or auxiliary operation, a system network diagram (see § 97.3(v)) shall be included in the station records during any period of operation.

5. Section 97.92 is added to read as follows:

§ 97.92 Record of operations.

When deemed necessary by the Engineer-in-Charge (EIC) of a Commission field facility to assure compliance with the rules of this part, a station licensee shall maintain a record of station operations containing such items of information as the EIC may require under Section 0.314(x).

§ 97.99 [Amended]

6. In § 97.99, paragraph (c) is removed.

§ 97.103 Undesignated heading. [Removed]

7. Section 97.103 and the undesignated heading "Logs" which precedes § 97.103 are removed in their entirety.

§ 97.105 [Removed]

8. Section 97.105 is removed.

§ 97.417 [Amended]

9. In § 97.417, paparagraph (d) is removed.

PART 97—[AMENDED]

Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, is amended as follows:

1. In § 97.13, paragraphs (c) and (d) are revised to read as follows:

§ 97.13 Renewal or modification of operator license.

* * * * *

(c) Application for renewal and/or modification of an amateur operator license shall be submitted on FCC Form 610 and shall be accompanied by the applicant's license or a photocopy thereof. Application for renewal of unexpired licenses must be made during the license term and should be filed within 90 days, but not later than 30 days, prior to the end of the license term. In any case in which the licensee has, in accordance with the provisions of this chapter, made timely and sufficient application for renewal of an unexpired license, no license with reference to any activity of a continuing nature shall expire until such application shall have been finally determined.

(d) If a license is allowed to expire, application for renewal may be made during a period of grace of five years after the expiration date. During this five-year period of grace, an expired license is not valid. A license renewed during the grace period will be dated currently and will not be backdated to the date of its expiration. Application for renewal shall be submitted on FCC Form 610 and shall be accompanied by the applicant's license or a photocopy thereof.

§ 97.32 [Amended]

2. In § 97.32, paragraph (f) is removed in its entirety.

§ 97.61 [Amended]

3. In § 97.61, the parenthetical phrase in paragraph (e) is revised to read as follows:

* * * * *

(e) * * *
(when type F1 or A2J emissions are employed in these bands, the radio or audio frequency shift, as appropriate, shall not exceed 1000 Hz)

4. In § 97.69, paragraph (a)(3) is removed in its entirety and paragraphs (a)(2) and (b)(3) are revised to read as follows:

§ 97.69 Digital communications.

* * * * *

(a) * * *

(2) When type A2, F1 or F2 emissions are used on frequencies below 50 MHz, the radio or audio frequency shift (the difference between the frequency for the "mark" signal and that for the "space" signal), as appropriate, shall not exceed 1000 Hz. When these emissions are used on frequencies above 50 MHz, the frequency shift, in hertz, shall not exceed the sending speed, in baud, of the transmission, or 1000 Hz, whichever is greater.

(b) * * *

(3) The International Radio Consultative Committee (CCIR) Recommendations 476-2 and 476-3 (commonly known as AMTOR):

provided that the code, baud rate and emission timing shall conform to the specifications of CCIR 476-2 (1978) or CCIR 476-3 (1982), Mode A or Mode B.

* * * * *

5. Section 97.81 is revised to read as follows:

§ 97.81 Authorized apparatus.

(a) An amateur station license authorizes the use, under control of the licensee, of all transmitting apparatus at the fixed location specified in the station license which is operated on any frequency or frequencies allocated to the Amateur Radio Service, and, in addition, authorizes the use, under control of the licensee, of portable and mobile transmitting apparatus operated at other locations.

(b) The apparatus authorized for use by paragraph (a) of this section shall be available for inspection upon request by an authorized Commission representative.

6. In § 97.84, paragraph (g) is revised to read as follows:

§ 97.84 Station identification.

* * * * *

(g) The identification required by this section shall be given on each frequency being utilized for transmission and shall be made in one of the following manners:

(1) By telegraphy using the international Morse code (if this identification is made by an automatic device used only for identification, the code speed shall not exceed 20 words per minute);

(2) By telephony using the English language (the Commission encourages the use of a nationally or internationally recognized standard phonetic alphabet as an aid for correct telephone identification);

(3) By telegraphy using any code authorized by § 97.69(b), when the particular code is used for transmission of all or part of the communication or when the communication is transmitted in any digital code on frequencies above 50 MHz; or

(4) By video using readily legible characters when A5 emissions are used, the monochrome portions of which conform, at a minimum, to the monochrome transmission standards of § 73.682(a)(6) through § 73.682(a)(13), inclusive (with the exception of § 73.682(a)(9)(iii) and § 73.682(a)(9)(iv)).

* * * * *

7. In § 97.99, the introductory paragraph is revised to read as follows:

§ 97.99 Stations used only for radio control of remote model crafts and vehicles.

An amateur radio station in radio control operation with a mean output power not exceeding one watt may, when used for the control of a remote model craft or vehicle, be operated under the special provisions of this section, provided that a writing indicating the station call sign and the licensee's name and address is affixed to the transmitter.

* * * * *

8. In § 97.173, paragraph (d) is revised to read as follows:

§ 97.173 Application for RACES station license.

* * * * *

(d) If the application is for a RACES station to be in any special manner covered by § 97.42, those showings specified for non-RACES stations shall also be submitted.

PART 97—[AMENDED]

It is proposed that Part 97 of the Commission's Rules, 47 CFR Part 97, be amended as follows:

Section 97.61 paragraph (c) would be revised to read as follows:

§ 97.61 Authorized frequencies and emissions.

* * * * *

(c) All amateur frequency bands above 29.0 MHz are available for repeater operation, except 50.0–52.0 MHz, 144.0–144.5 MHz, 145.5–146.0MHz, 220.0–220.5MHz, 431.0–433.0MHz, and 435.0–438.0MHz. Both the input (receiving) and output (Transmitting) frequencies of a station in repeater operation shall be frequencies available for repeater operation.

Build This Super Switch

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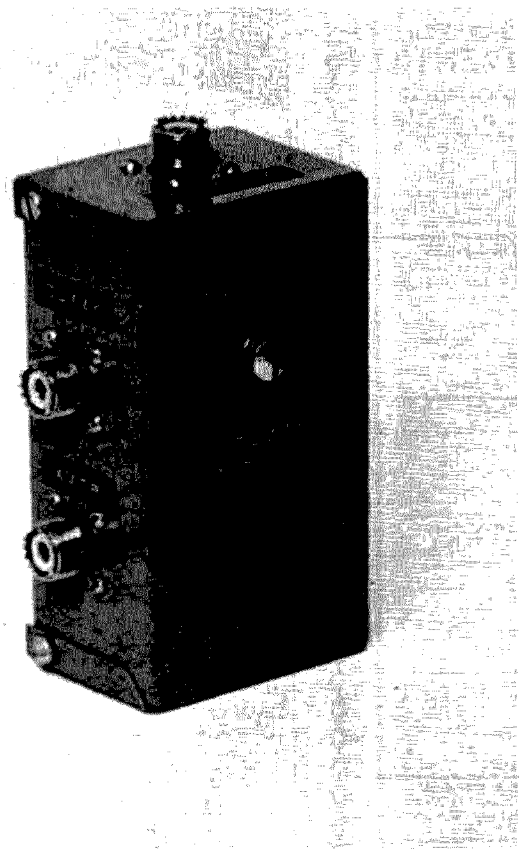

The lazy man's switch box.

R. K. Forsyth K4YS
1012 West Street
Rockledge FL 32955

Although I've often heard that necessity is the mother of invention, I believe that in my case it was just pure laziness. And that is why I designed and built the switch box to be described. It does all of the following things with just one flip of a switch:

- Connects your transmitter to your dummy load for initial tune-up.
- Connects your transmitter through your antenna-matching unit to your antenna for final tune-up and transmit.
- Disconnects the center lead of your antenna coax from your equipment and grounds it to your coax shielding when you are finished transmitting.
- Provides a simple, visual rf power-output monitor from your transmitter.

The switch box did not just develop at one time but came about as the result of an analysis of problems common to most amateurs.

Although many amateurs have dummy loads, often they are not used because disconnecting your coax cables from your tuning unit and connecting your dummy load for an initial tune-up takes time and is inconvenient. But there are some real advantages in first tuning up into your dummy load that should be considered in more detail.

First, you eliminate unnecessary QRM, which is important in our already overcrowded bands. And there is another technical advantage. By tuning up your transmitter into your dummy load initially, you are assured that your swr is 1:1, which prevents the possibility of excessive rf currents or voltages damaging your equipment. After you are properly tuned up into your dummy load, you should

not do any further adjusting of your transmitter rf controls. Then when you switch over into your antenna system, you have only to adjust your antenna-matching network. And by either remembering approximately where the dial settings of your tuning unit are for the various frequencies or using a simple chart or graph to set the dials, you can again keep your swr down to a reasonably low level until you fine-tune the controls for an swr of 1:1.

This technique, which actually is only good engineering practice, reduces your tune-up time and protects your rig as much as possible from dangerous tune-up conditions. Attempting to tune up your equipment without first going through the dummy load step just outlined means that you are trying to adjust both your transmitter and tuning-unit dials at the same time. This can lead to dangerous impedance mismatch conditions until your swr reaches its final lowest value. This haphazard procedure is not to be recommended if you value your equipment.

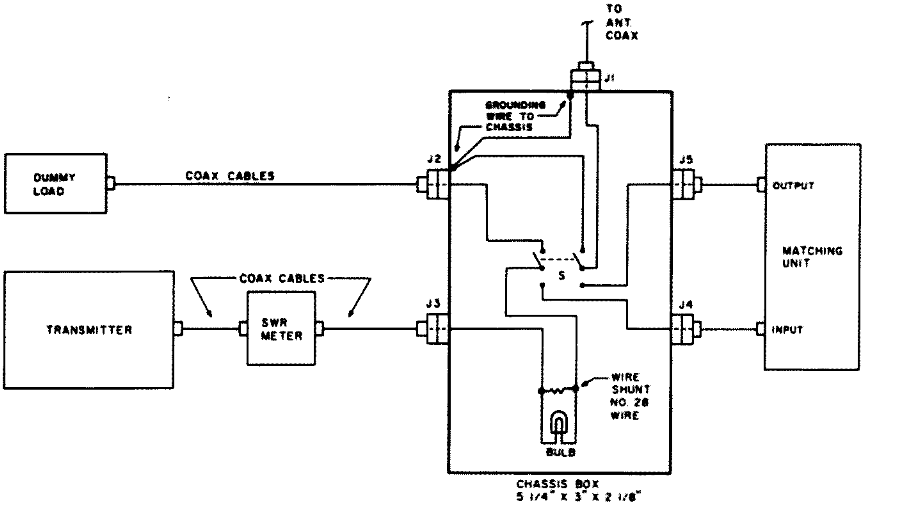

Fig. 1. Schematic diagram. J1-J5—SO-239 coax jack. S—275-652, 6-A DPDT switch. Bulb—PR2, 2.38 V, 500 mA. Mounting hardware—20 #4-40 ½-inch round-head machine screws and nuts. Grommet—bag of assorted sizes. All parts from Radio Shack.

The provision of disconnecting the center lead of your antenna coax from your equipment and grounding it to the coax shield when your station is shut down is a common-sense precaution that will drain off any static voltage buildup and eliminate any effects of induced voltages from a nearby lightning strike. In my own case, I had a diode in my swr meter burn out a couple of years ago when my antenna was not grounded and lightning hit nearby. That one experience made a believer out of me, and now I never leave my shack without first making sure that my equipment is disconnected from the antenna circuit.

It should definitely be pointed out, however, that just disconnecting the center of your antenna coax and grounding it to the shield is not a lightning-protection device! When lightning hits your antenna system directly, it can easily travel down the shield and, because of the extremely high voltages and currents involved, cause all sorts of damage. In a heavy lightning storm it is best to completely disconnect all incoming antenna leads to your shack and ground your antenna outside directly through a really heavy cable to a good ground. At least that is the procedure I've been using here, particularly since Florida has more lightning storms than any other state in the Union.

The rf-monitor circuit is nothing more than a simple small incandescent bulb shunted down with about three inches of number 28 wire in series with the rf output of the transmitter. The size of the bulb and the shunting wires are dependent, naturally, upon the power you run. In my case, a PR2 lamp from Radio Shack rated at 2.38 volts, 500 mA, worked just fine with my Ten-Tec Omni D. The friendly blinking light makes it fun to operate in a partly darkened room, as I often do in the evenings. And it is always reassuring to have a continuous monitor to tell you that everything is working as it should. As shown in the photograph, the bulb is just pushed into a rubber grommet, which makes for a good, neat, and insulated mounting.

Actually, the basic idea is as old as ham radio and makes me remember many years ago when a single turn of the wire soldered to a flashlight bulb was one of my most valuable tools. It was useful in neutralizing, tuning up the transmitter, and checking output when placed near the antenna coupler.

As seen in the diagram, the circuit is simple and the wiring is straightforward. The layout is not critical, and the project is simple enough to be, perhaps, an amateur's first attempt in getting acquainted with the fun of building his own gear.

After all the holes were drilled, a coat of gray enamel was used to paint the outside of the box. It was dried overnight and then baked in the oven at 250° F for fifteen minutes to provide a hard, good-looking finish. The decals added the final touch and ensured that I got my cables hooked properly.

Because the chassis box is of split construction, a wire was connected from J1 to J2 inside of the box so as not to have to rely upon the chassis contact for an rf path. Although a six-Ampere switch was used, I did try the unit at a friend's station with a linear amplifier, and the unit worked fine without the switch heating or any arc-over. However, ten-Ampere switches are commercially available for amateurs who may be running a California kilowatt. All other parts were obtained from Radio Shack, which simplified procurement problems.

Tests showed that, as expected, insertion of the unit changed the original settings of the antenna-matching unit slightly. (This generally happens whenever you change the configuration of your coax cables, probably because of such things as induced currents in coax shields or other minor secondary effects.) As in all rf projects, keep all cables and connections as short as practical and be sure that your coax jacks are well grounded to the chassis.

The real value to me has been the ease with which I can now tune up first into my dummy load and then, with a flip of the switch, into my tuning unit and antenna. It sure is a lazy man's switch box! ■

John M. Franke WA4WDL
1310 Bolling Avenue
Norfolk VA 23508

The Amazing Cylindrabola

This microwave antenna is easier to build than a dish. But it works just as well.

When you mention microwave antennas to most amateurs, the image that comes to mind is a large circular dish antenna. I have nothing against this type of antenna and use it at work and at home. However, I feel that many amateurs are turned away from microwave frequencies when they see the constructional difficulty of building a three-dimensional parabolic surface.

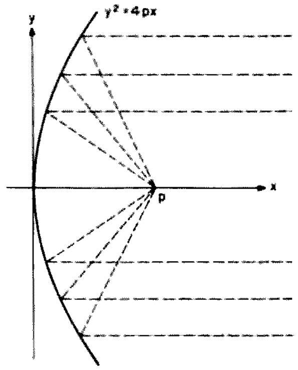

Fig. 1. Parabolic curve.

When maximum gain is needed, the full parabola is necessary, but there are times when it is not. After all, most amateurs just starting out on the high frequency bands do not initially erect rhombics. In recent months, I have been asked to build antennas for monitoring a studio microwave link for a local television station and for intercepting synchronization pulses from a radar site. In each case, the requirements were for moderate beamwidth, medium gain, and low cost. The last requirement was the primary goal. Each request was solved with the same antenna—a cylindrical parabola.

The cylindrical parabola is easily fabricated by hand with sheet metal formed in only one plane. The prototype unit described here was tested initially with an MDS receiver. The MDS signal offers several benefits to antenna work. First, the wavelength (14 cm) is short enough to permit reasonable-size antenna dimensions. Second, the signal is far enough away (3 miles from my location) to approximate a far field source. Third, the signal is available 24 hours a day—they maintain it, not I. And fourth, the bandwidth is large—6 MHz.

The major shortcoming of a cylindrical parabola is the unequal E- and H-plane beamwidths. The beamwidth is smallest in the plane of the curve. The smaller beamwidth is the same as for a dish antenna of the same diameter, while the larger beamwidth is essentially the beamwidth of the feed.

The antenna consists of two parts: the reflector and the feed. Both of the tasks referred to above were handled with the same reflector but with a difference in the size and type of feed. The studio-link

y	x
0	0
± 1"	0.05"
± 2"	0.20"
± 3"	0.45"
± 4"	0.80"
± 5"	1.25"
± 6"	1.80"
± 7"	2.45"
± 8"	3.20"
± 9"	4.05"
± 10"	5.00"
± 11"	6.05"

Table 1. X and y values used to make 22-inch-wide, 5-inch focal length cylindrical parabola antenna.

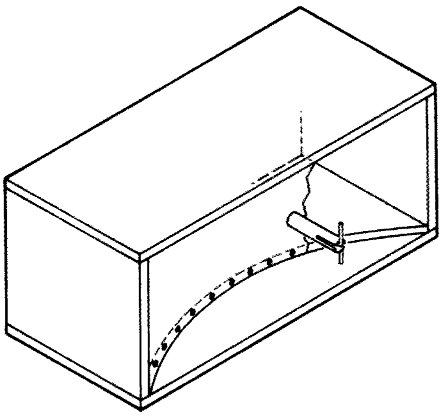

Fig. 2. Box construction with cutaway view of the lower surface support rib.

monitor used a slotted dipole like the one to be described. The radar monitor used a waveguide-to-coax transition as a feed.

The equation for the shape of a cylindrical parabola is identical to that for a circular parabola: $y^2 = 4px$, where y = distance measured tangent to the vertex, x = distance measured perpendicular to the vertex, and p = focal length of the antenna.

Fig. 1 is a graph of a parabola. The table gives the x and y coordinates of the curve used for the antenna shown in the photo. It has a focal length of five inches and a width of 22 inches. The height of the surface is one foot—just over two wavelengths. Increasing the height has little effect on the gain due to the rapid falloff of the radiation pattern of the dipole feed. The same effect is noted with corner reflector antennas.

A thin aluminum sheet was used for the reflector surface because I had some aluminum flashing left over from a home-improvement job. Hardware cloth or coarse wire screen could also have been used; as long as the largest opening is less than one-tenth wavelength, no degradation will be noticed. The aluminum sheet was fastened to the ribs with number 7 sheet-metal screws spaced 2 inches apart. (If wire screen were used, it could be stapled in place.)

The metal sheet was spray-painted flat white before final installation. The paint improves the antenna appearance but more importantly it serves as a fire preventative. The natural aluminum surface forms a good reflector for visible and infrared solar radiation. The intensity at the focus is sufficient to ignite a small stick in seconds.

The parabolic shape is maintained by two ribs made from half-inch plywood. The curve was laid out on graph paper, plotting the curve for y=0 to y=11. The curve was transferred to the plywood by tracing over the curve with carbon paper placed between the graph paper and the plywood. The graph then was flipped over and the other portion of the curve traced out. The two ribs were clamped together and cut simultaneously on a bandsaw. (No, I do not have a bandsaw. I use one at the Naval Air Station hobby shop, a benefit of being a weekend warrior.) The overall construction is shown in Fig. 2 and in the photograph.

The slotted dipole feed is similar in design to the one described in my article on a short backfire antenna published in the October, 1982, issue of *73*.

I do not have facilities for determining antenna gain directly, but I can make gain comparisons by placing an attenuator between the MDS converter and the receiver and noting how much attenuation must be added or subtracted to maintain a constant signal level when different antennas are connected. The completed antenna displays a gain of 10 to 11 dB over the popular coffee-can horn antenna. By simple aperture ratioing, the expected gain is 11 dB; the full height is not illuminated, however, so the 10-11-dB measurement is reasonable. ■

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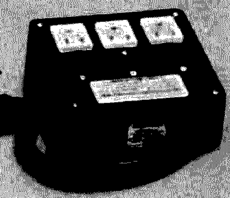

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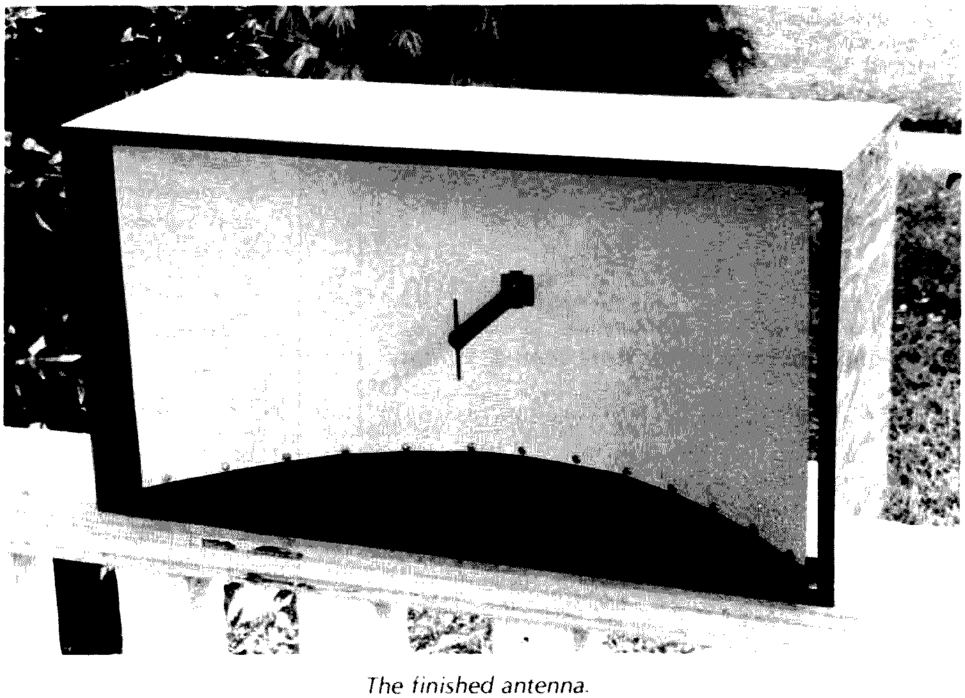


The finished antenna.

✓See List of Advertisers on page 114

Colorful RTTY: An Advanced System for the TRS-80C

It's all here—a TU, program, and modem to turn your CoCo into a professional-quality RTTY terminal.

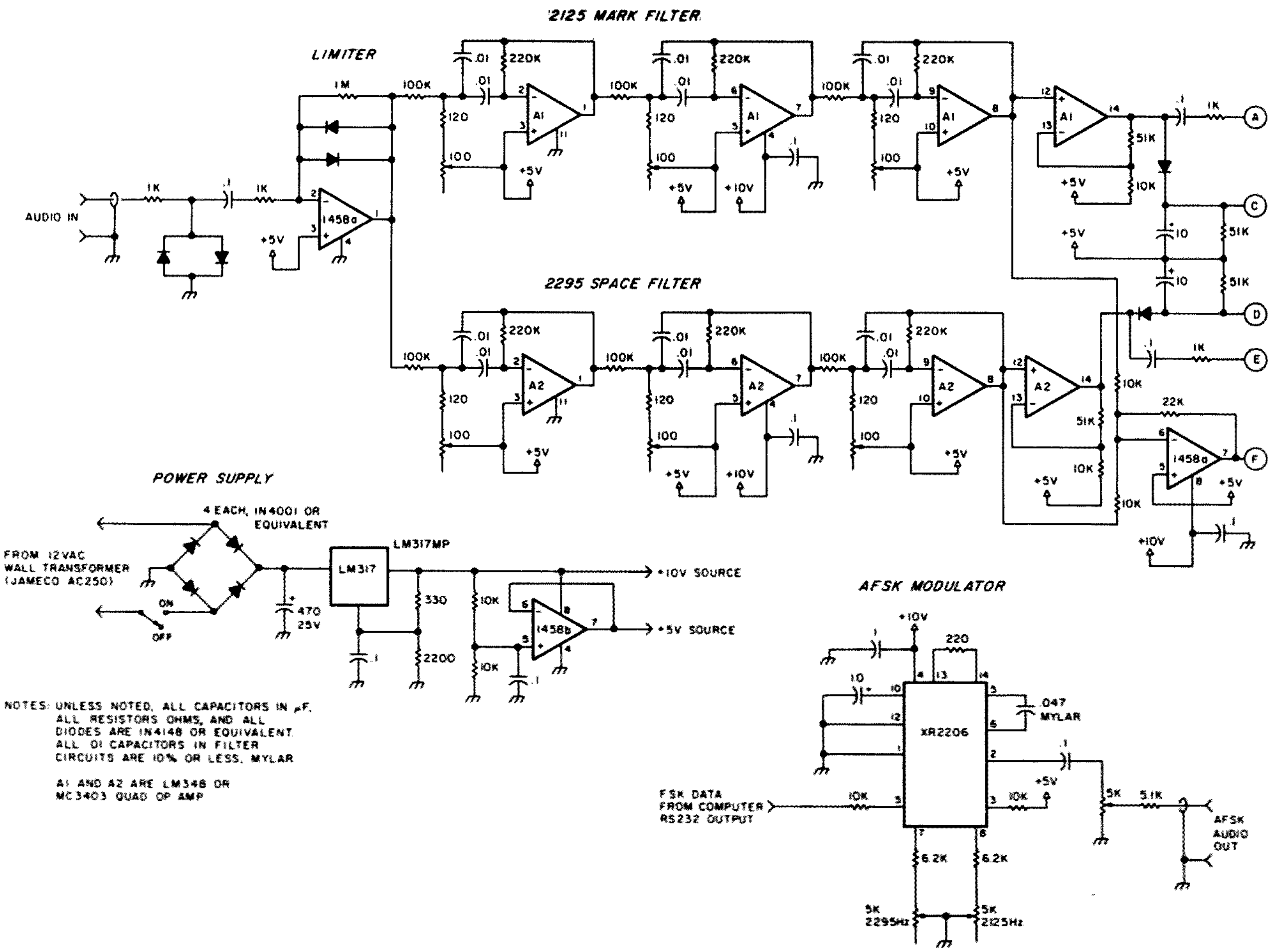


Fig 1(a). Filters, power supply, and modulator for the 170-Hz shift RTTY modulator/demodulator.

Clay Abrams K6AEP
1758 Comstock Lane
San Jose CA 95124

One of the most powerful low-cost computers available to date is the Radio Shack TRS-80C Color Computer, affectionately called the CoCo. The CoCo computer has grown in popularity over the past few years due to its low price and ease of expansion. It's hard to imagine how such a powerful computer can be sold at such a low cost.

Cost, however, is not the major attribute of this little computer. Tandy made a wise choice in selecting the 6809 processor for use in the CoCo. This processor is one of the least understood microcomputers available to date. It has many features which do not exist in any other microcomputer. Since my topic here is really amateur radio teletype, I'll show how this processor stands in a class by itself later in this article.

I would like to reach a couple of objectives in this article: to provide a small RTTY program which can be used as is or modified to add any features desirable, and to discuss a simple RTTY interface which can be purchased or constructed to get you on the air at minimal cost. But first, a little background on how this program was written.

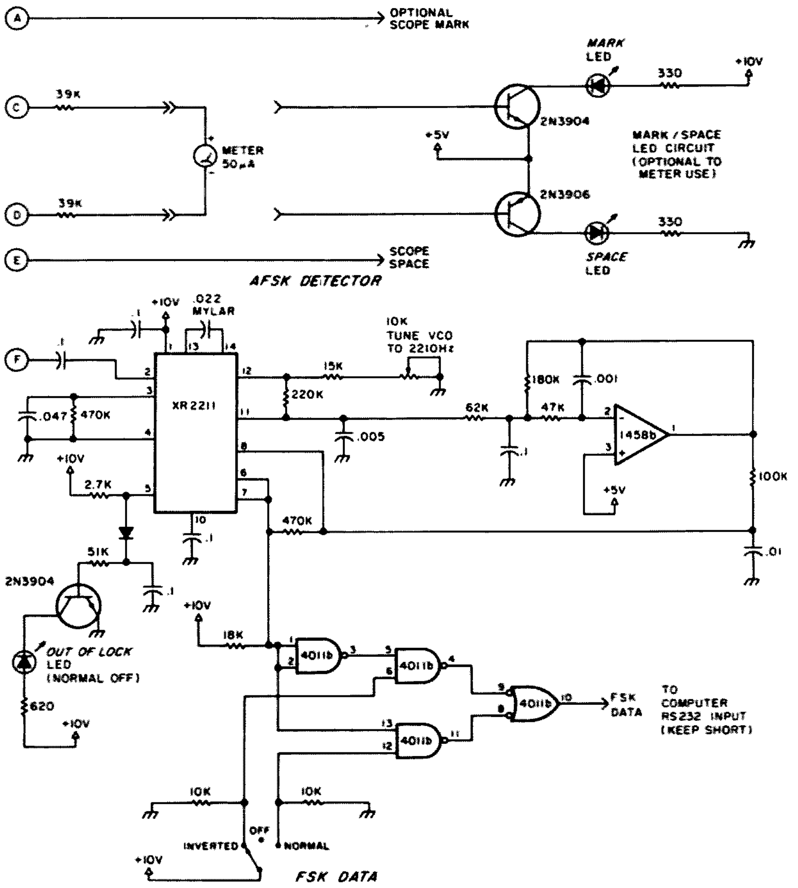


Fig. 1(b). Detector and tuning outputs for RTTY modulator/demodulator.

Program Background

Back in 1976, I wrote my first crude RTTY program for the South West Technical Products 6800 system. Do a few of you old-timers remember this computer? One can be seen from time to time even in flea markets. It became obvious in those early days that computers were the way of the future. The only big challenge to manufacturers was to drop their prices to a reasonable level.

After a few years of experimentation and further developments, I succeeded in writing a total of six RTTY programs for the 6800. In this period, I learned a lot and made a lot of mistakes. In 1980, I upgraded to the 6809 processor, which was a big step. But after a few months it became obvious that this processor was designed to be friendly and easy to program—unlike the 8080, 8088, Z80, 9900, and the 6502.

Probably the biggest moment in the history of the 6809 was Tandy's announcement of the CoCo in late 1980. As you might have guessed, I had one of these computers a few weeks after the announcement. In those days, a 4K computer was the norm, and one of my first challenges after developing some SSTV software was to write a RTTY program which would run on a 4K CoCo. I was very surprised to find that the CoCo was ideal for amateur radio applications. It was free from RFI susceptibility, even with 1 kW, and no birdies could be found on the HF receiver on any band. After the horror stories I heard about the TRS-80 Model I and other popular, expensive, well-known computers, I was very happy.

In this article you will see the results of my early RTTY efforts. Since this time, other RTTY programs have been written with greater features, but the basic principles are the same.

One point which must be emphasized is that if you desire to write programs for real-time high-speed applications, you should use machine language. A few RTTY programs have been written in Basic, but you can never achieve satisfactory results with it. Basic interpreters are too slow. The use of FORTH or the C language should work almost as well as machine language.

When designing a RTTY application program, a few fundamental decisions must be made even before starting to flowchart the code. These decisions are related to the hardware you use. In hardware selection, you have two possibilities. The first is to design the hardware to perform all the serial-to-parallel RTTY conversions. This requires the use of relatively complex hardware and relatively easy-to-write software. The advantage of this technique is for the manufacturer. The hardware costs can be passed along to the consumer and the manufacturer will not have to spend as much time writing software. This type of system has other advan-

Fig 2. Program listing.

```
SYMBOL TABLE:

ASCH    FFFE   ASCII   0AF9   ASCII1  0AFB   ASCII2  0B01   ASCII3  0B10
ASCII5  0B19   ASCII6  0B1D   ASCIO   0AC0   ASCIO1  0ACC   ASCIO2  0AD0
ASDEL   0AEF   ASDEL1  0AF3   BAUD    FFFD   BAUDA   0C4E   BAUDR   0642
BRATD   0C4C   BRATR1  0C48   BRATR2  0C4A   BS      066F   BS1     0673
BUF     0C50   BUF0    0C60   BUF1    0D5F   BUF2    0E5E   CDEL1   0B5D
CDL1    0B66   CDL2    0B6B   CODE    FFFF   COPYR   0746   CR      0B04
CURS    0677   CURS1   067D   CURS2   0683   CW      0B46   CW1     0B4A
CW2     0B4F   CWDEL   0640   CWL     0B9D   CWL1    0BAC   CWL2    0BD7
CWL3    0BEB   CWL4    0BCC   CWL5    0BEC   CWL6    0BE5   DASH    0B77
DEL     0937   DEL2    0930   DEL2C   0634   DEL3    093D   DEL3C   0636
DEL4    0946   DEL4C   0638   DEL5C   063A   DEL6C   063C   DEL7C   063E
DELA1   0B5B   DELA2   0B63   DOT     0B8B   END1    0B54   FIF2    09B7
FIF3    09D6   FIF4    09EF   FIF5    09CF   FIF6    09F4   FIFO    094F
FIFO1   0956   FIFO5   097D   FIFO6   0979   FIFO7   0988   FIFO8   0995
FINDA   082A   FINDA1  0839   FINDA2  0842   FINDA3  0854   FINDA4  0841
FINDB   07DC   FIMT    09A6   IN      0644   IN100   06D7   IN60    06B9
IN60A   06C3   IN60B   06BD   INE     0650   INEEE   064C   LAST    FFFC
LET     0B14   LF      0B0B   LOU     FFFB   LOU1    0762   LOW     0B46
MAINC   0B31   MAINC1  0B35   MAINC2  0B57   MARK    0689   MASK    FFF9
MENU    06DD   MENU1   00C9   MENU2   0A0F   MENU3   0C17   MENU4   0715
MENU5   0731   MENU6   0A53   MONIT   0613   NEXT    0631   OUT     0664
OUT1    066E   OUTEEE  065C   PIA     FF20   PIA2    FF22   QUE     080C
RECT1   08E9   RECT2   08FB   RECT3   090C   RECT4   0920   RECT5   092D
RECTB   090D   RECTB1  091C   RECTB2  0914   RECTB3  091B   RECV    08B7
RESTAR  A027   RETA    0824   RETA1   0820   RETA2   081E   RSIN    A000
RSOUT   A002   SP      0810   SPACE   087D   SPACE1  0870   SPEED   0689
SPEED1  069E   SPEED2  06A3   SPEED3  06B4   START   0600   STATB   0A68
STATB1  0ABE   STATB2  0AA9   STATB3  0AB1   STATB4  0AB0   STATB5  0ABC
STATB6  0AB6   STATB7  0ABA   TABCH   0BF3   TABNUM  0C0D   TR2     0864
TR3     086B   TR4     086D   TR5     0874   TRTTC   09FA   TRTTC1  0A04
TRTTY   0858   TRTTY1  0861   UD      FFFA   UD1     079D   UL      0895
UL1     089D   UL2     08AF   UL3     08AA   UL4     08AC   UP      084C


                     *
                     * RTTY Program for the Radio Shack TRS-80C
                     * Color Computer (4K or larger sized computer)
                     *
                     * ***************************************************
                     *          Clayton W. Abrams (K6AEP)
                     *             1758 Comstock Lane
                     *              San Jose, Calif.
                     *                   95124
                     *****************************************************
                     *  COPYWRITE NOTICE
                     *  Use of this program is authorized for amateur radio
                     *  non profit purposes. The program source may be modified,
                     *  reproduced as long as credit for the original work is
                     *  given to this author.
                     *****************************************************
                     *          (C) Clayton W. Abrams, 1981
                     *
                            OPT PAG
                     *
0600                        ORG $0600
                     *
                     * Program Equates
                     *
                FF20 PIA    EQU $FF20     RS 232 Port (OUTPUT) in TRS-80C
                FF22 PIA2   EQU $FF22     RS 232 Port (INPUT) in TRS-80C
                     *
                A000 RSIN   EQU $A000     TRS-80C input a character vector
                A002 RSOUT  EQU $A002     TRS-80C output a character vector
                A027 RESTAR EQU $A027     Basic restart vector
                     *
                     * Program variables for temporary storage
                     * All references are made relative to the
                     * the user stack.
                     *
                FFFF CODE   EQU -1        Baudot coded char to be translated
                FFFE ASCH   EQU -2        ASCII coded char to be translated
                FFFD BAUD   EQU -3        Translated Baudot Code
                FFFC LAST   EQU -4        Last BAUDOT shift
                FFFB LOU    EQU -5        Current BAUDOT shift
                FFFA UD     EQU -6        Current shift code to be xmitted
                FFF9 MASK   EQU -7        Program in ASCII or BAUDOT, 0=BAUDOT
                     *
                     * Initalization message for the program
                     *
0600 1F   43         START  TFR S,U       Find current system stack
0602 32   E8 EC             LEAS -20,S    Place system stack below user stack
0605 6F   59                CLR MASK,U    Set up for BAUDOT
0607 17   00AF              LBSR IN60     Initalize for 60 WPM
060A 30   8D 0138           LEAX COPYR,PCR Display COPYWRITE NOTICE
060E 8D   54                BSR OUT       Output it to screen
0610 17   058A              LBSR CWL      Ask for CW ID message
                     *
                     * Normal main line return when program
                     * is executing
                     *
0613 30   8D 00C6    MONIT  LEAX MENU,PCR Display main line monitor
0617 8D   4B                BSR OUT       Output it
0619 8D   31                BSR INEEE     Get an input character
061B 81   0C                CMPA #$0C     If CLEAR key return to BASIC
061D 27   12                BEQ NEXT
061F 81   52                CMPA #'R      Receive RTTY
0621 1027 0292              LBEQ RECV
0625 81   58                CMPA #'X      Xmit RTTY
0627 1027 0324              LBEQ FIFO
062B 81   53                CMPA #'S      Select speed
062D 27   5A                BEQ SPEED
062F 20   E2                BRA MONIT     Look for another key
                     *
                     * Go back to basic
                     *
0631 7E   A027       NEXT   JMP RESTAR    TRS80C BASIC restart
                     *
                     * Program delay constants
                     *
                     * 60 WPM BAUDOT
                     *
0634 0A20            DEL2C  FDB $0A20     Data bit delay
0636 0E00            DEL3C  FDB $0E00     Stop bit delay
0638 0500            DEL4C  FDB $0500     1/2 data bit delay
                     *
                     * 100 WPM BAUDOT
063A 0633            DEL5C  FDB $0633     Data bit delay
063C 08D3            DEL6C  FDB $08D3     Stop bit delay
063E 031A            DEL7C  FDB $031A     1/2 data bit delay
                     *
                     * CW DEL CONSTANT
                     *
0640 1600            CWDEL  FDB $1600     Approximately 15 WPM
                     *
                     * ASCII 110 BAUD DELAY
                     *
0642 047F            BAUDR  FDB $047F     Data bit delay
                     *
                     * I/O ROUTINES THROUGH
                     * TRS-80C BASIC
                     *
0644 34   14         IN     PSHS X,B      Input a character do not wait
0646 AD   9F A000           JSR [RSIN]    Input character vector
064A 35   94                PULS X,B,PC
                     * WAIT FOR K/B ENTRY
064C 34   14         INEEE  PSHS X,B
064E 8D   27                BSR CURS      Display a cursor
0650 AD   9F A000    INE    JSR [RSIN]    Input character vector
0654 27   FA                BEQ INE
0656 8D   17                BSR BS        Backspace
0658 8D   02                BSR OUTEEE    Output echo the character
065A 35   94                PULS X,B,PC
                     * OUTPUT A BYTE
065C 34   14         OUTEEE PSHS X,B
065E AD   9F A002           JSR [RSOUT]   Basic output vector
0662 35   94                PULS X,B,PC
                     * OUTPUT A STRING
0664 A6   80         OUT    LDA 0,X+      Get character from string
0666 81   04                CMPA 04       Is it the number 4
0668 27   04                BEQ OUT1      If so end
066A 8D   F0                BSR OUTEEE    Output the character
066C 20   F6                BRA OUT
066E 39              OUT1   RTS
                     * OUTPUT A BACKSPACE
066F 34   02         BS     PSHS A
0671 86   08                LDA #$08      Backspace character
0673 8D   E7         BS1    BSR OUTEEE    Output it
0675 35   82                PULS A,PC
                     * OUTPUT A CURSOR(BLACK)
0677 34   02         CURS   PSHS A
0679 86   F0                LDA #$F0      Black cursor
067B 20   F6                BRA BS1
                     * OUTPUT A CURSOR(RED)
067D 34   02         CURS1  PSHS A
067F 86   BF                LDA #$BF      Red cursor
0681 20   F0                BRA BS1
                     * OUTPUT A CURSOR(YELLOW)
0683 34   02         CURS2  PSHS A
0685 86   9F                LDA #$9F      Yellow cursor
0687 20   EA                BRA BS1
                     *
                     * SELECT ASCII OR BAUDOT
                     *
0689 30   8D 0088    SPEED  LEAX MENU4,PCR Ask for the mode
068D 8D   D5                BSR OUT       Output menu
068F 8D   BB                BSR INEEE     Get response
0691 81   41                CMPA #'A      Is it ASCII 110 Baud ?
0693 27   09                BEQ SPEED1
0695 6F   59                CLR MASK,U    Set baudot mask
0697 81   42                CMPA #'B      Is it baudot
0699 27   08                BEQ SPEED2
069B 16   FF75              LBRA MONIT
                     * Set up for ASCII
069E 6C   59         SPEED1 INC MASK,U    Set mask to ASCII
06A0 16   FF70              LBRA MONIT
                     * SELECT BAUDOT SPEEDS
```

tages, like hardware time and date clocks and the ability to print text while receiving RTTY.

The second hardware choice is to do all the serial-to-parallel decoding in software and allow the computer to be attached to any available TU. This technique is the best for the consumer. The costs are much less in this choice, but the burden of the system's performance is placed on the back of the programmer. This type of programming is very difficult and separates casual programmers from professionals. To do this type of programming requires the patience of a saint and the determination of a bulldog.

I will describe here a program which uses the simple hardware concept and demonstrates some of the techniques which can be used in more elegant software. Hopefully, this article will perform three functions:

1) Be a teaching tool to show how simply RTTY can be programmed.

2) Demonstrate some of the programming techniques which place the 6809 processor in a class by itself.

3) Allow a ham with a limited budget and a minimum computer to get on RTTY for the least cash outlay.

The System

To receive RTTY on today's crowded ham bands requires some sort of hardware interface with good input filtering. This type of interface to the computer is called the TU, or terminal unit. This interface is used to remove adjacent channel interference and general background noise. The only requirement for this interface is that its output and input are compatible with standard RS-232 levels. RS-232 has no meaning other than that the voltage levels are greater than plus or minus 8 volts. The program listing assumes that the TU has RS-232 compatibility and attaches to the CoCo through its RS-232 port. Later in this article, a sche-

```
06A3 30    8D 00BA  SPEED2 LEAX MENU5,PCR Ask for Baudot speed
06A7 8D    B8              BSR OUT
06A9 8D    A1              BSR INEEE
06AB 81    31              CMPA #'1       Is it 110 WPM
06AD 27    05              BEQ SPEED3
06AF 8D    08              BSR IN60       If not 100 WPM it must be 60 WPM
06B1 16    FF5F            LBRA MONIT
06B0 8D    21       SPEED3 BSR IN100      Set up 100 WPM
06B6 16    FF5A            LBRA MONIT
                    *
                    * INITALIZE SPEED CONSTANTS
                    *
                    * BAUDOT 60 WPM/ASCII 110
                    *
06B9 30    8D FF77  IN60   LEAX DEL2C,PCR 1'st character in table
06BD 31    8D 0587  IN60B  LEAY BRATRI,PCR Location to place constnts
06C1 C6    03              LDB #3         Three constants to move
06C3 34    04       IN60A  PSHS B
06C5 EC    81              LDD 0,X++
06C7 ED    A1              STD 0,Y++
06C9 35    04              PULS B
06CB 5A                    DECB           Do it again
06CC 26    F5              BNE IN60A
06CE EC    8D FF70         LDD BAUDR,PCR 110 Baud ASCII
06D2 ED    8D 0570         STD BAUDA,PCR
06D6 39                    RTS
                    * BAUDOT 100 WPM
06D7 30    8D FF5F  IN100  LEAX DEL5C,PCR 1'st character in 100 WPM table
06D9 20    E0              BRA IN60B
                    *
                    * MENUS FOR BASIC SELECTIONS
                    * COPYWRITE AND SPEED
                    *
06DD 0D             MENU   FCB $0D
06DE 52 54 54 59           FCC /RTTY PROGRAM/
06E2 20 50 52 4F
06E6 47 52 41 4D
06EA 0D                    FCB $0D
06EB 52 3D 52 45           FCC /R=RECEIVE,X=TRANSMIT/
06EF 43 45 49 56
06F3 45 2C 58 3D
06F7 54 52 41 4E
06FB 53 4D 49 54
06FF 0D                    FCB $0D
0700 43 4C 45 41           FCC /CLEAR=BASIC,S=SPEED/
0704 52 3D 42 41
0708 53 49 43 2C
070C 53 3D 53 50
0710 45 45 44
0713 0D 04                 FCB $0D,4
                    *
0715 0D             MENU4  FCB $0D
0716 41 3D 31 31           FCC /A=110 BAUD ASCII/
071A 30 20 42 41
071E 55 44 20 41
0722 53 43 49 49
0726 0D                    FCB $0D
0727 42 3D 42 41           FCC /B=BAUDOT/
072B 55 44 4F 54
072F 0D 04                 FCB $D,4
                    *
0731 0D             MENU5  FCB $0D
0732 31 3D 31 30           FCC /1=100 WPM,6=60 WPM/
0736 30 20 57 50
073A 4D 2C 36 3D
073E 36 30 20 57
0742 50 4D
0744 0D 04                 FCB $0D,4
                    *
0746 0D             COPYR  FCB $0D
0747 28 43 29 20           FCC /(C) CLAYTON W ABRAMS,1981/
074B 43 4C 41 59
074F 54 4F 4E 20
0753 57 20 41 42
0757 52 41 4D 53
075B 2C 31 39 38
075F 31
0760 0D 04                 FCB $0D,4
                    ********************************
                    *
                    * ASCII TO BAUDOT LOOKUP TABLE
                    * Letters: ABCDEFGHIJKLMNOPQRSTUVWXYZ
                    *
0762 9C B0 C4 84    LOU1   FCB $9C,$B0,$C4,$84,$BC,$A4
0766 BC A4
0768 D0 E8 CC 94           FCB $D0,$E8,$CC,$94,$84,$D8
076C 84 D8
076E E0 E4 F0 C8           FCB $E0,$E4,$F0,$C8,$88,$D4
0772 88 D4
0774 AC F8 8C C0           FCB $AC,$F8,$8C,$C0,$98,$A0
0778 98 A0
077A A8 B8 00 00           FCB $A8,$B8,0,0,0,0,0
077E 00 00 00
                    * Figures: !"#$%&'()*+,-./0123456789:;
0781 EC A4 B8 E8           FCB $EC,$A4,$B8,$E8,$B4,$D0
0785 B4 D0
0787 D0 94 84 D8           FCB $D0,$94,$84,$D8,0,0
078B 00 00
078D E4 00 E0 A0           FCB $E4,0,$E0,$A0,$C8,$88
0791 C8 88
0793 98 BC D4 F8           FCB $98,$BC,$D4,$F8,$A8,$BC
0797 A8 BC
0799 CC F0 C4 C0           FCB $CC,$F0,$C4,$C0
                    *
                    * BAUDOT TO ASCII
                    * LOOK UP TABLE
                    * Table order: KQU JWAXFYSBDZEVCPIGRL(lf.)MNH
                    * (sp)O(cr.)T  (!7 '2-/!6(bell)?$"3;:0&4)(lf.).,8
                    *  9(cr.)5
                    *
079D 4B 51 55 00    UD1    FCB $4B,$51,$55,0,$4A,$57
07A1 4A 57
07A3 41 58 46 59           FCB $41,$58,$46,$59,$53,$42
07A7 53 42
07A9 44 5A 45 56           FCB $44,$5A,$45,$56,$43,$50
07AD 43 50
07AF 49 47 52 4C           FCB $49,$47,$52,$4C,$0A,$4D
07B3 0A 4D
07B5 4E 48 20 4F           FCB $4E,$48,$20,$4F,$0D,$54
07B9 0D 54
07BB 00 00 28 31           FCB 0,0,$28,$31,$37,0
07BF 37 00
07C1 2C 32 2D 2F           FCB $2C,$32,$2D,$2F,$21,$36
07C5 21 36
07C7 07 3F 24 22           FCB $07,$3F,$24,$22,$33,$3B
07CB 33 3B
07CD 3A 30 38 26           FCB $3A,$30,$38,$26,$34,$29
07D1 34 29
07D3 0A 2E 2C 38           FCB $0A,$2E,$2C,$38,$20,$39
07D7 20 39
07D9 0D 35 00              FCB $0D,$35,0
                    *
                    *
                    * FIND BAUDOT CODE
                    * ASCH=ASCII code to be converted
                    * BAUD=BAUDOT code which has been converted
                    *
07DC 34    16       FINDB  PSHS X,A,B
07DE A6    5E              LDA ASCH,U     get the code
07E0 81    0D              CMPA #$0D      is it carriage return?
07E2 27    20              BEQ CR
07E4 81    0A              CMPA #$0A      is it line feed ?
07E6 27    20              BEQ LF
07E8 81    3F              CMPA #$3F      is it a ?
07EA 27    20              BEQ QUE
07EC 81    20              CMPA #$20      is it a space ?
07EE 27    20              BEQ SP
07F0 84    40              ANDA #$40      test for letter
07F2 26    20              BNE LET
07F4 A6    5E              LDA ASCH,U
07F6 84    3F              ANDA #$3F      must be a number mask upper bits
07F8 C6    01              LDB #1         shift bit
07FA E7    5B              STB LOU,U      save it
07FC 30    8D FF61         LEAX LOU1-1,PCR Base address of table minus one
0800 A6    86              LDA A,X        find code indexed into table
0802 20    1C              BRA RETA1      return too calling routine
0804 86    F4       CR     LDA #$F4       carriage return baudot code
0806 20    1C              BRA RETA
0808 86    DC       LF     LDA #$DC       line feed baudot code
080A 20    18              BRA RETA
080C 86    B0       QUE    LDA #$B0       question mark baudot code
080E 20    14              BRA RETA
0810 86    EC       SP     LDA #$EC       space baudot code
0812 20    0A              BRA RETA2
0814 A6    5E       LET    LDA ASCH,U     get back ascii character
0816 84    3F              ANDA #$3F      mask out upper bits
0818 30    8D FF45         LEAX LOU1-1,PCR table base address
081C A6    86              LDA A,X        find code offset into table
081E 6F    5B       RETA2  CLR LOU,U      clear current shift code
0820 A7    5D       RETA1  STA BAUD,U     store baudot code
0822 35    96              PULS X,A,B,PC return to calling routine
0824 C6    01       RETA   LDB #1         shift code
0826 E7    5B              STB LOU,U      save in current shift
0828 20    F6              BRA RETA1
                    *
                    * FIND ASCII CODE
                    * BAUDOT code is placed in CODE at start
                    * ASCII code is placed into BAUD in completion at end
                    *
082A A6    5F       FINDA  LDA CODE,U     get baudot code
082C 44                    LSRA           align byte
082D 84    1F              ANDA #$1F      mask out garbarge
082F 27    15              BEQ LOW        if zero get out
0831 81    04              CMPA #$04      is it a shift ?
0833 27    17              BEQ UP
0835 E6    5A              LDB UD,U
0837 26    09              BNE FINDA2
0839 30    8D FF5F  FINDA1 LEAX UD1-1,PCR base address of table
083D A6    86              LDA A,X        find offset into table
083F A7    5D              STA BAUD,U     store results
```

matic of a simple TU will be discussed which can be home-brewed at a low cost.

The only other necessary feature for the system is that the CoCo must have 4K or more RAM. Extended Tandy Basic is not required since the program is written in machine language. Attached to the computer must be a TV set for display and a tape recorder to save or load the program.

The Software

My seventh attempt at developing a RTTY program is shown in the program listing. This program can be keyed in directly from the listing in object form or keyed in in source form and assembled to create an object code. The object code is the actual machine-language programming which causes the computer to do its tricks. To key in a program, the left-hand column is the address in memory where the instruction is stored. The following bytes are the actual bytes in memory. For example, the RTTY program's first instruction is 1F and is loaded into memory at address 0600. To key in a program like this requires the use of a second program called a monitor. You can obtain a monitor program from commercial sources or write your own in Basic. One of the most important features of the RTTY program is that it can be saved anywhere in the CoCo's memory without changes. This means that you can key the program into address 1000 or 2000 hex and it will run without changes. The 6809 microprocessor is the only computer which allows you to do this. All other processors require that the program must be reassembled at another address to make it run. This feature is called Position Independent Code.

To understand how to write a program to take advantage of this feature is a little difficult. I'll try to point out how it is done as I proceed through the program description.

```
0841 39              FINDA4 RTS              return to calling routine
0842 8A    20        FINDA2 ORA #$20
0844 20    F3               BRA FINDA1
0846 6F    5A        LOW    CLR UD,U         lower case
0848 6F    5D               CLR BAUD,U
084A 20    F5               BRA FINDA4
084C 86    FF        UP     LDA #$FF         upper case
084E A7    5A               STA UD,U
0850 6F    5D               CLR BAUD,U
0852 20    ED               BRA FINDA4
0854 6F    5D        FINDA3 CLR BAUD,U
0856 20    E9               BRA FINDA4
                     *
                     * TRANSMIT SUBROUTINE
                     * This routine takes a character in ASCH
                     * and transmitts it via the RS-232 port on the
                     * computer
                     *
0858 6D    59        TRTTY  TST MASK,U       is it ASCII or BAUDOT
085A 1026  0262             LBNE ASCIO       if it is not zero it's ASCII
085E 17    FF7B             LBSR FINDB       find the baudot code
0861 8D    32        TRTTY1 BSR UL           look for upper lower case shift
0863 5F                     CLRB             clear bit counter
0864 48              TR2    ASLA             shift xmit bit into carry
0865 25    04               BCS TR3          if carry is set xmit a space
0867 8D    20               BSR MARK         if carry off xmit a mark
0869 20    02               BRA TR4
086B 8D    10        TR3    BSR SPACE        xmit a space
086D 5C              TR4    INCB             increment bit counter
086E C1    06               CMPB #6          is it six bits
0870 27    02               BEQ TR5          if so send stop bit
0872 20    F0               BRA TR2          do it all over again
0874 86    02        TR5    LDA #02          place RS-232 low
0876 B7    FF20             STA PIA          execute
0879 17    00C1             LBSR DEL3        delay stop bit time
087C 39                     RTS
                     *
                     * XMIT A SPACE
                     *
087D 34    06        SPACE  PSHS A,B
087F 86    00               LDA #0           make RS-232 high
0881 B7    FF20             STA PIA          execure
0884 17    00A9             LBSR DEL2        delay a bit time
0887 35    86               PULS A,B,PC
                     *
                     * XMIT A MARK
                     *
0889 34    06        MARK   PSHS A,B
088B 86    02               LDA #2           make RS-232 low
088D B7    FF20             STA PIA          execute
0890 17    009D             LBSR DEL2        delay a bit time
0893 35    86               PULS A,B,PC
                     *
                     * UPPER LOWER CASE SHIFT
                     *
0895 E6    5B        UL     LDB LOU,U        get current shift status
0897 E8    5C               EORB LAST,U      compare it with the last status
0899 26    02               BNE UL1          they are different
089B 20    0F               BRA UL4
089D 86    40        UL1    LDA #$40         test for letter
089F A5    5E               BITA ASCH,U
08A1 26    0C               BNE UL2          if not branch
08A3 86    90               LDAA #$90        letter shift
08A5 5F                     CLRB
08A6 8D    BC               BSR TR2
08A8 86    01               LDA #1
08AA A7    5C        UL3    STA LAST,U       update new last
08AC A6    5D        UL4    LDA BAUD,U
08AE 39                     RTS
08AF 86    B0        UL2    LDA #$B0         figure shift
08B1 5F                     CLRB
08B2 8D    B0               BSR TR2
08B4 4F                     CLRA
08B5 20    F3               BRA UL3
                     *
                     * RECEIVE RTTY
                     * MAIN LINE
                     *
08B7 30    8D 000E   RECV   LEAX MENU1,PCR receive menu
08BB 17    FDA6             LBSR OUT         output menu
08BE 6D    59               TST MASK,U       test for ASCII
>08C0 1026 005C             LBNE RECT4       receive ASCII
08C4 8D    23               BSR RECT1        receive and display characters
08C6 16    0086             LBRA FIFO        now transmit
                     *
08C9 0D              MENU1  FCB #$0D
08CA 52 45 43 45            FCC /RECEIVE RTTY/
08CE 49 56 45 20
08D2 52 54 54 59
08D6 0D                     FCB #$0D
08D7 41 4E 59 20            FCC /ANY KEY=TRANSMIT/
08DB 4B 45 59 3D
08DF 54 52 41 4E
08E3 53 4D 49 54
08E7 0D 04                  FCB #$0D,4
                     *
                     * RECEIVE ROUTINE
                     *
08E9 17    FD58      RECT1  LBSR IN          look for a keyboard input
08EC 26    1E               BNE RECT3        if any end receive
08EE B6    FF22             LDA PIA2         get RS-232 input
08F1 84    01               ANDA #1          mask out garbarge
08F3 26    F4               BNE RECT1        if nothing look for keyboard
                     * some thing has been received
08F5 6F    5F               CLR CODE,U       clear conversion byte
08F7 8D    4D               BSR DEL4         delay 1/2 data bit time
08F9 C6    06               LDB #6           six bits
08FB 8D    10        RECT2  BSR RECTB        input a byte
08FD 5D                     TSTB
08FE 26    FB               BNE RECT2        if zero do it again
0900 17    FF27             LBSR FINDA       convert byte to ASCII
0903 A6    5D               LDA BAUD,U       results in A
0905 17    FD54             LBSR OUTEEE      output it
0908 8D    33               BSR DEL3         stop bit delay
090A 20    DD               BRA RECT1
090C 39              RECT3  RTS
                     *
                     * INPUT A BAUDOT BYTE
                     *
090D B6    FF22      RECTB  LDA PIA2         get RS232 input
0910 84    01               ANDA #1          mask out other bits
0912 27    08               BEQ RECTB1       if on shift in a bit
0914 68    5F        RECTB2 ASL CODE,U       shift the whole mess left
0916 5A                     DECB             decrement bit counter
0917 27    02               BEQ RECTB3       last bit
0919 8D    15               BSR DEL2         delay a data bit time
091B 39              RECTB3 RTS
091C 6C    5F        RECTB1 INC CODE,U       add a bit to byte
091E 20    F4               BRA RECTB2
                     *
                     * RECEIVE ASCII
                     *
0920 17    FD21      RECT4  LBSR IN          look for keyboard input
0923 26    08               BNE RECT5        if a key has been struck got out
0925 17    01D1             LBSR ASCII       got ASCII charactre
0928 17    FD31             LBSR OUTEEE      display it
092B 20    F3               BRA RECT4        do it all over agin
>092D 16   001F      RECT5  LBRA FIFO        now go to transmit mode
                     *
                     * DELAY ROUTINES
                     * DEL4=1/2 DATA BIT
                     * DEL3=STOP BIT
                     * DEL2=DATA BIT
                     *
0930 34    04        DEL2   PSHS B
0932 10AE  8D 0311          LDY BRATR1,PCR
0937 31    3F        DEL    LEAY -1,Y
0939 26    FC               BNE DEL
093B 35    84               PULS B,PC
                     *
093D 34    04        DEL3   PSHS B
093F 10AE  8D 0306          LDY BRATR2,PCR
0944 20    F1               BRA DEL
                     *
0946 34    04        DEL4   PSHS B
0948 10AE  8D 02FF          LDY BRATD,PCR
094D 20    EB               BRA DEL
                     *
                     *
                     * TRANSMITT BUFFER
                     *
094F 30    8D 00BC   FIFO   LEAX MENU2,PCR xmit menu
0953 17    FD0E             LBSR OUT         output it
0956 17    FCEB      FIFO1  LBSR IN          look for keyboard input
0959 27    FB               BEQ FIFO1        if none do it again
095B 81    0D               CMPA #$0D        is it a carriage return
095D 27    1E               BEQ FIFO5        if so go to
095F 81    0C               CMPA #$0C        is it CLEAR key ?
0961 1027  FCAE             LBEQ MONIT       go to main line monitor
0965 81    3C               CMPA #$3C        if < key send CW ID
0967 1027  01C6             LBEQ MAINC
096B 81    2B               CMPA #$2B        if + load station buffers
096D 1027  00F7             LBEQ STATB
0971 81    3E               CMPA #$3E        if >  xmit station buffer
0973 27    42               BEQ FIF2
0975 81    3D               CMPA #$3D        if = send RYRY
0977 27    0F               BEQ FIFO7
0979 8D    2B        FIFO6  BSR FXMT         xmit a character on RTTY
097B 20    D9               BRA FIFO1
                     * Carriage Return has been sent
097D 86    0A        FIFO5  LDA #$0A         line feed
097F A7    5E               STA ASCH,U
0981 17    FED4             LBSR TRTTY       xmit it
0984 86    0D               LDA #$0D         carriage return
0986 20    F1               BRA FIFO6
                     * Xmit 15 RY's
0988 86    0A        FIFO7  LDA #$0A         line feed
098A A7    5E               STA ASCH,U
098C 17    FEC9             LBSR TRTTY
098F 86    0D               LDA #$0D         carriage return
```

Program Description

The program was written to perform three functions: receive RTTY, transmit RTTY, and issue a CW ID at the end of a transmission. Each of the functions can be broken down further into smaller parts which change RTTY speeds, allow for program option selections, and do general housekeeping. Before jumping into the description of these various functions, let's discuss how the program achieves position independence. I'll next go into each of the functional program parts.

Position Independence. The RTTY program uses two means to achieve program position independence. The first technique is use of the user stack, or U register. The user stack is similar to the system stack, but it can be used in the 6809 for two purposes. One use is as a third index register. The U stack can also be used as a pointer in memory for the storage of program variables. This is how U is used in this program. When the program is first executed, the system stack is placed slightly below the user stack. This system stack position is determined by Tandy Basic and varies as a function of the size of memory. Typically, it is in the upper 256 bytes of available memory. If program variables are referred to by this pointer, their position in real memory can be variable. Some of the variables in the RTTY program use this technique.

The second technique is the use of the LEA or Load Effective Address instruction. This instruction allows for an index register to be loaded with the address of a program variable relative to the program counter (PCR) wherever it may be in memory. For example, the LEAX MENU,PCR will load the address of MENU into the X register. The PCR portion of the instruction means that the load is relative to the location in memory where the program is currently exe-

```
0991 8D    13              BSR FXMT
0993 C6    0F              LDB #15        15 characters
0995 34    04      FIFO8   PSHS B
0997 86    52              LDA #'R        ascii R
0999 8D    0B              BSR FXMT       xmit it
099B 86    59              LDA #'Y        ascii Y
099D 8D    07              BSR FXMT       xmit it
099F 35    04              PULS B
09A1 5A                    DECB
09A2 26    F1              BNE FIFO8
09A4 20    80              BRA FIFO1      go back to polling routine
                   * GENERAL TTY XMIT
09A6 A7    5E      FXMT    STA ASCH,U
09A8 17    FEAD            LBSR TRTTY     send it on rtty
09AB 17    FCC1            LBSR BS        output a backspece
09AE A6    5E              LDA ASCH,U
09B0 17    FCA9            LBSR OUTEEE    ascii character last xmitted
09B3 17    FCC7            LBSR CURS1     output a cursor
09B6 39                    RTS
                   *
                   * STATION BUFFER XMIT
                   *
09B7 30    8D 0098 FIF2    LEAX MENU6,PCR station buffer menu
09BB 17    FCA6            LBSR OUT       send it out
09BE 17    FC8B            LBSR INEEE     get input character
09C1 81    33              CMPA #'3       is it higher then 3
09C3 22    F2              BHI FIF2       if so not valid
09C5 81    30              CMPA #'0       is it zero ?
09C7 27    28              BEQ FIF6       get buffer 0 addres
09C9 84    0F              ANDA #$0F      mask out high of buffer number
09CB 30    8D 0291         LEAX BUF0,PCR buffer base address
09CF 30    89 00FF FIF5    LEAX 255,X     find address of buffer
09D3 4A                    DECA           decrement number
09D4 26    F9              BNE FIF5
                   * XMIT BUFFER SELECTED
09D6 A6    80      FIF3    LDA 0,X+       get bufer byte
09D8 34    02              PSHS A         save it
09DA A7    5E              STA ASCH,U
09DC 17    FC7D            LBSR OUTEEE    display it
09DF 8D    19              BSR TRTTC
09E1 17    FC60            LBSR IN        look for input character
09E4 26    09              BNE FIF4
09E6 35    02              PULS A
09E8 81    1B              CMPA #$1B      is it the buffer end ?
09EA 26    EA              BNE FIF3
09EC 16    FF67            LBRA FIFO1
09EF 35    02      FIF4    PULS A
09F1 16    FF62            LBRA FIFO1
                   * SELECT BUFFER 0
09F4 30    8D 0268 FIF6    LEAX BUF0,PCR address of buffer 0
09F8 20    DC              BRA FIF3
                   *
                   * IF ONLY A CR IS INPUTTED A LF WILL BE ISSUED
                   *
09FA A6    5E      TRTTC   LDA ASCH,U
09FC 81    0D              CMPA #$0D      is it a CR
09FE 27    04              BEQ TRTTC1
0A00 17    FE55            LBSR TRTTY
0A03 39                    RTS
0A04 17    FE51    TRTTC1  LBSR TRTTY
0A07 86    0A              LDA B$A        LF
0A09 A7    5E              STA ASCH,U
0A0B 17    FE4A            LBSR TRTTY
0A0E 39                    RTS
                   *
                   * MENU FOR TRANSMITT
                   *
0A0F 0D            MENU2   FCB $0D
0A10 54 52 41 4E           FCC /TRANSMIT RTTY,CLEAR=MONIT/
0A14 53 4D 49 54
0A18 20 52 54 54
0A1C 59 2C 43 4C
0A20 45 41 52 30
0A24 4D 4F 4E 49
0A28 54
0A29 0D                    FCB $0D
0A2A 3C                    FCB $3C
0A2B 3D 43 57 20           FCC /=CW ID,/
0A2F 49 44 2C
0A32 2B                    FCB $2B
0A33 3D 4C 4F 41           FCC /=LOAD S BUF/
0A37 44 20 53 20
0A3B 42 55 46
0A3E 0D                    FCB $0D
0A3F 3E                    FCB $3E
0A40 3D 58 4D 49           FCC /=XMIT S BUF,/
0A44 54 20 53 20
0A48 42 55 46 2C
0A4C 3D                    FCB $3D
0A4D 3D 52 59              FCC /=RY/
0A50 0D                    FCB $0D
0A51 20 04                 FCB $20,4
                   *
0A53 000D          MENU6   FDB $0D
0A55 53 45 4C 20           FCC /SEL BUFFER 0-2 ?/
0A59 42 55 46 46
0A5D 45 52 20 30
0A61 2D 32 20 3F
0A65 0D 0A 04              FCB $D,$A,4
                   *
                   * STATION BUFFER LOAD
                   *
0A68 30    8C E8   STATB   LEAX MENU6,PCR menu for station buffer load
0A6B 17    FBF6            LBSR OUT       output menu
0A6E 17    FBDB            LBSR INEEE     get keyboard input
0A71 81    32              CMPA #'2       is it buffer 2 or higher
0A73 22    F3              BHI STATB
0A75 81    30              CMPA #'0       is it buffer 0
0A77 27    37              BEQ STATB4
0A79 84    0F              ANDA #$0F      mask out high bits
0A7B 30    8D 01E1         LEAX BUF0,PCR buffer 0 address
0A7F 1F    89              TFR A,B
0A81 30    89 00FF STATB3  LEAX 255,X     find buffer address
0A85 4A                    DECA
0A86 26    F9              BNE STATB3
                   * NOW LOAD THE BUFFER
0A88 C1    02              CMPB #2        is it the short buffer ?
0A8A 27    2A              BEQ STATB6     load this one
0A8C C6    FE      STATB5  LDB #254       buffer size
0A8E 17    FBBB    STATB1  LBSR INEEE     get character to be inputted
0A91 34    16              PSHS A,B,X
0A93 A7    5E              STA ASCH,U
0A95 17    FF62            LBSR TRTTC     check for CR or LF
0A98 35    16              PULS A,B,X
0A9A A7    80              STA X+         put it in RAM
0A9C 81    0C              CMPA #$0C      is it a CLEAR key
0A9E 27    09              BEQ STATB2     if so terminate entry
0AA0 5A                    DECB           decrement byte counter
0AA1 27    06              BEQ STATB2     if last byte end
0AA3 81    08              CMPA #$08      is it a backspace ?
0AA5 27    13              BEQ STATB7     if so whipe out character
0AA7 20    E5              BRA STATB1
0AA9 86    1B      STATB2  LDA #$1B       place last byte terminator
0AAB A7    1F              STA -1,X       decrement location counter
0AAD 16    FE9F            LBRA FIFO      go back to main line
                   * SET UP FOR BUFFER 0
0AB0 30    8D 01AC STATB4  LEAX BUF0,PCR address of buffer 0
0AB4 20    D6              BRA STATB5
                   * MAKE BUFFER 2 SHORT
0AB6 C6    7D      STATB6  LDB #125       short buffer
0AB8 20    D4              BRA STATB1
                   * REMOVE LAST CHAR FROM BUFFER
0ABA 30    1E      STATB7  LEAX -2,X
0ABC 5C                    INCB
0ABD 5C                    INCB
0ABE 20    CE              BRA STATB1
                   *
                   * OUTPUT AN ASCII BYTE ON RTTY
                   *
0AC0 34    17      ASC10   PSHS X,B,A,CC
0AC2 A6    5E              LDA ASCH,U     get character
0AC4 5F                    CLRB           clear bit counter
0AC5 F7    FF20            STB PIA        stop bit on PIA
0AC8 C6    08              LDS #8         8 bit ASCII
0ACA 34    06              PSHS B,A
0ACC EC    8D 017E ASCI01  LDD BAUDA,PCR bit delay
0AD0 83    0001    ASCI02  SUBD #1        decrement it
0AD3 26    FB              BNE ASCI02     do it again
0AD5 64    E4              LSR 0,S        shift ascii byte on the stack
0AD7 59                    ROLB           put shifted bit in
0AD8 59                    ROLB           RS-232 output bit location
0AD9 F7    FF20            STB PIA        ship it to interface
0ADC 6A    61              DEC 1,S        decrement bit counter
0ADE 26    EC              BNE ASCI01     is it the last bit ?
0AE0 32    62              LEAS 2,S       if so un screw stack
0AE2 8D    0B              BSR ASDEL      delay bit time
0AE4 C6    02              LDB #2         stop bit
0AE6 F7    FF20            STB PIA        ship it to pia
0AE9 8D    04              BSR ASDEL      delay bit time
0AEB 8D    02              BSR ASDEL      twice for stop bit
0AED 35    97              PULS PC,X,B,A,CC
                   *
                   * ASCII DELAY
                   *
0AEF EC    8D 015B ASDEL   LDD BAUDA,PCR bit delay
0AF3 83    0001    ASDEL1  SUBD #1
0AF6 26    FB              BNE ASDEL1
0AF8 39                    RTS
                   *
                   * INPUT AN ASCII BYTE
                   *
0AF9 34    15      ASCII   PSHS X,B,CC
0AFB B6    FF22    ASCII1  LDA PIA2       Get input from RS-232
0AFE 47                    ASRA           Look to see if interface is on
0AFF 24    FA              BCC ASCII1     If low keep looking
0B01 B6    FF22    ASCII2  LDA PIA2       Look again
0B04 47                    ASRA           Shift received bit into carry
0B05 25    FA              BCS ASCII2
0B07 EC    8D 0143         LDD BAUDA,PCR Bit time delay
0B0B 44                    LSRA
```

cuting. This programming technique allows the program to be moved around in memory.

General Housekeeping. When the program is first executed, the start routine sets up RAM delay constants, places a message on the screen, and asks for a CW ID to be transmitted. The CW ID can consist of up to 15 characters. As each character is entered into the keyboard, it is translated to CW and placed in a buffer at the end of the program called BUF. Next, the primary menu is flashed on the screen of the CoCo. This menu allows for the selection of receive, transmission, or speed selections.

All communications to and from the program are through INEEE, OUT, and OUTEEE routines. These routines use the standard Radio Shack I/O vectors in the Basic ROM. It would be possible to change these vectors to any 6809 system and the program will function.

RTTY Receive. RTTY can be received by the program as either 8-bit ASCII without parity or 5-bit Baudot. Either mode can be selected by the SPEED routine. When the program is first initialized, a speed of 60-wpm Baudot is selected. This is accomplished by the IN60 routine which adds the appropriate constants to BRATR1,2 and BRATD.

To receive RTTY, the mainline routine RECV is selected. When selected, the routine first checks to see if ASCII or Baudot is chosen. This is accomplished by checking MASK. If this value is zero, the mode is Baudot; if anything else, the mode is ASCII.

The mainline Baudot receive routine is RECT1, and ASCII is RECT4. These routines continuously receive RTTY and display the results on the screen until a key is struck on the keyboard. The ASCII routine has a little abnormality in that once it is selected, either a signal or

```
0B0C 59                 ROLB           Divide bit time by 2
0B0D 83    0001         SUBD #1
0B10 83    0001  ASCII3 SUBD #1
0B13 2E    FB           BGT ASCII3
0B15 C6    08           LDB #8         Set for 8 bit ASCII
0B17 34    06           PSHS B,A       Put bit count delay on stack
0B19 EC    8D 0131 ASCII5 LDD BAUDA,PCR Get delay time again
0B1D 83    0001  ASCII6 SUBD #1        Count it down
0B20 26    FB           BNE ASCII6
0B22 12                 NOP            Equalize times
0B23 F6    FF22         LDB PIA2       Get input again
0B26 54                 LSRB           Is the input off or on
0B27 66    E4           ROR 0,S        Shift the carry on to the stack
0B29 6A    61           DEC 1,S        Decrement the bit counter
0B2B 26    EC           BNE ASCII5     If not 0 do it all over again
0B2D 35    06           PULS B,A       Restore the stack
0B2F 35    95           PULS PC,X,B,CC A reg has received byte
                 *
                 * ROUTINE TO XMIT
                 * CW ID
                 *
0B31 30    8D 011B MAINC LEAX BUF,PCR  CW ID menu
0B35 A6    80    MAINC1 LDA 0,X+       Get a byte from the buffer
0B37 27    1E           BEQ MAINC2     If zero issue a CW space
0B39 81    FF           CMPA #0FF      If last return to main line
0B3B 1027  FAD4         LBEQ MONIT
0B3F 8D    05           BSR CW         Send the CW character
0B41 17    FB3F         LBSR CURS2     Place the new cursor on the screen
0B44 20    EF           BRA MAINC1
                 *
                 * XMIT CW
                 *
0B46 1F    89    CW     TFR A,B        Save a copy of char in B
0B48 C4    07           ANDB #007      Set B to # of bit to xmit
0B4A 48          CW1    ASLA           Shift xmit bit to carry
0B4B 25    2A           BCS DASH       If on its a dash
0B4D 8D    3C           BSR DOT
0B4F 5A          CW2    DECB           Decrement bits to xmit
0B50 27    02           BEQ END1       If last end
0B52 20    F6           BRA CW1        Keep xmitting
0B54 8D    05    END1   BSR DELA1
0B56 39                 RTS
                 *
0B57 8D    17    MAINC2 BSR SPACE1     Xmit a space
0B59 20    DA           BRA MAINC1
                 *
                 * DASH DELAY
0B5B 86    03    DELA1  LDA #3         Dash 3X that of a dot
0B5D 8D    07    CDEL1  BSR CDL1       Dot delay
0B5F 4A                 DECA
0B60 26    FB           BNE CDEL1
0B62 39                 RTS
                 * DOT DELAY
0B63 8D    01    DELA2  BSR CDL1
0B65 39                 RTS
                 * DELAY LOOP FOR CW
0B66 10AE  8D FAD5 CDL1 LDY CWDEL,PCR CW delay constant
0B6B 31    3F    CDL2   LEAY -1,Y
0B6D 26    FC           BNE CDL2
0B6F 39                 RTS
                 * SPACE DELAY
0B70 8D    E9    SPACE1 BSR DELA1      Delay 7 times as long as dot
0B72 8D    E7           BSR DELA1
0B74 8D    ED           BSR DELA2
0B76 39                 RTS
                 * DASH TRANSMISSION
0B77 34    06    DASH   PSHS A,B
0B79 86    00           LDA #0         Turn RS-232 on
0B7B B7    FF20         STA PIA
0B7E 8D    DB           BSR DELA1      Delay dash time
0B80 86    02           LDA #2         Turn RS-232 off
0B82 B7    FF20         STA PIA
0B85 8D    DC           BSR DELA2
0B87 35    06           PULS A,B
0B89 20    C4           BRA CW2
                 * DOT TRANSMISSION
0B8B 34    06    DOT    PSHS A,B
0B8D 86    00           LDA #0         Turn on
0B8F B7    FF20         STA PIA
0B92 8D    CF           BSR DELA2
0B94 86    02           LDA #2         Turn off
0B96 B7    FF20         STA PIA
0B99 8D    C8           BSR DELA2
0B9B 35    86           PULS A,B,PC
                 *
                 * LOAD CW BUFFER WITH
                 * STATION ID
                 *
0B9D 30    8D 0076 CWL  LEAX MENU3,PCR Load buffer menu
0BA1 17    FAC0         LBSR OUT       Send it out
0BA4 30    8D 00A8      LEAX BUF,PCR   Get buffer base address
0BA8 C6    0F           LDB #15        Max buffer size
0BAA 34    04           PSHS B
0BAC 17    FA9D  CWL1   LBSR INEEE     Get keyboard input
0BAF 1F    89           TFR A,B        Save a copy in B
0BB1 81    0D           CMPA #$0D      Is it a return ?
0BB3 27    37           BEQ CWL5       If so terminate entry
0BB5 C4    30           ANDB #$30      Is it a number ?
0BB7 C1    30           CMPB #$30
0BB9 27    1C           BEQ CWL2       If so go to number
                 * LETTER DECODE
0BBB 81    20           CMPA #$20      Is it a space?
0BBD 27    26           BEQ CWL6       Enter a space
0BBF 81    2F           CMPA #$2F      Is it a slash?
0BC1 27    25           BEQ CWL3
0BC3 31    8D 002C      LEAY TABCH,PCR Base address of conversion table
0BC7 84    1F           ANDA #$1F      Mask out high bits
0BC9 4A                 DECA           Adjust for look up table
0BCA A6    A6           LDA A,Y        Find CW character
0BCC A7    80    CWL4   STA 0,X+       Save it in buffer
0BCE 35    04           PULS B
0BD0 5A                 DECB           Decrement the character count
0BD1 27    19           BEQ CWL5       If last terminate
0BD3 34    04           PSHS B
0BD5 20    D5           BRA CWL1       Get next character
                 * NUMBER DECODE
0BD7 84    0F    CWL2   ANDA #$0F      Mask out all but significient bits
0BD9 81    09           CMPA #9        Is it 9 or ASCII 39
0BDB 22    08           BHI CWL6       If greater it is not a number
0BDD 31    8D 002C      LEAY TABNUM,PCR Base address of number
0BE1 A6    A6           LDA A,Y        Find CW character
0BE3 20    E7           BRA CWL4
                 * SPACE
0BE5 4F          CWL6   CLRA           Place a space in the buffer
0BE6 20    E4           BRA CWL4
                 * SLASH
0BE8 86    95    CWL3   LDA #$95       Place a slash in the buffer
0BEA 20    E0           BRA CWL4
                 * END OF ENTRYS
0BEC 86    FF    CWL5   LDA #$FF       Last entry into table
0BEE A7    84           STA 0,X
0BF0 16    FA20         LBRA MONIT
                 * CW CHARACTER LOOKUP TABLE
                 *  characters: ABCDEFGHIJKLMNOPQRSTUVWXYZ
0BF3 42 84 A4 83 TABCH  FCB $42,$84,$A4,$83,$01,$24,$C3,$04
0BF7 01 24 C3 04
0BFB 02 74 A3 24        FCB $02,$74,$A3,$24,$C2,$82,$E3,$64
0BFF C2 82 E3 64
0C03 D4 43 03 81        FCB $D4,$43,$03,$81,$23,$14,$63,$94,$B4,$C4
0C07 23 14 63 94
0C0B B4 C4

                 * NUMBER TABLE
                 * characters: 0123456789
0C0D FD 7D 3D 1D TABNUM FCB $FD,$7D,$3D,$1D,$0D,$05,$85,$C5
0C11 0D 05 85 C5
0C15 E5 F5              FCB $E5,$F5
                 *
0C17 0D          MENU3  FCB $0A0D
0C18 43 57 20 49        FCC /CW ID LOAD, TYPE CALL/
0C1C 44 20 4C 4F
0C20 41 44 2C 20
0C24 54 59 50 45
0C28 20 43 41 4C
0C2C 4C
0C2D 0D                 FCB $0A0D
0C2E 31 35 20 43        FCC /15 CHAR MAX,ENTER TO END/
0C32 48 41 52 20
0C36 4D 41 58 2C
0C3A 45 4E 54 45
0C3E 52 20 54 4F
0C42 20 45 4E 44
0C46 0D 04              FCB $0D,4
                 ************************************************************
                 *   IF THIS PROGRAM IS TO BE PLACED ON EPROM
                 *   AN ORG SHOULD BE ASSEMBLED INTO THE PROGRAM
                 *   TO PLACE THESE CONSTANTS IN MICROPROCESSOR RAM
                 ************************************************************
                 *       ORG    X$XX      FOR EPROM OPERATION
                 *
                 * RAM CONSTANTS
                 *
0C48 0000        BRATR1 FDB 0          Baud rate constants
0C4A 0000        BRATR2 FDB 0
0C4C 0000        BRATD  FDB 0
0C4E 0000        BAUDA  FDB 0
                 *
                 * CW CHARACTER BUFFER
                 *
0C50             BUF    RMB 16         CW xmit buffer
                 *  STATION BUFFERS
0C60 18          BUF0   FCB $18        End of buffer
0C61                    RMB 254        Buffer size
0D5F 18          BUF1   FCB $18
0D60                    RMB 254
0E5E 18          BUF2   FCB $18
0E5F                    RMB 125
                 *
                        END START

0 ERROR(S) DETECTED
```

more input data will allow deselection of the routine while pressing a key.

The receive routines function by sampling the RS-232 input and looking to see if the port is high or low. If software delay is executed, you can sample, delay, then sample again for all data bits. If the bit is off, it is a data bit; if on, it is not a data bit. As each bit is received, a data byte is formed in which the results are stored. When complete, this data byte can be displayed on the screen or converted to ASCII from Baudot and then displayed.

The Baudot-to-ASCII conversion routine is located at FINDA. The routine expects the Baudot code to be stored in CODE. The routine takes the Baudot byte, masks out the high-order bits, and adds the results to an address located in the X register. The address in the X register is the base address of UD1, which is the look-up table. This table is organized to allow the byte to control program flow based upon the Baudot code received. After completion, this routine places the resultant ASCII code in a variable called BAUD. To add a few complications to this process, some tests must be made to determine if the Baudot is uppercase or lowercase. This is accomplished by checking the UD value in RAM. This value determines whether the Baudot character is a figure or a letter.

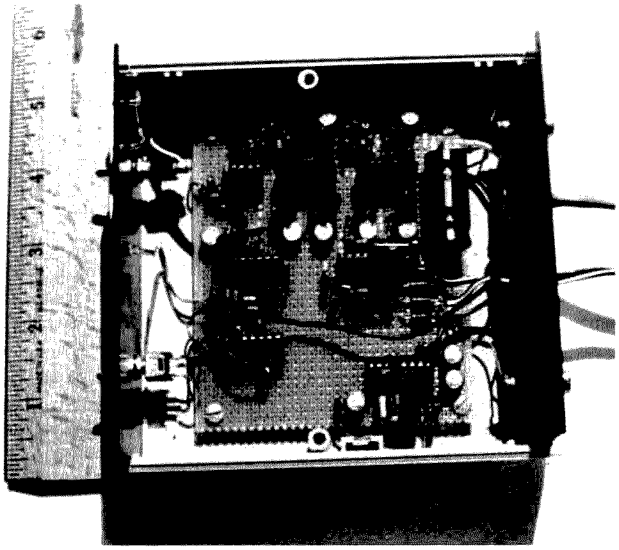
Transmit RTTY. If you understood receive RTTY, then transmit should be easy. This technique is the opposite of receive. The mainline routine for transmission is FIFO. This routine normally stays in a polling state looking for a keyboard input. If the input is a special character, any one of five different functions can be selected. If the keyboard entry is a standard character, then it will be transmitted. The five possible functions are:

- Clear key—Return to mainline routine.

Parts List

Qty.	Item	Qty.	Item	Qty.	Item
1	LM317MP regulator	2	6.2k	1	.047-uF ceramic
2	LM1458 op amp	10	10k	15	.1-uF ceramic
2	LM348 op amp	1	15k	1	1-uF 15-V electrolytic
1	4011B CMOS	1	18k	2	10-uF 15-V electrolytic
1	XR2206 function generator	1	22k	1	470-uF 25-V electrolytic
1	XR2211 AFSK demodulator	2	39k	12	.01-uF mylar™
2	2N3904 transistor (see options)	1	47k	1	.022-uF mylar
1	2N3906 transistor (see options)	5	51k	1	.047-uF mylar
3	LED light-emitting diode	1	62k		
7	1N4148 signal diode	7	100k	1	0-50-uA meter (see options)
4	1N4001 rectifier	1	180k		
		7	220k	1	SPDT switch (power)
6	120-Ohm resistor	2	470k	1	SPST switch, center-off (data)
1	220	1	1 meg		
3	330	6	100-Ohm trimpot	4	RCA style jack (input, output, optional scope)
1	620	3	5k trimpot		
4	1k	1	10k trimpot	1	12-V 250-mA wall transformer (Jameco AC250)
1	2.2k				
1	2.7k	1	.001-uF ceramic	1	Box, Radio Shack 270-218
1	5.1k	1	.005-uF ceramic		
		1	.01-uF ceramic	2	cable strain relief for RS-232 and power wires

Front view of interface.



Inside view of interface. Assembly was done using small-style capacitors and the resistors are mounted vertically. Wiring is point-to-point. Perfboard material is similar to Vector CIRCBORD 8002.

Rear view of interface. Jacks for optional scope monitor are not installed.

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Geff N8CE ✓4

✓See List of Advertisers on page 114

- Less-than key—Xmit a CW ID.
- Plus key—Load station buffers.
- Greater-than key—Xmit station buffers.
- Equal key—Xmit 15 RYs.

Let's continue on the RTTY transmit before discussing the other functions. When a character is to be transmitted, the FXMT routine is called. This routine places the ASCII character from the keyboard entry into ASCH and then calls the TRTTY routine. This routine first determines if the character is to be transmitted as ASCII or Baudot. If it is Baudot, the FINDB routine is next called. This routine functions in a similar manner as FINDA. Once the Baudot character is found, a test determines if an upper- or lowercase shift should be made. This is accomplished by the UD routine. A comparison is made with the last shift sent and, if necessary, another shift is made to the opposite sense. Upon completion of this test, the Baudot bits are shifted into the carry and transmitted as RTTY. Between each shift, a delay is made to adjust to the correct speed.

If ASCII characters are to be sent, the ASCIO routine is called and the ASCII keyboard entry is transmitted directly as RTTY.

Returning to the five option selections, they can be summarized as follows. The CW ID is transmitted by the CW routine. This routine functions similarly to transmit RTTY. The CW byte is loaded into the A accumulator and the data bit is shifted into the carry and sensed as a transmit mark or space. The lower three bits in the CW transmit byte indicate the number of CW bits to be transmitted. Various delays are made in the software to proportion the relationship between the dot and dash.

The plus command loads three station buffers with characters. These buffers can be preloaded with messages and saved on tape with the program. Two of the station buffers have 254 bytes; the third has 125 bytes. This restriction was due primarily to the RAM limitations of a 4K computer. The buffer sizes and numbers can be changed to suit individual taste. You are limited only by the size of RAM in your computer. One feature of the load command is that RTTY is transmitted as the buffer is loaded.

The greater-than key is used to transmit station buffers which have been loaded previously.

The equal-to command is used to transmit a series of RYs to test out the equipment at both ends of the path.

Program Assembly and Saving

As discussed earlier, the program can be loaded directly into memory and saved as a binary file on tape by a machine-language monitor or from Extended Tandy Basic. The best way is to key the source into the computer using a text editor, then use an assembler to generate object code. This technique will allow for ease of modification at some later date. A good idea might be to load up the station buffers with text which you normally send on RTTY and save the complete text and program on tape.

If you wish to load this program on Tandy disk, it must be placed above address $0F00 and then saved on disk. The program can also be placed on EPROM. This will require a change to the program. The text buffers and the program RAM constants must be changed to a location in RAM and the program assembled at the ROM address. This is another advantage of using an assembler to create the object code. The program uses 1609 bytes of code, which means that it can fit on one 2716 EPROM. The program can then be placed in a ROM cartridge if assembled at location $C000. The RAM buffers could be placed at $0600 and loaded or saved from tape.

RTTY Interface

Almost any RTTY TU interface will function with this program. Numerous articles have been published in many magazines on this subject. The only requirement is that the input and output from the computer be through the RS-232 interface on the rear of the computer. All that is required is a 4-pin DIN connector, a cable, and a TU. The CoCo is quite tolerant; it will accept standard TTL voltage levels or RS-232 levels. A number of commercial firms produce interfaces which are advertised in this magazine. For some of you devoted home-brewers, see Fig. 1, a schematic of a simple RTTY interface which was provided to me by Dynamic Specialities.

RTTY Interface Circuit

The interface is quite straightforward and uses easy-to-obtain components. The interface can be constructed on perfboard or a pluggable prototype card and placed into a cabinet. On RTTY receive, the circuit uses two bandpass filters of 2125 and 2295 Hz respectively to filter the RTTY tones. The filtered tones are connected to a simple AFSK detector which consists of an XR2211 and some drivers which are connected to the RS-232 input of the CoCo.

A switch is provided on the buffer circuitry after the XR2211 demodulator. This switch is optional. Once the correct polarity of the signal is determined, the circuit can be hard-wired, thus eliminating the polarity switch.

The tuning meter on the output of the filters is required due to the sharp response of the filters used. When adjusted correctly, a mark tone will swing to 20 microamps and a space to 40 microamps. During normal RTTY reception, the meter will read 40 microamps.

To transmit RTTY, the interface uses an AFSK modulator. This modulator consists of a single XR2206 IC. This IC takes an output from the RS-232 interface on the CoCo and converts the voltage to an audio tone. This tone is either 2125 Hz (mark) or 2295 Hz (space). To adjust the AFSK generator, ground pin 9 of the XR2206 and, by use of a counter, adjust the output to 2125 Hz. Next, place 10 volts on pin 9 and adjust for 2295 Hz.

Next, connect the modulator output to the TU input and adjust the mark and space filters.

To connect the TU to a ham transceiver is a simple process. Connect the transceiver's headphone output to the TU's input. Connect the AFSK output to the microphone of the transceiver. Switch the transceiver to lower sideband. Presto, you are now on RTTY.

Conclusion

The RTTY program described in this article was a lot of fun to develop. Its performance leaves a lot to be desired in features and usability. A very desirable function is split-screening of the buffers and receive data. This feature is very tricky to program and requires the use of interrupts. If you are interested in more advanced RTTY, SSTV, WEFAX, or CW amateur radio software, drop me a line for information on its availability.

I would like to thank Dynamic Specialties for providing the TU circuit. An advanced version of the TU is available in PC board form and includes a state-of-the-art automatic digital filter. Contact Dynamic Specialties, PO Box 20903, San Jose CA 95160, for more information.■

73 INTERNATIONAL

Each month, 73 brings you amateur radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Avery L. Jenkins WB8JLG.*

BANGLADESH

M. Saifud Dahar Shahid
President, BARL
GPO Box 3512
Dacca, Bangladesh

BARL ADMITTED TO IARU

The Bangladesh Amateur Radio League (BARL) applied for membership in the International Amateur Radio Union some time back. In a special issue of *IARU Calendar* (no. 108, December 8, 1981), the headquarters made a proposal concerning the admission of BARL. *Calendar* no. 111 (March 24, 1982) published the results of the election of BARL.

It is very encouraging to note that all of the 49 votes received by the IARU headquarters were in favor of BARL admission. Bangladesh is the 115th member society of this international body.

BARL JOINS IARU REGION 3 ASSOCIATION

After joining the IARU, BARL applied for membership in the IARU Region 3 Association. In the Fifth Conference of the Region 3 Association, held in Manila, Philippines, this application was considered. BARL has now been officially informed by the Region 3 Association that it has been accepted as the 18th member of the Associaton.

IARU VP VISITS DHAKA

Carl L. Smith WØBWJ and his XYL, Terry, visited Dhaka recently. In his report, the IARU vice president mentioned that "a continued organizational development of the BARL was noted in Bangladesh."

This is the second time an IARU officer visited Bangladesh. In 1981, BARL had a visit from David Rankin, then-secretary and present chairman of the Region 3 Association. During his visit, David met with the high officials of the T&T Board and the Wireless board, the Minister for PT&T, the State Minister for Science and Technology, and the Prime Minister. A TV interview of David was also recorded for broadcast on April 26, 1981.

These visits certainly contributed to the promotion of amateur radio activities in Bangladesh.

BARL PRESIDENT VISITS USA AND SRI LANKA

BARL President Saif Shahid, during his visit to the USA in April, 1982, made contacts at the IARU headquarters at the ARRL. He spoke with Victor C. Clark W4KFC and David Sumner K1ZZ about the development of amateur radio in Bangladesh.

On a separate visit, Saif Shahid and Tariq Hasan, another member of BARL, visited Sri Lanka to attend a two-week-long seminar on microcomputers. During their stay they were invited by John Amaratunga 4S7JA (RSSL president) to a dinner followed by a visit to 4S7EA's shack for a demonstration of a RTTY QSO on a VDU. BARL looks forward to a long-lasting friendship with RSSL.

BARL APPLIES FOR CLUB STATION LICENSE

BARL has applied to the Wireless and Frequency Allocation Board for issuance of an ad hoc amateur radio license for a BARL headquarters club station. It is understood that the application is under active consideration by various government agencies. BARL expects to have the club license in time to enable it to participate in various activities during World Communications Year.

In the second Bangladesh Electronics Symposium, a paper titled "Role of Amateur Radio in Bangladesh" was presented jointly by Saif Shahid and Nizam Chowdhury. The technical session was chaired by Air Vice Marshal Sultan Mahmood, Chief of Air Force Staff. The paper highlighted the various aspects of amateur activities and the prospects of such activities in the technical advancement of a developing country like Bangladesh.

CANADA

Cary Honeywell VE3ARS
PO Box 2610, Station D
Ottawa, Ontario K1P 5W7

By the time most of you read this, the summer will be gone. In some places in Canada the summer is measured in days rather than months. This does not stop clubs and organizations from holding their annual flea markets and hamfests. Most of ours cannot match the Dayton or Rochester hamfests, but for Canada, they come close.

In the eastern part of the country, the big ones are held near the Toronto, Ontario, area: The Whitby area holds one in late April or early May, while Guelph holds theirs in the first week of June. July sees the Southern Ontario Hamfest, held at Milton, just west of Toronto. One of the biggest hamfests in Canada is the RSO convention, held each fall. This year, Toronto hosts this event.

In the contest area, the CARF-sponsored Canada Day Contest was held on July 1, this being Canada's birthday. Although not as well advertised this year, the event made most bands very active with Canadian stations.

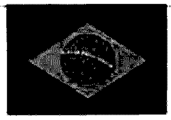
In my August column, I was discussing TRC24, the syllabus for amateur examinations, and how the efforts of the amateur community were wasted. Well, it seems the DOC heard our cries of anguish. Shortly after a meeting between CARF officials and the Director General of Telecommunications for the DOC, both CARF and the Canadian Division of the ARRL were asked to submit proposals to amend the issue. CARF President Don Slater VE3BID and ARRL Canadian Director Tom Atkins VE3CDM agreed on a method of obtaining a consensus before the June 10th deadline which the DOC had specified. The cooperation between the two groups was well under way when the Canadian vice director Harry MacLean VE3GRO, intervened and asked for the DOC to extend the deadline. So much for cooperation. The matter is still up in the air, and I will let you know how things develop.

On other matters, the Canadian Amateur Radio Federation held its Annual General Meeting during May. At the meeting, two new directors were introduced: Robert Sondack VE2ASL of St. Luc, Quebec, well known in AMSAT circles in that province and also a director of the Quebec provincial amateur association, RAQI; and Leigh Hawkes VE1ZN of Dartmouth, Nova Scotia. Leigh is also well known in Canada as one of the most prominent workers on cable television interference. These gentlemen join Craig Howey VE3HWN of Waterloo, Ontario; Geoff Smith VE3KCE of Aurora, Ontario; Norm Waltho VE5AE of Moose Jaw, Saskatchewan; and Peter Driessen VE7AB of Surrey BC in the job of directing Canadian amateur affairs for the federation. Two departing directors, Nate Penny VO1NP of Shoal Harbour, Newfoundland, and Raymond Mercure VE2BIE of Hull, Quebec, were congratulated on a job well done and wished good luck. All other positions in the federation remain the same.

I would like to hand out a couple of laurels this month. First, to Bill Deacon VE3BDO. Bill has been writing a superb series of articles called "Life on the Ocean Wave" for *TCA* over the past few months. A steady stream of letters has been coming in to the editor of *TCA* (me) in support of this assessment. The Society of Wireless Pioneers is preparing to reprint the series soon, and I hope more of you will get the chance to read these memoirs of a radio operator in the pre-WWII era of radio.

My second laurel goes down east. Across Canada, we have many QSL bureaus, both outgoing and incoming. The best known outgoing bureau is the CARF National QSL bureau at Box 66, Islington, Ontario. The best known incoming bureau is in Halifax, Nova Scotia, and is run by Britt Fader VE1FQ. For many years the Canadian Division ARRL's central bureau was run by Britt and even though his is only a provincial operation now, he still receives and forwards many QSL cards. A tip of the hat to Britt Fader VE1FQ.

By the way, if you are wondering why the CARF QSL bureau is not in the *Callbook*, the answer is simple. It is not the ARRL bureau.



BRAZIL

Gerson Rissin PY1APS
PO Box 12178, Copacabana
20000 Rio de Janeiro, RJ
Brazil

BRAZIL WINS ITU TROPHY

The ITU Contest is sponsored every second and third weekend of May to commemorate the World Telecommunications Day (May 17th). The ITU Trophy goes to the country with the highest aggregate score. (Brazil's total was 442,825.) This is determined by the top five single-operator scores plus the top multi-operator scores, both on phone and CW. The trophy remains in the possession of the representative national association of that country for one year. It is retired by the country winning three consecutive times or five intercalated times. (See box for scores.)

Other trophies won were as follows. Single operator: Gold—RX7CF for CW and UP2NK for phone; Silver—PY1DOQ for CW and OE3ITU (OE2VEL) for phone; Bronze—EA2IA for CW and HA5WE/7 for phone; and Silver Plates for multi-operators LZ1KDP for CW (257,096 points) and UKØQAA for Phone (364,984 points).

WORKED ALL PP AWARD

Sponsored by LABRE/Goias, the WAPP

1982 ITU CONTEST RESULTS

Single Operator (All Bands)		Multi-Operator (All Bands)	
CW	**Points**	**CW**	**Points**
RX7CF	234,419	LZ1KDP	257,096
PY1DOQ	193,104	UK2PRC	185,702
EA2IA	168,760	UK2PCR	142,120
UP2BAO	97,779	UK2BBB	126,936
UA6LLT	94,146	RK7PAL	69,444
EX5UKW	88,910	UK2BCR	61,848
ON6TW	81,039	UK4WAB	42,600
IO2DMK	76,938	HA9KSF	31,671
F6DKV	57,150	UK5AAA	31,125
PR7CM	37,520	HA8KAX	23,232
Phone	**Points**	**Phone**	**Points**
UP2NK	268,919	UKØOAA	364,984
OE3ITU	224,964	UK2PRC	209,150
HA5WE/7	126,174	LZ1KDP	200,658
PP2ZDD	121,088	UK2BBK	120,460
DL7RT	96,320	LXØRL	71,307
Y35TE	36,150	UK5IAZ	47,928
ZY1NEZ	31,185	YO3KWJ	2,568
YB8VB	26,892	JA1ZGP	552
DA2QS	23,652	VK2ATZ	497
LZ2AF	23,163		

SWL

CW	Phone
OK2-9329—Dusan Hanak	AP-0101—Farrukh Zia

Award is available to all licensed amateurs for confirmed contacts with : (a) PY1 stations prefixes (PP1, PP2, PP5, PP6, PP7, and PP8). The PP2 contact must be with a station located in the city of Goiania. The award is to celebrate the centennial of the city of Goiania, in Goias State.

All contacts must be made during 1983, on any band and any mode. Send GCR log of stations worked (call, date, time, band, mode, and report) and 10 IRCs for mailing expenses, to LABRE/Goias—Coordenador De Diplomas, PO Box 676, 74000 Goiania, GO, Brazil.

There are no special endorsements for the WAPP Award.

SWL: Same rules.

CWRL AWARD

Sponsored by the Lakes Region of the Rio de Janeiro Radio Club, the CWRL Award is available to all licensed amateur for confirmed contacts with: (a) PY1 stations whose first suffix letters form the phrase: *Araruama—onde o sol passa o inverno* (meaning: "Araruama—where the sun spends the winter), and (b) three CWRL members (any prefix or suffix).

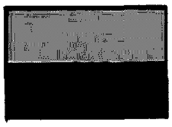
Contacts must have been made after January 1, 1983, on any amateur band. Only two-way CW mode.

Send GCR log of stations worked (call, date, time, band, mode, and report) and 10 IRCs for mailing expenses, to CWRL Bureau, PO Box 91, 28970 Araruama, RJ, Brazil.

There are no special endorsements for the CWRL Award.

SWL: Same rules.

CWRL members are PY1AEE, PY1AFA, PY1ASI, PY1AZG, PY1BPI, PY1BUG, PY1BVY, PY1CC, PY1COA, PY1DEA, PY1DFF, PY1DGB, PY1DJY, PY1DMQ, PY1DMX, PY1DPG, PY1DQV, PY1DWM, PY1EBH, PY1EBK, PY1ECL, PY1EWN, PY1GO, PY1TCJ, PY1TZ, PY1VMW, PY1VEH, PY1VTN.



COLOMBIA

Abelardo (Lalo) Santos V. HK3EQJ
PO Box 88937
Bogota
Colombia

MALPELO (HK0TU) DXPEDITION

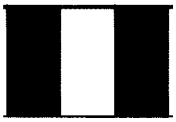
In the second week of October, 1983, for five days, there will be a DXpedition to Colombia's Malpelo Island, located at 3° 59' 07" latitude north, 81° 34' 27" longitude west, in the Colombian Pacific Ocean territorial waters. The DXpedition is jointly sponsored by the Colombian Radio Amateur League (Liga Colombiana de Radioaficionados) in cooperation with the Colombian navy, which will supply the transportation and the required logistics support.

The main goal of this extremely interesting DXpedition (Malpelo Island being the fourth most important valid country for the DXCC award) is to publicize Colombian radio amateur operations. This year the Liga Colombiana de Radioaficionados is celebrating its 50th anniversary.

Because of the roughness of the terrain, the DXpedition organizers required all participants to have perfect health, good physical fitness, and, if possible, previous experience in this kind of DXpedition. They also have to be younger than 46. However, as is well known, some of the "oldies" are tougher and better performers in the field. A main team of 15 Colombian operators is being carefully selected by the League.

The transmitting frequencies are: CW—28,025; 21,025; 14,025; 7,025; 3,525; and 1,825 kHz; phone—28,595; 21,295; 14,195; 7,085; 3,795; and 1,825 kHz. Also, there will be extensive experimentation via satellite on 146.460 MHz. The QSL manager will be internationally famous Beto Rojas HK3DDD.

Though an inscription limit was locally set till the end of May, 1983, written applications from foreigners (on a restricted basis) are welcomed by the League via PO Box 584, Bogota, Colombia, South America.



FRANCE

Claude Guee F1DGY
11 Rue Emile Labiche
28100 Dreux, France

TERRES AUSTRALES FRANCAISES AWARD

For three contacts with these different lands, or four contacts to receive the golden star "EXCELLENCE" award: FB8FX (Kerguelen Island), FB8Z (St. Paul, Nouvelle Amsterdam Island), FB8W (Crozet Island), and FB8Y (Terre Adelie).

Only contacts after April 1, 1946, are valid. The fee is 10 IRCs.

DEPARTMENT ET TERRITOIRES D'OUTRE-MER AWARD

For contacts with these nine different prefixes: FM7 (Martinique), FG7 (Guadeloupe—St. Martin, St. Barthelemy), FY (Guyane), FR (Reunion—Glorieuse, Europa, Tromelin, Juan de Nova), FP (St. Pierre et Miquelon), FK (Nouvelle Caledonie—Pins, Chesterfield, Huon, Loyautes), FH (Comores), FW (Wallis-Futuna) and FO (French Polynesia).

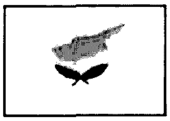
Only contacts after January 1, 1982, are valid. The fee is 10 IRCs. For these two awards, the manager is Alain Duchauchoy F6BFH, 21 Rue de la Republique, 76420 Bihorel, France. The usual conditions apply to these awards (certified log extract, no QSL requirement).

OTHER NEWS

At this moment, there are about 12,000 French radio amateurs. Despite the fact that France was once very advanced in this hobby, this one is not as popular as it should be! Especially if we compare ourselves with other countries.

Besides the conventional traffic on the HF bands, the upper bands are more and more used as follows:

- 2 meters with repeaters mainly, but also SSB, satellites, RTTY, SSTV, and CW.
- 70 cm with repeaters also (many promising projects), fast scan TV, SSB.
- 23 cm—the new frontier—some repeaters are scheduled. Currently, most activity is on FM, SSB, and fast-scan TV. Aerials are generally F9FT 23-element beams.
- 10 GHz—This band had its heyday some years ago with Gunn diodes. Nevertheless, fans are numerous and there are regular skeds on FM, SSB (fast-scan TV also).
- Otherwise, microcomputing is now a very active branch for hams. Many radio clubs are the first school for newcomers.
- Two associations help the French ham. They publish two magazines: Reseau des Emetteurs Francais (REF) publishes *Radio REF*, and the Union des Radio-Clubs (URC) publishes *Ondes Courtes Informations*.



CYPRUS

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Limassol, Cyprus

AN OVERVIEW: AMATEUR RADIO IN CYPRUS

At the present there are about 280 amateur radio licenses with the 5B4 prefix and a dozen or so with the ZC4 one. The 5B4 licenses are issued by the Republic of Cyprus and the ZC4 by the British bases' authorities in Cyprus.

Although someone would expect that this number of amateurs is high compared with the 630,000 population of the island, not many amateurs are active on the HF bands. All amateur radio acitvity comes from the southern part of the island, which is under the control of the government of the Republic of Cyprus, and the great majority of amateurs are Greek Cypriots. On the northern part of the island, which is under Turkish occupation, there is no amateur activity at the moment. Occasionally there is some activity there by United Nations personnel operating with a 5B4 license.

There is only one type of license which permits use of all bands and modes. Licensing conditions and restrictions are very similar to the old British regulations—Cyprus being an ex-British colony. On the HF bands, only about a dozen stations are active at the moment, mostly on 20m, 15m, and 10m. The rest of the stations are either not active at all—some do not even own equipment—or operate on 2m only.

To help amateurs without equipment as well as prospective amateurs, who are usually young boys, a few keen amateurs have established one club station in each city. These stations are active once a week for only a few hours. These clubs also offer instruction by suitably qualified amateurs to help prospective amateurs pass the radio amateur examinations. The tests are given by the Ministry of Communications and Works, but the British Radio Amateurs Examination is also accepted.

Most 5B4 stations are on SSB 20m, 15m, and 10m, but one or two of them can be found on 75m and 40m. On the last two bands, 5B4EP and 5B4JE are still active. During the winter, 5B4EP, 5B4JE, and 5B4PW occasionally operated on 160m.

As far as I know, only about four 5B4 stations are using CW at the moment and perhaps an equal number of ZC4s. On RTTY, only two stations are active, 5B4CV and 5B4HF, mostly on 20m. During the last few months, 5B4CV also was active on SSTV, and after a short break he will soon be operational again with a home-brew camera.

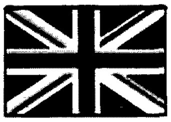
Most of the equipment used by Cyprus amateurs is commercial and imported, but there also is some home-brewing going on, such as tuners, linear amplifiers, small transceivers, test gear, antennas, etc. Leaders in home construction at the moment are 5B4BS, 5B4CV, 5B4AZ, 5B4AH, and 5B4DV.

The Cyprus Amateur Radio Society (CARS), a member of the IARU, besides other activities runs a QSL bureau which is very conscientious but also very slow, through no fault of its own. The reason is purely economic. The QSL manager has to wait a long time to collect enough cards for a certain country so that postage will be cheaper. CARS is not so strong financially because not all licensees are members of CARS. My advice for amateurs, if they want to get a quick QSL card, is to QSL direct. Using the bureau takes as long as three years sometimes.

I do hope that I have given you a general idea about amateur radio in Cyprus. In future columns, I will give you information about awards, temporary licenses, and current 5B4 activities.

From Cyprus, the island of Aphrodite, goddess of love, we hope to keep you informed regularly.

Aris 5B4JE.



GREAT BRITAIN

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THE UK SCENE

For as long as I have been reading *Radio Communication*, the monthly journal of the Radio Society of Great Britain (known to everyone as *Radcom*), there has been a monthly column called "Technical Topics." This 3-to-6-page potpourri (known throughout G-land as "TT") has provided a forum for new, sometimes untried, ideas. It reports on the proceedings of appropriate learned bodies such as the IEEE, it summarizes foreign amateur radio journals including those written in non-

English languages, and it suggests new circuit ideas.

A recent TT in *Radcom* included the following variety of subjects:

● Electro-Magnetic Compatibility (EMC) and its supplanting of RFI and TVI as the main external factor affecting the operation of amateur stations.

● Screening and filtering and the need to minimize out-of-band or unnecessary in-band radiation at source. The work done by Philip Rand W1DBM many years ago was discussed again.

● A 20-A power supply following the KISS (Keep it Simple, Stupid) principle and using only 17 components. The originator of the circuit, G4HYD, counsels the underrating of components in such systems.

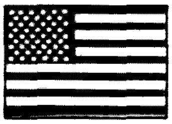
● High-power MOSFET amplifiers as originally presented by K7ES/OH2ZE in *QST*.

● New loop antennas raised again the thorny problem of defining HF antenna performance. Systems such as the G2PL special (turned-over quad) seem to indicate that a horizontal loop antenna can provide effective low-angle, DX-working even when the wire is only a few feet above ground. However, TT also promulgates the theories that (a) it would be impossible to devise any piece of wire that would never result in DX when conditions were very good, and (b) when an amateur puts up a new antenna he tends to become more active and this results in more and better DX until at least the first flush of enthusiasm wears off.

All very interesting and thought-provoking stuff—but why report the contents of an average TT in "The UK Scene?" The edition to which I refer is remarkable for two reasons. First, it is twenty-five years since the column started and any silver jubilee is worth celebrating (as any readers lucky enough to be in the UK in 1977 will testify). Second, TT has been written for all those 25 years by the same author, Pat Hawker G3VA. Quite an achievement, I think, to cover virtually the entire era of silicon and the parallel demise of thermionics without becoming boring or repetitive.

It seems that there may have been some substitution of candidates for the Home Office Morse test in recent months. (Passing the test at 12-wpm send and receive is a prerequisite of a full HF-class A license.) The authorities have "with some reluctance" introduced new vetting procedures for prospective amateurs sitting the test. It is now necessary for some positive means of identification such as a passport to be produced. Presumably, a document bearing a photograph will be necessary.

The Morse test is carried out by the Maritime Branch of British Telecom (formally the Post Office) at a coastal radio station. Although informal in nature, the required standards have not been allowed to slip. Taking the test currently costs US$22 and may involve quite an amount of traveling, as many BT coastal radio stations are now unmanned and operated remotely.



GUAM

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THE VIEW FROM GUAM

Many hams around the world are familiar with the two dots on our globe that share the name Cocos Island. The first, off Costa Rica's western shores, sports the TI9 callsign prefix. The other Cocos Island (also known as Keeling Island) is located in the eastern Indian Ocean, and hams operating from there use the VK9Y prefix.

Here on Guam, however, we have our own Cocos Island. Located just over two miles from Guam's southernmost village of Merizo, the narrow sliver of land points like a finger extending into the crystal blue waters of the Philippine Sea.

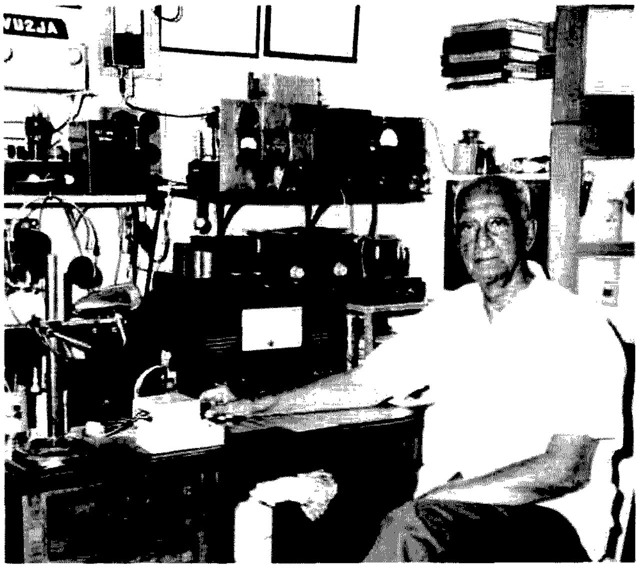
Shortly after WWII, the US Coast Guard built a LORAN "A" station on the island. However, with the advent of the LORAN "C" system, the Cocos station was closed and much of the island was turned over to enterprising developers. Today, a beautiful beach, a picnic area, a small zoo, and plans for a resort hotel with casino make Cocos Island a popular destination for tourists and residents alike.

Recognizing this popularity, the Guam chapter of the American Red Cross has, since 1981, held an annual fund-raising event called the Cocos Challenge. The object of the challenge is to swim, snorkel, sail, paddle, or in some other way travel the distance from Cocos to Merizo. And, for the third consecutive year, the Red Cross requested assistance from Guam's hams to help ensure the safety of the participants. Thus, at 6:00 am on May 15th, 10 hams from around the island met with their 2-meter gear to help make the third annual Cocos Challenge a little safer for those in the water.

Preston "Al" Allen KH2BB acted as net control at the officials' tent, while Dave Beck KH2BD kept an eye on things at the Merizo Pier finish line and Ann McDaniel KG6JKN helped out at the starting line on Cocos. The remaining operators, Bill Michling KH6II, Russ Albee WB7EHU, Gerry McDaniel KG6JHN, Carl Wegner KG6JKV, Dave Chartier W1YRM, Gary Resta N2BMV, and Jim Pogue KH2AR took their places in the station. Rescue and Coast Guard boats were present to provide timely and reliable communications throughout the event.

Although no serious problems arose during the race, a few swimmers who tired early were pulled from the water and transported to shore.

Perhaps the highlight of the day was when one of the "Crazy Craft," an old VW car floating on pontoons, proved to be too unwieldy to make the entire trip to Merizo. The Coast Guard boat on the scene was heard reporting to their Rescue Center, "... be advised, we are headed for Cocos Island with a 1967 Volkswagen in tow." After a lengthy pause, the Rescue Center haltingly replied, "... say again?"



OM J. A. Faithful VU2JA.

Al KH2BB operates net control during the 3rd Annual Cocos challenge.

INDIA

MEET JOE FAITHFUL VU2JA

There are a few valid reasons why we want you all to meet OM Joe Faithful VU2JA. He is one of the few hams who had the luck and opportunity to communicate with spark transmitters, carborundum crystal detectors, valve transmitters and receivers, and solid-state devices.

His vital statistics are: name—Joseph Alexander Faithful; born—April 11, 1898, in Shillong, India; callsigns—VU1AA, VS8AA, VU2BX, VU7AA, MP4BAF, and VU2JA; qualifications—PMG certificate—First Class for spark transmitter up to 5 kW (1920).

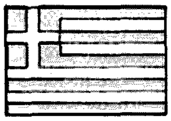
His awards and certificates:

1. The Old Old-Timers Club.
2. The Incorporated Radio Society of Great Britain, Corporate Member (1932) VU1AA.
3. The Incorporated Radio Society of Great Britain, WBE (1935) VU2BX.
4. All Asian DX Contest, 1940.
5. The Old Old-Timers Club, world's first OOTC 200 Award.
6. ARRL Old-Timers Club, 1958.
7. A-1 Operator's Club, 1961.
8. ARRL DX Century Club, 1962.
9. WAC/YL Young Ladies Radio League, 1966.
10. The OOTC QSO Party, first place in the continent of Asia (VU2JA, 1969).
11. WAS-CW, 1975.

On his way to England from India in 1914 (16 years old), he was taken as a prisoner of war during World War I. He escaped from the German POW camp in 1919 and reached England.

Can you beat this record?

At the young age of 85, Joe Faithful still feels like climbing up on the roof to experiment with different antennas—also, you can see the array of equipment still functioning faithfully. Joe is regular and active on all HF bands 80 through 10 meters between 0130 GMT to 1530 GMT depending on band condition. You can reach him at the following address if you want a direct sked or communication: J. A. Faithful, "Mon Desir," 20, Cubbon Road, Bangalore 560 001, India.



GREECE

Manos Darkadakis SV1IW
Box 3751
Athens, Greece

After a short review of Greek amateur radio history in my July column, we are now going to talk a little about the amateur community itself.

Today, the Amateur Radio Association of Greece has about 1,000 members, of course, not all of them are licensed to transmit. Licensed members number about 500. This number increases at the rate of at least 50 amateurs annually, after the two examination periods in March and September.

Not too long ago, Greece changed the callsign system that was in use for many years, which had only the number 1 after the SV prefix. We adopted the multi-number system common to most countries around the world. Therefore, Greece was divided into nine regions, and the SV0 prefix was assigned to foreigners operating

for more than one year in our country. The SV1 prefix was given to the central part of Greece including Athens, SV2 was given to Macedonia in the northern part of Greece (including Thessaloniki), SV3 was given to Peloponnissos, SV4 to Thessalia, SV5 to Dodecanese islands including Rhodes, SV6 to Hepiros, SV7 to Thraki, SV8 to all Greek islands except Dodecanese and Crete, and the SV9 prefix was given to the island of Crete.

Subsequently, another problem came in sight with the increase of amateur population in other areas besides SV1. Local problems appeared more and more frequently and, with headquarters offices in Athens, it was almost impossible to solve them either by phone or mail. Then, during a meeting between the headquarters officials and representatives of the SV2 area, the first branch office was born in 1979. After three years of satisfactory operation of the SV2 branch office, the SV9 branch office was established in 1982.

So now there are two branch offices, with more to come in the near future.

The headquarters of RAAG are situated on the top floor of a six-story building in downtown Athens (31, Arcadias and Messogion Ave., Tel.: 01/7700835). Headquarters are open every evening from Monday to Friday, 5:00-8:00 pm. RAAG's officials welcome any foreign ham to stop by and meet the SV fellow amateurs who gather every Wednesday afternoon from 6:00-9:00 pm.

So that's all for now. Next time we'll talk about interests of Greek hams in amateur radio bands, repeater sites, equipment used, etc.

ISRAEL

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Kibbutz Urim
Negev Mobile Post Office 85530
Israel

This month I'd like to report on recent and upcoming events and activities here. These happenings give a picture of the life of the amateur radio community in Israel, how hams get together, and how they interact with the public at large.

Heralding in the spring was the Mount Gilboa March. "Marches" or, more properly, group hikes, are a popular event here, where sometimes thousands of people of all ages walk along certain routes. The annual march on Mount Gilboa, overlooking the Jordan and Jezreel Valleys, is sponsored by the Jezreel Regional Council at a time when the winter rains have finished and the Gilboa is speckled by abundant colorful wild flowers.

On our weekly Saturday morning roundtable and news magazine on 7.050 MHz, Moshe 4X4MJ, of Kibbutz Geva in the Jezreel Valley, suggested that for the first time hams take part in the march. The amateurs were enthusiastic, and Moshe initiated contacts between the Israel Amateur Radio Club's Special Events Committee and the organizers of the march.

Tee shirts displaying the IARC emblem were ordered and made available at half price to participating hams, who also were exempted from the entrance fee. The night before the event, a party of amateurs camped out on the Gilboa and established a base station. On the day of the march, tee-shirted amateurs were all along the route toting their two-meter hand-helds to provide emergency communications. Fortunately, outside of a few children separated from their parents, there were no real emergencies.

At the finish line, the base station, operating on the HF bands as well as VHF, proved the fact that hams are more than a group of people running around with "Motorolas" (Hebrew for handie-talkie)! As a result of the amateur participation, a few scores of impressed hikers requested information about ham radio.

In early April, on "National Communications Day" in the State of the Children Exhibit at the Tel Aviv exhibition grounds, amateurs were on hand operating a station with the special callsign 4X0ARI, under the capable supervision of Naomi 4X6DW. This also served as a drawing card to bring new recruits to the radio clubs. Incidentally, an interesting sidelight to this day was a few truckloads of government surplus "junk" being brought in to be disassembled by the kids who were told beforehand to bring along side-cutters and screwdrivers!

Israel Independence Day is marked by the very popular Annual Spring Contest. This is a national mini-contest taking place on 160, 80, 40, 2 meters, and 70 centimeters for the duration of three hours. Considering that there were perhaps no more than 80 stations active on the bands, this was definitely enough time to make the contest short and sweet, with little time needed afterwards to take care of logs.

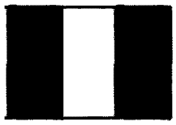
Special recognition should go to Seth 4X6DX and Ronen 4X6II, two high schoolers who set themselves up on "Radar Hill" in the Jerusalem mountains, braving unseasonably cold winds and rains (the contest was on April 18), churning out QSOs with most of the country's eighteen contest zones, modes, and bands. (In this test, the outside world counts as one zone—no doubt the biggest zone in any ham radio competition!) Stations operating in remote areas or on emergency power get special multipliers.

There was some discontent about VHF contacts being scored the same way as those on HF, as since there was no special tropospheric skip, more remote VHF operators were at a clear disadvantage. However, I'm sure that next year's contest committee will rectify the matter. All in all, it was an enjoyable event and, for me, not having the time, patience, or nerves for weekend-long contests, was just my style. Long live mini-contests!

By the time you read this, the annual Assembly of the Israel Amateur Radio Club will have come and gone. This year it was held in June at the Wise Auditorium of the Hebrew University in Jerusalem. The Assembly is a crammed evening containing a technical lecture, a "political" forum where anyone can take the floor, the election of officers of the IARC for the year, a raffle of "junk" and door prizes, and, most important, a chance to eyeball hams from all over the country whom you've been QSOing all year long. QSLs from the bureau are distributed, and people bring the outgoing bureau manager many good kilos of sorting!

Last year, when the Assembly was held in Tel Aviv, about 800 amateurs and visitors were present. There's been a feeling among club officials that because of the shortage of time and impatience of the amateurs to get the discussions and elections over with and on to the more important raffle, not enough attention is devoted to the running of our national organization. Perhaps it is indeed time to change the format and make it a day-long hamfest/convention, as the Israeli amateur population has certainly grown since the club was founded in the early fifties. In a future column, I'll report on the Jerusalem Annual Assembly and ensuing developments.

That's it for now. Conditions between the States and Israel are at present most stable on 20 meters between 2100 and 0500 GMT, so might see you there! In the meantime, happy hamming and good DXing. Shalom and 73.



ITALY

Mario Ambrosi I2MQP
Via Stradella, 13
21029 Milano, Italy

Having recently been named the Award and Contest Manager for the Italian Amateur Association (ARI), I will take this opportunity to give some rules of the Italian awards.

COM—Certificate del Mediterraneo (Mediterranean Certificate). It is issued to any amateur who can show confirmation of a two-way contact since June 1, 1952, with a fixed amateur station in at least 22 countries on the list (below) and at least 30 amateur stations of peninsular Italy. The same station can be worked only once. The certificate is available in two classes: phone and CW, and phone only. Also available for the SWL. The minimum reports allowed are RST 338 and RS 33.

Following is the list of countries:

Spain, Balearic Islands, Morocco, France, Algeria, Corsica, Sardinia, Sicily, Lebanon, Egypt, Greece, Crete, Dodecanese Islands, Turkey, Syria, Yugoslavia, Albania, Malta, Gibraltar, Cyprus, Monaco, Tunisia, Israel, and Libya, plus the deleted countries of Spanish Morocco, French Morocco, and Trieste.

WAIP—Worked All Italian Provinces. This award is issued to those amateurs who can show confirmation of a two-way contact (since January 1, 1949) with a fixed amateur station in at least 80 provinces (the equivalent of US counties) of the Italian Republic. The same station may be worked twice or more if he is in different provinces. Also available for the SWL. The minimum reports are RST 338 and RS 33. List of the Italian provinces: Agrigento Alessandria, Ancona, Aosta, Arezzo, Ascoli-Piceno, Asti, Avellino, Bari, Belluno, Benevento, Bergamo, Bologna, Bolzano, Brescia, Brindisi, Cagliari, Caltanisetta, Campobasso, Caserta, Catania, Catanzaro, Chieti, Como, Cosenza, Cremona, Cuneo, Enna, Ferrara, Firenze, Foggia, Forli, Frosinone, Genova, Gorizia, Grosseto, Imperia, Isernia, L'Aquila, Laspezia, Latina, Lecce, Livorno, Lucca, Macerata, Mantova, Massa, Matera, Messina, Milano, Modena, Napoli, Nuoro, Padova, Palermo, Parma, Pavia, Perugia, Pesaro, Pescara, Piacenza, Pisa, Pistola, Pordenone, Potenza, Ragusa, Ravenna, Reggio-Calabria, Reggio-Emilia, Rieti, Roma, Rovigo, Salerno, Sassari, Savona, Siena, Siracusa, Sondrio, Taranto, Teramo, Terni, Torino, Trapani, Trento, Treviso, Trieste, Udine, Varese, Venezia, Vercelli, Verona, Vicenza, and Viterbo.

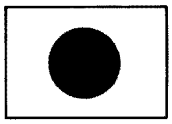
The award application has to be sent to the following address: ARI Award Manager, c/o ARI, Via Scarlatti 31, 20124 Milano, Italy, together with the complete list of QSLs, each with callsign, date, frequency, reports, time, and time of emission. Send QSLs or GCR apply. Fee: 10 IRCs or US$2.

DMG Award. Another award is a beautiful anodized-aluminum plaque with the reproduction of a photo of Guglielmo Marconi making one experimental transmission. It is available to radio amateurs worldwide. It's the OGM Award, or Diploma Guglielmo Marconi. It is not a very popular award, being a difficult one to qualify for, but it's a really beautiful plaque.

It is sent with no cost to the applicant apart from the mailing expenses (a couple of dollars). Applications have to be addressed to Roberto Borhy I4BFY, Via Toscana 133, 40141 Bologna, Italy.

To obtain the award, you have to contact and get a QSL from 40 of the following locations or 35 of the following locations plus 2 commemorative stations of Marconi, one of which must be IY4FGM. All the locations on the list are localities in which Marconi conducted his experiments. Contacts with the following locations are valid: D44 (Cape Verde), CT1 (Lisbon), CT3 (Madeira), CN8 (Morocco), EA7 (Cadice), EI (Ireland), F (France), FC (Corsica), G (London), GB (Flatholm Is.), G (Isle of Wight), GI (Ireland), GM (Scotland), HB (Switzerland), HV (Vatican), I4 (Bologna), I5 (Italy), I0 (Rome), IY4FGM, IP1TTM, IT9 (Sicily), IS0 (Sardinia), JA (Japan), LU (Buenos Aires), ON (Belgium), PY (Rio), SM (Stockholm), SM1 (Gotland), UA1 (Leningrad), VE1 (Canada), VO2 (Labrador), VO1 (Newfoundland), VK2 (Sidney), VP9 (Bermuda), W1 (Massachusetts), W2 (New York or New Jersey), W0 (Missouri), W9 (Illinois), VU (India), ZB2 (Gibraltar), YU2 (Yugoslavia), and 5A (Tripoli).

I am waiting to receive many applications! Best 73!



JAPAN

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RECIPROCAL AGREEMENT?

There are no reciprocal agreements with Japan, but Americans and others operate anyway.

As you know from last month's issue, Japan does not have reciprocal agreements with any country yet although a law has been passed to set things in motion. In spite of this, we have had through the years—since 1970, in fact—many non-Japanese operating ham radios in Japan. How did this come about, and why do we need a reciprocal agreement at all if "foreign" (that's you) operators can operate here anyway?

In the beginning, some time after God created the Earth, giving us light and air waves right along with all the other good things, signals coming from Japan were devoid of anything except "pure Japanese" signals. If you were assigned to Japan you might just as well pack your rig in mothballs for the duration of your stay unless, of course, you happened to come to Japan as a member of the US Armed Forces sent overseas (sometimes referred to as "Americans forced overseas"). These American military forces are given special KA callsigns and operate here quite happily just like they would in the States. The Japanese government decreed, however, that these Americans are not hams at all, and issued stern warnings to the effect that any Japanese ham having a QSO with a KA station would be punished. Following suit, the JARL will not recognize a contact with a KA station in issuing its awards. (Of course, a KA sta-

tion operating from US soil is a different matter and is fully recognized.)

So during those dark ages, what would one do if one were coming to Japan in a civilian capacity—say, to work for IBM or Gulf Oil or whatever? Well, as I said above, you would just put the rig in mothballs, take up knitting, scream and shout, commit hara-kiri, or, worse yet, join the US Army. These were the alternatives open to you, none of which was too satisfying.

In 1968, as we began to approach the end of the medieval age, the US sent a new ambassador to Japan, the Honorable Armin H. Meyer. Now, you wouldn't expect to get much more than perfunctory help from an ambassador when it comes to a ham radio problem. After all, it's only a hobby and doesn't stack up too well against the many important problems facing Japan and America. But you see, the good ambassador was himself a ham, whose call letters are W3ACE. Ambassador Meyer, setting his priorities in proper order, wanted to get on the air. Of course he could have opted for a military-type KA callsign and operated quite easily and comfortably from the ambassador's official residence, adjacent to the embassy. Or, as some people argued, under international treaty the US embassy is technically and legally US territory, and it is doubtful that the Japanese government would attempt to put the ambassador off the air should he fire up the rig and sign W3ACE/JA1.

But the ambassador wanted to do things right and decided that the time was ripe for a reciprocal agreement between Japan and the US. But it was not to be. Changes in the law to permit reciprocal licensing would have to be introduced to the Japanese Diet (Parliament), kicked around for discussion among many comittees and whatnot, presented to other ministries for approval, etc., which could take a lot of time. Furthermore, the Japanese "congressmen" were reportedly not in the mood to discuss amateur radio, a mere "schoolboy's hobby." Ambassador Meyer's assignment to Japan might indeed have expired before anything was done. (In retrospect, we can only say, "How true!") A more expeditious way had to be found. It was. Taking the cue from his callsign, W3ACE had one up his sleeve.

After many trips to the Japanese Foreign Ministry and Ministry of Telecommunications and Post (80, it was said), Ambassador Meyer was able to convince the Japanese authorities that when Japanese hams visit the United States they are permitted by law to operate an American friend's ham station as long as the American operator is in "control." This was certainly true; anyone, even a non-licensed person, may speak over the microphone of a ham station in the United States.

The Ambassador argued that since this was the case, why couldn't the Japanese allow Americans the same privilege? Furthermore, the Japanese club station structure seemed ideally suited to this type of operation. In Japan, the letter Y or Z after the numeral indicates that the station is a club station, and there are hundreds, maybe thousands of them. Almost every Japanese is a member of some club, so in addition to his own personal callsign, the Japanese ham is also allowed to use a club callsign. Therefore, the argument went, why couldn't Ambassador Meyer have a Japanese "club" station installed in the embassy, and go on the air?

The authorities agreed, and made a slight modification to the Japanese ham radio laws, specifying that citizens of the US could join a Japanese club and could operate the station as long as a licensed Japanese operator was in "control." (This word, control, caused some problems in later years since it was not defined properly in the law.)

Apparently no one noticed, however, that if a Japanese operator did have a ham friend in the United States, he could talk over the microphone and actually have QSOs but was prohibited from talking to any country with which the United States did not have a third-party agreement. None existed between Japan and America. Therefore, the Japanese ham visiting America could not talk to his Japanese buddies back in his own country. On the other hand, in Japan the government was persuaded to give out operator permits to Americans under this club system, and is still doing so today. Therefore Americans can, and do, talk to any country in the world, and third-party agreements do not enter into the picture. This was not discovered immediately, but did produce some consternation among certain circles in Japan some time later.

Anyway, W3ACE was now ready to go on the air, but he needed a call. Ambassadors have connections everywhere, so it's not surprising that in rather short order some prominent Japanese hams got together and formed a club for the exclusive use of W3ACE. The law states that not more than one third of the membership of a ham club can be non-Japanese, so to be on the safe side, the membership consisted of three Japanese hams and Ambassador Meyer. In early 1970, Ambassador Meyer finally went on the air from the American embassy in Tokyo, using callsign JH1YDR, and continued to operate until his departure in 1971.

So now the doors were open. The Japanese Radio Regulatory Bureau had a special form printed so that Americans could apply for permission to operate a club station. The form was sloppily printed, contains several grammatical errors, and parts of it are somewhat puzzling and ambiguous, but that seems to fit the pattern for government forms of any kind. It does serve the purpose, however. All that one is required to do is take the original FCC license to the US embassy, have a photocopy made, and have an embassy officer swear that it is a true copy. (Embassy officers are trained to swear.) There is even a rubber stamp made for this purpose, with a place for the officer to sign. Then this copy of the license and the aforementioned form are mailed or taken in person to a Radio Regulatory Bureau office. Turnaround time is from two weeks to a month. Permission is about the size of a postcard, and expires on the date of one's visa or ham license, whichever comes first. For renewal, one follows the same steps.

Remember that this permission is only an operator's permit and not a callsign. The two are separate in Japan, and only Japanese citizens can obtain a callsign in Japan. So one of the hitches is that you have to find a friendly Japanese ham who is either willing to let you use an existing club callsign or to form a new club for you. This can take time. If you can't find a willing Japanese ham, you are just out of luck and might as well look over the alternatives I've listed above. In practice, however, I have never heard of a case where an American could not find a Japanese ham club or Japanese ham friends to form a club. Forming a club takes a little time and money (equivalent to about $25), but is not an impossibility.

One of the problems is that the Japanese have an inspection system for any station over 10 Watts. If you are content to stay within the 10-Watt power limit (that's output power, by the way), once you find the club and put in the application you can be on the air without much delay. If you want to run higher power, you will have to wait for six months or more for the inspectors to come. There is an additional fee for the inspection.

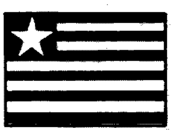
But what about the "control" of the station? Does the Japanese operator have to watch over your shoulder while you operate? Well, I can tell you that in the case of Amassador Meyer, the "control operator" definitely was not called to appear on the scene each time the rig was fired up. And, in fact, other than the first day when the station officially went on the air complete with a contingent of newspaper reporters and photographers, with the "control operator" wedged in somewhere in the crowd, Ambassador Meyer was on his own. I'm betting that that's the way he wanted it.

You may have noticed that up to this point we have limited this discussion to Americans. But what about those other countries out there? There are some others, you know. It so happened that at the same time Ambassador Meyer obtained permission to get on the air, there was (and still is) a ham in the West German embassy. Germany, this man correctly pointed out to the Japanese government, has always allowed hams from Japan (and from almost every other country, for that matter) to operate in their country. If the Americans can operate, how about the Germans? That argument brought about another modification to the law, and the Germans were then given permission to operate Japanese ham club stations just like the Americans. In more recent years, Finland and Ireland also were afforded the same privileges.

That's the story of how Americans, Germans, Finns, and Irish hams can operate from Japan even though Japan has not signed a reciprocal agreement with any country. So why do we need a reciprocal agreement? For the answer to that question, consider the following questions: What about the foreign visitor to Japan for one week? How does he find a club station or Japanese friend in such short order? Also, what if the Japanese friend who has "lent" you his club station callsign decides that he wants the call back, or what if a personal dispute arises and your Japanese sponsor decides to pull the rug out from under you? Then what do you do?

And, of course, we also have to consider the other countries. At any given time, there are any number of nationalities residing in Japan. At present, we have hams from Sweden, Italy, Great Britain, Australia, New Zealand, Canada, Philippines, and many other countries living here.

Actually, some of them are already on the air in Japan. How did they manage that since, as I have just explained, only hams from America, West Germany, Ireland, and Finland can operate here? I'll tell you about that next month. I'll also tell you about the strange situation in which certain Americans in Japan are prohibited under Japanese regulations from talking to other Americans. What complicated webs human beings weave!



LIBERIA

Mark H. Monson, M.D. EL5G
Box 1046
Monrovia, Liberia

Have you ever wondered what hamming in Liberia is like? After all, you've probably heard some EL2s on the air and maybe even worked one or two. Well, let me give you an idea of what it is like to be an amateur radio operator in Liberia.

Licenses are issued by the Liberian Telecommunications Corporation (LTC) for the Ministry of Posts and Telecommunications (P&T). LTC has authorized the Liberian Radio Amateur Association (LRAA) to administer and write the amateur examinations and recommend candidates as qualified for licensing. The president of the LRAA, Walcott Benjamin EL2BA, has appointed Lee Ruff EL2FE to write the examinations, and the president then appoints any two General-class amateurs to administer them at the site most convenient for both the examiners and the prospective amateur. A popular central location is St. Patrick's School in Monrovia, the QTH of Don Steffes EL2AL. The examinations are quite similar to those used in the US.

There are two classes of licenses, Novice and General. Novices can operate CW on any band authorized for Liberian use and phone on 2 meters. They also are allowed phone on 7.060 during the West Africa Net. They pass a simplified theory test and a 5-wpm code test, and are issued a callsign with a suffix beginning with N. Generals take a 13-wpm code test and have all privileges granted to amateurs, which include a 1-kilowatt power limit and Region 1 frequency allocations.

The Liberian government gives us no restrictions on Region 1 frequencies. We thus can operate all the usual bands that are available in the US except 6 and 1¼ meters. The P&T gave Tom Viseli EL2AV special authority to experiment and operate 6 meters, and he made many contacts which I'm sure 6-meter enthusiasts will remember.

The Region 1 bands are similar to the US bands except for the obviously larger phone bands on 20, 15, and 10 meters. It seems, however, that this will not be the case much longer. Many people forget that we have smaller overall bands on 160, 80, 40, and 2 meters. The upper limit of these smaller bands are 1.85, 7.10, 3.80, and 146.0 MHz respectively. The low bands usually require split operation for phone contacts to Region 2—which is interesting if you haven't tried it before. We now can operate 30 meters, and I made the first EL 30-meter contact with a VE3 in 1982.

Licenses are issued on an annual basis and cost $35. They expire on the 31st of December every year and a one-month grace period is then in effect. Every amateur must renew his license during the month of January, which is often a major inconvenience for those of us who live outside Monrovia.

We have between 75 and 100 licensed amateurs in the country, but of course not all of them are active. Liberia has a reciprocal licensing agreement with the US, and also offers licenses on a courtesy basis to any amateurs licensed in another country. In addition, the examinations may be given and licenses issued to non-citizens. We also are allowed to run third-party traffic with the US (but not with Canada).

Those wanting to operate from Liberia should bring their licenses with them and apply when they get here. Several photographs are required. Licenses are usually issued quickly, but a month wait is not uncommon. If the stay is short, the LRAA (Box 1477, Monrovia) can assist you if you write well in advance. Things have been a little unsettled since the 1980 coup; this resulted in two months off the air, an increase in fees, changes in the licensing

Continued on page 134

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

DARC CORONA 10-METER RTTY CONTEST
1100-1700 GMT September 3

This is the third of four tests during the year sponsored by DARC to promote RTTY activity on the 10-meter band. (The 4th will be on November 6.) Each of the four tests is scored separately. Use the recommended portions of the 10-meter band.

EXCHANGE:

RST, QSO number, and name. US stations also give state.

SCORING:

Each station can be contacted only once. Each completed 2 x RTTY QSO is worth 1 point. Multipliers include the WAE and DXCC lists, each district in VE/VO and VK, plus each different US state. The final score is the total number of QSOs times the total multiplier.

AWARDS:

Awards to the leading stations in each class with a reasonable score present. Operating classes include: Class-A for single or multi-op, and Class-B for SWLs.

ENTRIES:

Official logs are recommended and are available from the contest manager (SASE or IRCs are appreciated). Logs must contain name, call, and full address of participant. Also show class, times in GMT, exchange, and final score. SWLs apply to the rules accordingly. Logs must be received within 30 days after each test. Send all entries to: Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

CRAY VALLEY RADIO SOCIETY SWL CONTEST
Starts: 1800 GMT September 10
Ends: 1800 GMT September 11

Up to 18 hours of logging may be done during the contest period with a rest period clearly shown. Multi-operator stations may log during the entire contest. The contest is open to anyone in the world, and there will be two sections, phone and CW, each with two categories: single operator and multi-operator. The second category is open to two or more listeners or to clubs and more than one receiver may be used. The 1.8-, 3.5-, 7-, 14-, 21-, and 28-MHz bands may all be used.

For the purpose of this contest, the practice of logging a series of contacts made by one station is deprecated. Log entries must not include the same callsign in the station-worked column more than five times on each band.

Scores should be compiled as follows: one point for each station heard multiplied by the number of different countries heard on each band. A list of countries heard must be furnished and a separate log must be submitted for each band. Illegible logs will not be accepted.

The call areas of the USA, Canada, and Australia will each count as a separate country. All other countries will be determined by the official RSGB/ARRL Countries List. No CQ or QRZ or similar call will be allowed to count for points. If points are claimed for both sides of a QSO, the callsign of each must appear in the station-heard column.

Log sheets are available from Owen Cross G4DFI, 28 Garden Avenue, Bexleyheath, Kent DR7 4LF, England, if you include a large SAE and sufficient return postage. It is desirable that entrants use official log sheets, but entries on home-made log sheets will be accepted if the following information is given: date, time, band station heard, station being worked, report at SWL's QTH. Points may be claimed only for stations actually heard and the callsign must be shown in full.

Entries should be sent to the Contest Manager, G4DFI, at the above address, to arrive no later than October 31st. Certificates of merit will be awarded at the discretion of the board of the Cray Valley RS, and its decision will be final.

RF-CARRIER

NEWSLETTER OF THE MONTH

The Dayton Amateur Radio Association is best known for its hamvention—but this month's newsletter contest winner, the *RF-Carrier*, proves that DARA is not all show.

The *RF-Carrier* is the message-bearer for this incredibly active club. Not only do the members put on the largest amateur radio convention to be found, but they also operate three repeaters (one on 2 meters, one on 70cm, and a 440-MHz video repeater), maintain an emergency communications van with more gear than you could find in Elmer's basement, and supply people and equipment for public-service events. Not to mention a color weather radar and a local addition to the Westlink broadcast, appropriately named Dayton Link.

You might think that a newsletter editor would have his hands full keeping the members up to date on just those activities, but somehow *RF-Carrier* Editor Bob McKay N8ADA finds time for more goodies—like "Uncle Augie's Corner," a humorous feature from the Amateur Radio News Service; and "Bits and Pieces," a collection of interesting news shorts, updates on members, and general information.

And at a time when newsletter editors are scurrying helter-skelter for word processors and hard-to-read dot-matrix printers, the *RF-Carrier* is still typed—uncompressed, large type that is easy on the eyes.

It may not be the easy way to prepare a newsletter, but it is evident that, to McKay and the members of DARA, the best quality is worth the extra effort.

If you would like to enter your newsletter in *73*'s contest, put us on your mailing list. Send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

CALENDAR

Sep 3	DARC Corona 10-Meter RTTY Contest
Sep 9-11	Connecticut Oyster Festival
Sep 10-11	ARRL VHF QSO Party
Sep 10-11	Cray Valley Radio Society SWL Contest
Sep 10-11	IARS/CHC International Contest—CW
Sep 17-18	IARS/CHC International Contest—SSB
Sep 17-18	Scandinavian Activity Contest—CW
Sep 17-19	Washington State QSO Party
Sep 17-18	Kansas State QSO Party
Sep 24-25	Scandinavian Activity Contest—Phone
Oct 1-2	California QSO Party
Oct 1-3	Oregon QSO Party
Oct 8-9	ARRL QSO Party—CW
Oct 9-10	ARRL QSO Party—Phone
Oct 15-16	ARRL Simulated Emergency Test
Oct 15-18	Maryland/DC QSO Party
Oct 15-18	Scout Jamboree On The Air
Oct 22-23	MF Runda SW Activity Weekend
Oct 22-23	Clara Ac-Dc Contest
Oct 22-23	QRP ARCI Fall QSO Party
Oct 22-23	Pennsylvania QSO Party
Nov 5-6	ARRL Sweepstakes—CW
Nov 8	DARC Corona 10-Meter RTTY Contest
Nov 19-20	ARRL Sweepstakes—Phone
Dec 3-4	ARRL 160-Meter Contest
Dec 10-11	ARRL 10-Meter Contest
Feb 4-5	South Carolina QSO Party
Feb 18-19	America Radio Club International DX Contest

IARS/CHC INTERNATIONAL CONTEST
CW
Starts: 0000 GMT September 10
Ends: 2400 GMT September 11
SSB
Starts: 0000 GMT September 17
Ends: 2400 GMT September 18

This is a semi-annual contest sponsored by the International Amateur Radio Society and Certificate Hunters Club. Work stations once per band; no repeaters or crossmode contacts allowed. Look for stations calling "CQ CHC."

EXCHANGE:

RS(T), IARS and/or CHC number, and state, province, or country.

FREQUENCIES:

CW—70 kHz from the bottom of the band.

SSB—3960, 7260, 14300, 21360, 28600.

SCORING:

Multiply QSOs times the number of countries worked, times the number of IARS/CHC members worked. Any member of both divisions counts as two multipliers!

AWARDS:

Engraved plaque to the highest overall score. Certificates awarded to the highest scorer per band and to the top 10 runners up.

ENTRIES:

Logs must show date and time in GMT, station worked, exchanges sent and received, QSO points claimed, and final claimed score. All entries with 100 or more QSOs must also include a check sheet. Entries must be mailed by December 1st to Ted Melinosky K1BV, 525 Foster St, South Windsor CT 06074. Include a large SASE for a copy of the results.

WASHINGTON STATE QSO PARTY
0100 to 0700 GMT September 17
1300 GMT September 17 to 0700 GMT September 18
1300 GMT September 18 to 0100 GMT September 19

The eighteenth annual contest sponsored by the Boeing Employees' Amateur Radio Society (BEARS) is divided into 3 operating periods as show. All amateurs are invited to participate. All bands (except 10.10 to 10.15 MHz) and modes may be used, but no CW QSOs are allowed in the phone bands. Stations may be worked once on each band and mode for contact points and more than once each band/mode if they are additional multipliers.

EXCHANGE:

QSO number, RS(T), and state, province, country, or Washington county.

FREQUENCIES:

Phone—1815, 3925, 7260, 14280, 21380, 28580.

CW—1805, 3560, 7060, 14060, 21060, 28160.

Novice—3725, 7125, 21150, 28160.

SCORING:

Washington stations score 2 points for each phone contact and 3 points for each CW contact, including contacts with other Washington stations. Multiply QSO points by the total number of different states, Canadian provinces, and other foreign countries worked.

All others score 2 points for each phone contact and 3 points for each CW contact with a Washington station. Multiply QSO points by the total number of different

Washington counties worked (39 maximum). There will be an extra multiplier of one for each group of 8 contacts with the same Washington county for all non-Washington stations.

AWARDS:

Certificates will be awarded to the highest-scoring station (both single and multi-operator) in each state, Canadian province, foreign country, and Washington county. Additional certificates may be issued at the discretion of the contest committee. Worked Five BEARS Awards are also available to anyone working 5 club members before, during, or after the QSO Party, unless previously issued. (All QSO Party entries will be screened by the contest committee for possible Worked Five BEARS Awards.) Worked Three BEAR Cubs Awards are also available for working 3 Novice members. All BEARS awards besides QSO Party certificates are handled by Doyel Burleson WA7HKD, Award Chairman. (See *73* for August, 1979, page 28, for additional details.)

ENTRIES:

Logs must show dates/times in GMT, stations worked, exchanges sent and received, bands and modes used, and scores claimed. Include a dupe sheet for entries with more than 200 QSOs. Each entry must include a signed statement that the decision of the contest committee will be accepted as final. No logs can be returned. Results of the QSO Party will be mailed to all entrants and an SASE is NOT required. Log sheets and summary sheets must be postmarked no later than October 19 and sent to: Boeing Employees' Amateur Radio Society, c/o Willis D. Propst K7RS, 18415 38th Avenue South, Seattle WA 98188.

RESULTS

73'S WORLD SSB CHAMPIONSHIP CONTESTS—1983 CLAIMED SCORES

40 Meters (Single Operator) W/VE

W1WEF	CT	13,728
N0OQS	IA	12,485
KA2EAY	NY	9,416
N7BUP	AZ	9,350
NF4F	TN	9,050

40 Meters (Multi-Operator) W/VE

K3TUP	PA	120,063
K8ND	OH	113,648
K5LZO	TX	81,512
KC8SZ	CO	78,713
KB0QA	SD	42,742

40 Meters (Multi-Operator) DX

4M3AZC	Venezuela	124,805
IO3MAU	Italy	83,447
OK1TN	Czech	77,940
CT4NH	Portugal	74,888
PY5EG	Brazil	69,064

40 Meters (Multi-Operator)

I5NPH	Italy	149,051
I4OUT	Italy	126,524
DA1TN	West Germany	47,738
JI1QQI	Japan	1,806

80 Meters (Single Operator) W/VE

KG1E	MA	83,104
N5AU	TX	82,156
N8II	WV	61,146
W3USS	MD/DC	54,984
KC8JH	OH	42,297

80 Meters (Multi-Operator) W/VE

N4TY	KY	41,106
K1WW	NH	39,933
K5LZO	TX	31,088
KA4JNC	VA	31,050
N8AKY	MI	25,216

80 Meters (Single Operator) DX

YV3BRF	Venezuela	132,108
IO3MAU	Italy	88,284
HI8GB	Dom. Rep.	75,330
C6ADV	Bahamas	32,550
CT4NH	Portugal	10,700

80 Meters (Multi-Operator) DX

I5NPH	Italy	101,092
JA2YKA	Japan	1,185

160 Meters (Single Operator) W/VE

KC8JH	OH	279,000
AAIK	DE	266,660
K0HA	NE	223,650
KV8Q	CO	194,370
K6SE	CA	191,750

160 Meters (Multi-Operator) W/VE

K8ND	OH	330,330
WA2SPL	NY	325,230
WB8JBM	OH	289,600
W4CN	KY	271,450
N7DF	KS	195,880

160 Meters (Single Operator) DX

YV3AZC	Venezuela	22,420
YV2IF	Venezuela	10,005
XE1HHA	Mexico	8,875
EA3CCN	Spain	3,640
OK1JDX	Czech	1,560

160 Meters (Multi-Operator) DX

YU7JDE	Yugoslavia	3,680

Full details of these very popular events will be featured in an upcoming issue.

KANSAS STATE QSO PARTY

0100 to 0700 GMT September 17
1300 GMT September 17 to 0700 GMT September 18
1300 GMT September 18 to 0100 GMT September 19

This is the second annual contest sponsored by the Boeing Employees' Amateur Radio Society of Wichita (BEARS0) and all amateurs are invited to participate. Use all bands (except 10 MHz) and modes. Stations may be worked once on each band and each mode for contact points, more than once each band/mode if they are additional multipliers.

EXCHANGE:

QSO number; RS(T); and state, Canadian province, foreign country, or Kansas county.

FREQUENCIES:

Phone—1815, 3925, 7260, 14280, 21380, 28580.
CW—1805, 3560, 7060, 14060, 21060, 28160.
Novice—3725, 7125, 21150, 28160.

SCORING:

Kansas stations score two points for each phone contact and three points for each CW contact, including contacts with other Kansas stations. Multiply contact points by the total number of different states, Canadian provinces, and other foreign countries worked. All others score two points for each phone contact and three points for each CW contact with a Kansas station. Multiply contact points by the total number of different Kansas counties worked (105 maximum). For all stations multipliers are counted only ONCE regardless of how many bands or modes they are worked on. However, there will be an additional multiplier of one for each group of eight contacts with the same Kansas county for all non-Kansas stations.

AWARDS:

Certificates will be awarded to the highest scoring station (both single and multi-operator) in each state, Canadian province, foreign country and Kansas county. Additional certificates may be awarded at the discretion of the contest committee.

Worked Five Kansas BEARS Awards are also available to anyone working five club members before, during, or after the QSO Party. All QSO Party entries will be screened by the contest committee for possible Worked Five Kansas BEARS Awards. All Kansas BEARS awards are administrated by Mike Thornton WA8TAH, Contest Chairman.

ENTRIES:

Logs must show dates and times in GMT, stations worked, exchanges sent and received, bands and modes used, and scores claimed. Include a dupe sheet for entries with more than 200 QSOs. Each entry must include a signed statement that the decision of the contest committee will be accepted as final. No logs can be returned. Log and summary sheets are available for an SASE from the contest chairman. Entries must be postmarked no later than October 20 and sent to: Boeing Employees' Amateur Radio Society of Wichita, c/o Mike Thornton WA0TAH, 1001 Munnell Ave., Wichita KS 67213.

SCANDINAVIAN ACTIVITY CONTEST

CW
Starts: 1500 GMT September 17
Ends: 1800 GMT September 18
Phone
Starts 1500 GMT September 24
Ends: 1800 GMT September 25

Object of the contest is to encourage activity on the part of Scandinavian and

RESULTS

1982 CRAY VALLEY RADIO SOCIETY 12TH SWL CONTEST

Name and Callsign	QSOs	Country Multipliers	Total
CW Section Single Operator			
John Alley WI-SWL	342	110	*37620
Jim Dunnet BRS 30694	239	126	*30114
Corker Rhines W8-SWL	174	82	14288
Neil Coxhead G-SWL	117	37	4329
Multi-operator			
Ray Smith and David Newland W5-SWLs	354	122	*43188
Phone Section Single Operator			
Jean-Jacques Yerganian ONL-383	748	286	*213928
Martin Parry G-SWL	683	222	*151626
John Sutton BRS 35509	634	210	133140
David Whitaker BRS 25429	533	232	123656
Top US Operator			
Bob Hertz Berg WDX-9IIK	303	94	*28482

*Certificate winners

RESULTS

1983 VIRGINIA QSO PARTY

Plaques: High VA: KG4W—86,625; High Mobile: W4OMW/M4—4,455; High Out-of-State: AE3Y—7,200; High QRP: K0RI—236*.

AL	WA4VEK	4
AK	WB4WXE	12
CA	W8NNV	210
CO	KV0E	775
CN	K1BV	792
FL	K4DDB	558
GA	K4BAI	120
WV	W3IJT	735
IL	K9BG	814
	KI9A	*31
IA	K0HOE	25
LA	W5WG	2492
ME	W1APU	840
MD	AE3Y	7200
MA	WA1UDH	3000
WI	K9GDF	130
MI	WB8WKQ	1628
NV	KA7GXO	221
NJ	W2UAP	1050
	W2JEK	*17
NM	KB5DQ	99
NY	W2MTA	3328
TX	K5LZO	720
OH	W8EAO	22
OK	N5AFV	8
OR	WB7VBQ	1
PA	WA3JXW	1275
SD	KC0ZU	153
NC	KS4S	63
WA	W7DRA	12

Province—Certificate

Ontario:	VE3KK	1740

* = QRP No multipliers.

non-Scandinavian amateurs to work each other and to promote communications skills between amateur stations worldwide. For the purpose of this, the 25th running of this annual event, non-Scandinavian stations will try to work as many Scandinavian stations as possible. Scandinavian stations are defined by the following prefixes: LA/LB/LG/LJ (Norway), JW (Svalbard and Bear Islands), JX (Jan Mayen), OF/OG/OH/OI (Finland), OHØ (Aland Island), OJØ (Market Reef), OX (Greenland), OY (Faeroe Island), OZ (Denmark), SJ/SK/SL/SM (Sweden), and TF (Iceland).

Operating categories include:

(a) Single Op/Single Xmtr—allband only; one person performs all operating, logging, and spotting functions. The use of multiplier spotting assistance or any other form of alerting assistance is not allowed in this category.

(b) Multi-Op/Single Xmtr—allband only; only one signal allowed at any one time on any band. The station must remain on the band for at least 10 minutes following initial transmission on that band after band change.

(c) Multi-Op/Multi-Xmtr—no limit to transmitters, but only one signal per band is allowed.

Club stations may work only multi/single or multi/multi categories. All transmitters and all receivers, including spotting equipment for a station using one and the same callsign must be located within a 500-meter radius. The same station may be worked once on each band. Only CW-to-CW and phone-to-phone QSOs are valid; no cross-mode contacts.

EXCHANGE:

RS(T) plus serial QSO number starting from 001. QSOs after 999 are numbered 1000, 1001, etc. Multi-op/Multi-Xmtr stations use separate serial numbers, starting from 001 on each band.

FREQUENCIES:

CW—3505-3575, 7005-7040, 14010-14075, 21010-21120, 28010-28125.

Phone—3600-3650, 3700-3790, 7050-7100, 14150-14300, 21200-21350, 28400-28700.

Don't forget to use only those frequencies you are authorized to use. (Above frequencies for the phone segment list non-US frequencies!) Regions 2 and 3 stations may also transmit on their frequencies above 3790 and 7100.

SCORING:

European stations count one point for every complete Scandinavian QSO on any band. Non-European stations count one point per Scandinavian QSO on 20- through 10-meter bands and three points per QSO on 80 or 40 meters.

The multiplier is the number of Scandinavian call areas worked. Note that LA1 = LS1 = LJ1! Portable stations without a district number count for the tenth area, e.g., W4XXX/OZ counts for OZØ and G3XYZ/LA counts for LAØ. OHØ and OJØ are separate call areas. SJ9 counts for the 9th call area in Sweden. Each multiplier cannot be credited more than once per band. The final score is the total QSO points times the sum of all multipliers.

AWARDS:

Top scorer in each country as well as each US call district, in each category, both on CW and phone, will receive a contest award provided a reasonable score is made. Depending on the number of entrants from each country, the award of additional certificates will be considered by the contest committee. The top scoring single-operator stations on each continent will receive a contest plaque both on CW and phone, provided a reasonable score is made.

ENTRIES:

Signed original logs (or copies of original logs) must be submitted separately for CW and phone. Logs to be filled out in the following order: date and time in GMT, station worked, sent and received exchange, band, multipliers, and points.

All entrants must submit a summary sheet showing station callsign, category, name of operator(s) and address. Indicate number of QSOs per band less duplicates, number of duplicates per band, number of multipliers per band, QSO points per band, and final score.

All entrants must submit a multiplier sheet for each band with more than 200 QSOs. Possible duplicate QSOs must be shown in the log and counted for zero points. Each entrant shall submit a duplicate QSO sheet for each band with more than 200 QSOs. Duplicate sheet to contain worked stations listed by DXCC countries and call areas.

Logs and accompanying sheets shall be mailed no later than October 30, 1983, addressed to: SAC Contest Committee, PO Box 306, SF-00101 Helsinki 10, Finland.

Violation of amateur radio regulations applicable in the country of the contestant or of the rules of this contest, unsportsmanlike conduct, and the taking of credit for unverifiable QSOs or multipliers may lead to disqualification. A log showing more than 1% unremoved duplicate QSOs results in unconditional disqualification. Each unremoved duplicate QSO found by the contest committee results in a penalty of 5 QSOs of the same value as the duplicate.

By submitting a contest log, the entrant agrees to abide by the rules of the Scandinavian Activity contest and by the decisions of the contest committee. The committee's decisions are final and definite. Right to changes in the rules is reserved.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

BLOOMINGTON IN
SEP 4

The 6th annual Bloomington IN hamfest will be held on Sunday, September 4, 1983, from 8:00 am to 3:00 pm, at 2335 Vernal Pike, Bloomington IN. Admission is $2.00 with no additional charge for flea-market sales. Dealer and flea-market setups start at 7:00 am. Refreshments and lots of parking will be available. Talk-in on 147.78/.18 and 146.04/.64. For further information, contact Bob Myers K9KTH, 2335 Vernal Pike, Bloomington IN 47401.

LARAMIE WY
SEP 9-10

The fourth annual High Plains Ham Roundup will be held on September 9-10, 1983, at Yellow Pine and Pole Creek Campgrounds, Medicine Bow National Forest, 10 miles east of Laramie, Interstate Highway 80, Lincoln Monument turnoff. The campgrounds have been reserved for hams and their families. Bring your own food and drink and stay as long as you wish. Roast beef will be furnished for the potluck supper on Saturday evening. There will be a bluegrass band, a barbershop quartet, and a sing-along. Talk-in on 146.25/.85, 146.22/.82, or 146.52 simplex. For further information, contact Mick Marchitelli, PO Box 731, Laramie WY 82070.

HAMBURG NY
SEP 9-10

Ham O Rama '83 will be held on Friday and Saturday, September 9-10, 1983, at the Erie County Fairgrounds (Buffalo Raceway), Hamburg NY, just south of Buffalo NY. The hours on Friday are 6:00 pm to 9:00 pm and on Saturday, 7:00 am to 5:00 pm. General admission is $3.50 in advance and $4.00 at the gate. The inside flea market is $10.00 and the outside flea market is $3.00. Features will include new equipment, video, and computer displays, technical and non-technical programs, an auction, and a radio test bench. Talk-in on .31/.91 (W2EUP). For more information, contact N. Oldfield WA2ZSJ, 126 Greenway Boulevard, Cheektowaga NY 14225.

JOHNSON CITY TN
SEP 10

The Bristol, Kingsport, and Johnson City Amateur Radio Clubs will hold the 3rd annual Tri-Cities Hamfest on Saturday, September 10, 1983, at the Gray Fairgrounds, Gray TN, midway between the three cities and just off I-81. General admission is $2.00 in advance and $3.00 at the gate; flea market, $5.00. Everything will be indoors and computer enthusiasts are welcome. For tickets or more information, write Tri-Cities Hamfest, PO Box 3682 CRS, Johnson City TN 37601.

LOUISVILLE NY
SEP 10

The area amateur radio clubs and REACT teams will sponsor the fourth annual Seaway Valley Hamfest on Saturday, September 10, 1983, rain or shine, at the Louisville Firemen's Area, Louisville NY. Tickets are $2.50 per person in advance and $3.00 per person at the gate; children under 12 will be admitted free. Registration and the flea market begin at 9:00 am (setups may begin at 7:30 am). There will be a snack bar all day. Events will include an ARRL officials forum, technical talks, an OSCAR presentation, and a magic show. The ticket includes flea-market space, either tailgating or indoors. Talk-in on .31/.91, .04/.64, .52/.52, or channel 9. For tickets, contact Lois Ierlan WA2RXO, 725 Proctor Avenue, Ogdensburg NY 13669 (include an SASE or pick up the tickets at the main gate).

MARION IN
SEP 10

The 4th annual Grant County (Indiana) Amateur Radio Club Hamfest will be held on Saturday, September 10, 1983, beginning at 8:00 am, at McCarthy Hall, St. Paul's Catholic Church, Marion IN. Donations are $2.00 in advance and $3.00 at the gate. Table reservations are $2.00 per 8-foot table. Refreshments and free parking will be available. Talk-in on 146.19/.79 or 146.52 simplex. For tickets or further information, send an SASE to Jerry Richards KA9DLJ, PO Box 1146, Marion IN 46952.

MOBILE AL
SEP 10-11

The Mobile Amateur Radio Club will sponsor the Hospitality Hamfest on September 10-11, 1983, beginning at 9:00 am, at Al's Party Palace, 2671 Dauphin Island Parkway (1 mile off I-10). Admission is free. There will be XYL and YL activities, swap tables, adequate parking, reasonable overnight rates, and good food. Talk-in on 146.22/.82. For more information, write Jim Wilder N4GUC, (205)-343-7365.

WINDSOR ME
SEP 10-11

The Augusta Emergency Amateur Radio Unit will hold the 1983 ARRL-sanctioned State of Maine Hamfest on September 10-11, 1983, at the Windsor Fairgrounds. The gate donation is still $1.00 and camping is $2.50 per night. Features will include a flea market, programs for all, speakers, commercial distributors, light meals, and the traditional Saturday bean and casserole supper. Talk-in on the 146.22/.82 repeater or on 146.52. For further information, contact N1AZH, RFD #2, Box 3678, Greene ME 04236, or phone (207)-946-7557.

MELBOURNE FL
SEP 10-11

The Platinum Coast Amateur Radio Society will hold its 18th annual hamfest and indoor swap-and-shop flea market on September 10-11, 1983, at the Melbourne Auditorium, Melbourne FL. Admission is $3.00 in advance and $4.00 at the door. Swap tables are $10.00 for one day and $15.00 for both days. Food, plenty of free parking, and tailgate space will be available. Features will include meetings, forums, and awards. Talk-in on .25/.85 and .52/.52. For reservations, tables, and more information, write PCARS, PO Box 1004, Melbourne FL 32901.

FINDLAY OH
SEP 11

The Findlay Radio Club (W8FT) will hold the 41st annual Findlay Hamfest on Sunday, September 11, 1983, from 6:30 am to 5:00 pm, at the Hancock Recreational Center, 3430 North Main Street, Findlay OH. Admission is $3.00 in advance (cutoff date is September 1st) and $4.00 at the door. Tables are $6.00 each in the arena, and outdoor flea-market car spaces are $6.00. Talk-in on 147.15/.75. For more information and reservations, write Findlay Radio Club, PO Box 587, Findlay OH 45840.

MONETT MO
SEP 11

The Ozarks Amateur Radio Society will hold the 2nd annual Ozarks Amateur Radio Club Congress & Swapfest on Sunday, September 11, 1983, beginning at 11:00 am,

at the Monett City Park, junction of highways US 60 and MO 37, Monett MO (about 40 miles southwest of Springfield MO). There is no admission charge and no charge for swappers and tailgate traders (all space available on a first-come, first-served basis). The picnic and social hour begin at 1:00 pm. Bring a single covered dish to the country-style picnic and share in the buffet. Clubs are urged to attend as a group with an intent to form an alliance to expand the event in future years. Talk-in on 146.37/.97, 146.52, and 7.250. For more information, contact OARS, Box 327, Aurora MO 65605.

CARTERVILLE IL
SEP 11

The Shawnee Amateur Radio Association will sponsor Sarafest '83 on Sunday, September 11, 1983, beginning at 7:00 am, rain or shine, at John A. Logan College, Highway 13, near Carterville IL (9 miles east of Carbondale). Admission is $3.00 at the door. Features will include new equipment and computers, displays, a flea market, ladies' activities, forums, and contests. There will be free coffee and doughnuts from 7:00 am to 8:00 am, and lunch will be available from 11:00 am to 1:00 pm. Talk-in on 146.25/.85 MHz, 146.52 MHz simplex, and 3.925 MHz. For more information, contact William May KB9QY, 800 Hilldale Avenue, Herrin IL 62948, or call (618)-942-2511 days.

JACKSONVILLE FL
SEP 16-18

The first of two Great Southern Computer and Electronics Shows will be held on September 16-18, 1983, at the Veterans Memorial Coliseum, Jacksonville FL. Features will include computer hardware and software, peripherals, accessories, and word and data processing. Exhibits will include commercial and personal electronics, video products, robotics, and communications equipment. There will also be classes, workshops, seminars, and panel discussions. For registration information, exhibitors and attendees should contact Great Southern Computer and Electronics Shows, PO Box 655, Jacksonville FL 32201, or phone (904)-384-6440.

GRAND RAPIDS MI
SEP 17

The Grand Rapids Amateur Radio Association, Inc., will hold its annual swap and shop on Saturday, September 17, 1983, beginning at 8:00 am, at the Hudsonville Fairgrounds. There will be dealers, an indoor sales area, an outdoor trunk swap area, and a food concession. Talk-in on 146.16/.76. For more information, write Grand Rapids Amateur Radio Association, Inc., PO Box 1248, Grand Rapids MI 49501.

SEBASTOPOL CA
SEP 17

The Sonoma County Radio Amateurs, Inc., will hold their indoor ham radio flea market on Saturday, September 17, 1983, from 9:00 am to 3:00 pm, at the Sebastopol Community Center, 390 Morris Street, Sebastopol CA (5 miles west of Santa Rosa, just off Hwy. 12). Admission and parking are free. Indoor flea-market spaces are $2.50 ($5.00 with a table) in advance and $3.00 ($6.00 with a table) at the door. Vendor setup starts at 8:00 am. Features will include a radio clinic and an auction in the afternoon. Refreshments will be available. Talk-in on 146.13/.73. For tickets and more information, write SCRA, Box 116, Santa Rosa CA 95404.

PEORIA IL
SEP 17-18

The Peoria Area Amateur Radio Club will hold its Peoria Superfest '83 on September 17-18, 1983, at the Exposition Gardens, W. Northmoor Road, Peoria IL. The gate opens at 6:00 am and the Commercial Building at 9:00 am. Admission is $3.00 in advance and $4.00 at the gate. Activities will include amateur radio and computer displays, a huge free flea market, a free bus for the ladies to Northwoods Mall on Sunday, and a Saturday night informal get-together at Heritage House Smorgasbord, 8209 N. Mt. Hawley Road, Peoria IL. There are full camping facilities on the grounds. Talk-in on 146.16/.76 (W9UVI). For reservations or more information, send an SASE to Superfest '83, 5808 N. Andover Ct., Peoria IL 61615.

NEW KENSINGTON PA
SEP 18

The Skyview Radio Society will hold its annual hamfest on Sunday, September 18, 1983, from noon to 4:00 pm, at the club grounds on Turkey Ridge Road, New Kensington PA. The registration fee is $2.00 and the vendor fee is $4.00. Talk-in on .04/.64 and .52 simplex.

DANBURY CT
SEP 18

The Candlewood Amateur Radio Association will hold its annual flea market on Sunday, September 18, 1983, from 10:00 am to 4:00 pm, at the Elks Lodge, 346 Main Street, Danbury CT (exit 5 off I-84). Admission is $1.00 and tables are $6.50. Features will include dealers and a magic show for the kids. Talk-in on 147.72/.12. For advance table reservations, contact CARA, PO Box 188, Brookfield Ce 06850. For more information, pl George KC2QF at (914)-533-2758, Ke N1BVS at (203)-744-6953, or George AF1U at (203)-438-0549.

PENNSAUKEN NJ
SEP 18

The South Jersey Radio Association will hold its 35th annual hamfest on September 18, 1983, from 8:00 am to 4:00 pm, at the Pennsauken Senior High School, Hylton Road, Pennsauken NJ. Tickets are $2.50 in advance and $3.50 at the gate; tailgaters are $5.00. Refreshments will be available. Talk-in on .22/.82 and .52. For more information, contact Fred Holler W2EKB, 348 Bortons Mill Road, Cherry Hill NJ 08002, or phone (609)-795-0577.

VENICE OH
SEP 18

The forty-sixth annual 1983 Cincinnati Hamfest will be held on Sunday, September 18, 1983, at Stricker's Grove, State Route 128, one mile west of Venice (Ross) OH. Admission and registration are $5.00. Features will include a flea market (radio-related products only), exhibits, music, talks, a hidden transmitter hunt, and an air show. Food and refreshments will be available. For more information, contact Lillian Abbott K8CKI, 317 Greenwell Road, Cincinnati OH 45238.

MT CLEMENS MI
SEP 18

The L'Anse Creuse Amateur Radio Club will hold their 11th annual swap and shop on Sunday, September 18, 1983, from 9:00 am to 3:00 pm, at the L'Anse Creuse High School, Mt Clemens MI. Take I-94 eastbound to the Metropolitan Parkway exit;

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then take the Metropolitan Parkway to Crocker; go left on Crocker to Reimold and then right on Reimold to the last school, L'Anse Creuse High School. Admission is $1.00 in advance and $2.00 at the door. FCC representatives will be there, as well as plenty of new and used gear. There will be lots of food and parking. Talk-in on 147.69/.09 and 146.52. For more information, send an SASE to Wm. Chesney N8CVC, 215 Elizabeth, Mt. Clemens MI 48043, or phone (313)-463-1412.

ELMIRA NY
SEP 24

The 8th annual Elmira International Hamfest will be held on September 24, 1983, beginning at 6:00 am, at the Chemung County Fairgrounds. Tickets are $2.00 each in advance and $3.00 each at the gate. The flea market is free; breakfast and lunch will be available at reasonable prices. Features will include tech talks and dealer displays. Talk-in on 147.96/.36, 146.10/.70, and 146.52/.52. For advance tickets, write John Breese, 340 West Avenue, Horseheads NY 14845.

WICHITA FALLS TX
SEP 24-25

The Wichita Amateur Radio Society will hold its second annual hamfest on September 24-25, 1983, at the National Guard Armory, Wichita Falls TX. Pre-registration closes Wednesday, September 21, 1983, and is $4.00 per person and $3.00 per swap table. Registration at the door is $5.00 and starts at 8:00 am both Saturday and Sunday. There is free shuttle service from the Kickapoo Airport (¼ mile south), free RV parking without hookups at the armory, and a concession stand open both days. There will be dealer displays, an inside flea market with 24-hour security, scheduled ladies' activities, contests, meetings, and many special events. Talk-in on 146.34/.94 and 147.75/.15. For more information and pre-registration, write to WARS Hamfest, PO Box 4363, Wichita Falls TX 76308.

YORK PA
SEP 24-25

The York County Amateur Radio Clubs will hold their 28th annual York Hamfest and Specialized Communications Expo on Saturday and Sunday, September 24-25, 1983 at the York Fairgrounds, Rte. 74 at the northwest edge of the city, York PA. Saturday registration is $2.00 and begins at 11:00 am; Sunday registration is $3.00 and begins at 8:00 am. Student registration is $2.00 for both days and children under 12 and XYLs will be admitted free. There will be tailgating Sunday only and gates will open at 6:00 am for tailgaters and vendors. Tailgate spaces are $3.00 per ten feet, plus registration (required for vendors and helpers). Indoor tables (with electricity) prepaid before August 1 are $5.00; $6.00 after August 1. There will be refreshments, computer displays, ladies' events, overnight camping, new equipment displays, and on Saturday, beginning at 1:00 pm, seminars and talks. Talk-in on 146.37/.97 and .52/.52. For table pre-registration and tickets, send checks to York Hamfest, Box W, Dover PA 17315.

GRAYSLAKE IL
SEP 24-25

The Chicago FM Club, Inc., will hold Radio Expo 83 on September 24-25, 1983, at the Lake County Fairgrounds, Rtes. 45 and 120, Grayslake IL (halfway between Chicago and Milwaukee). Tickets for both days are $3.00 in advance and $4.00 at the door. The flea market will open at 6:00 am and tables are available at $5.00 per day. Exhibits will open at 9:00 am. The camp area will be open Friday night and camping is free. There will be displays of communications, how-to and technical sessions, discussions with FCC and ARRL spokesmen, and a ladies' program. Talk-in on 146.16/.76, 146.52, and 222.5/224.10. For more information, write to Radio Expo, Box 1532, Evanston IL 60204, or call (312)-582-6923.

CLEVELAND OH
SEP 24-25

The Cleveland Hamfest Association will hold the Cleveland Hamfest, 1983, and the ARRL Great Lakes Division Convention on Saturday and Sunday, September 24-25, 1983, at a new location, Cleveland Aviation High School, North Marginal Road, between E 55th Street and E 9th Street, by Burke Lakefront Airport, off I-90 or I-77. The ARRL/Cleveland Hamfest Banquet will be held on Saturday, September 24th, and on Sunday, September 25th, the hamfest will be open from 8:00 am to 5:00 pm. The flea market will open at 6:00 am and spaces are $2.00 each. General admission is $3.00 and advance tickets are $2.50. Features will include forums, commercial exhibits, and ladies' activities. Breakfast and lunch will be served and overnight parking, as well as free parking in a secure area, will be available. Talk-in on 146.52 (W8QV). For advance tickets, send a check or money order before August 31, 1983, to Cleveland Hamfest Association, PO Box 93077, Cleveland OH 44101.

WILLIMANTIC CT
SEP 25

The Natchaug ARA will hold a hamfest and giant flea market on Sunday, September 25, 1983, from 9:00 am to 4:00 pm, at the Elks Home, 198 Pleasant Street (off Rte. 32), Willimantic CT. Admission is $2.00; tables are $5.00 in advance and $7.00 at the door. The ARRL-approved event will be both inside and outside and free parking will be available. Talk-in on 147.30/147.90 and 146.52. For more information, contact Edward C. Sadeski KA1HR, 49 Circle Drive, Willimantic CT 06226, (203)-423-7137, or Clifton Pease KA1HYW, 268 Main Street, Willimantic CT 06226, (203)-456-1432 after 4:00 pm.

GAINESVILLE GA
SEP 25

The 10th annual Lanierland ARC Hamfest will be held on September 25, 1983, beginning at 9:00 am, in Holiday Hall, Holiday Inn, Gainesville GA. Admission is free, as well as tables and inside displays for dealers requesting them in advance. Activities will include a large flea market, a boat-anchor auction, and a ladies' country store. Talk-in on 146.07/.67. For more information, contact Phil Loveless KC4UC, 3574 Thompson Bend, Gainesville GA 30506, or phone (404)-532-9160.

BOULDER CO
SEP 25

The Boulder Amateur Radio Club will hold its fall swapfest, Barcfest, on September 25, 1983, from 9:00 am to 3:00 pm, at the National Guard Armory, 4750 N. Broadway, Boulder CO. Admission is $3.00 per individual or per family. There will be an indoor and outdoor flea market, a snack bar, and free parking. Talk-in on 146.10/.70 and 146.52 simplex. For more information, phone Tim Groat KRØU at (303)-466-3733, or write 1000 East 10th Avenue, Broomfield CO 80020.

GARDEN CITY KS
SEP 25

The Sandhills Amateur Radio Club will hold its annual Eye-Ball OSO Party on September 25, 1983, beginning at 9:00 am, at the Finney County Fairgrounds, Garden City KS. For more information, send an SASE to SHARC, PO Box 811, Garden City KS 67846.

WOODBRIDGE NJ
OCT 1

The De Vry Technical Institute Amateur Radio Club will hold its annual flea market on October 1, 1983, from 9:00 am to 4:00 pm, in the school parking lot, 479 Green Street (between Rtes. 1 and 9), Woodbridge NJ. Admission is $3.00 for sellers and free for buyers. No electricity will be available. For further information, contact Frank Koempel WB2JKU, De Vry Technical Institute, 479 Green Street, Woodbridge NJ 07095.

SYRACUSE NY
OCT 1

The Radio Amateurs of Greater Syracuse (RAGS) will hold their annual Hamfest and Computer Display on Saturday, October 1, 1983, from 9:00 am to 6:00 pm, at the Art and Home Center, New York State Fairgrounds, Syracuse NY. Admission is $3.00 at the door. Featured will be commercial exhibitors, a large indoor and outdoor flea market, tech talks, an ARRL booth, displays, women's activities, contests, and entertainment. Hot food and beverages will be served. Talk-in on .90/.30, .31/.91, and .52 simplex. For further information, contact RAGS, Box 88, Liverpool NY 13088.

WARRINGTON PA
OCT 1-2

The Pack Rats 7th annual Mid-Atlantic VHF Conference will be held on Saturday,

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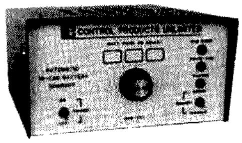

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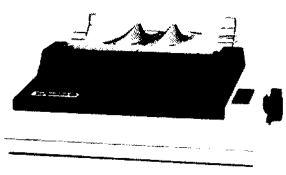

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October 1, 1983, beginning at 7:30 am, rain or shine, at the Warrington Motor Lodge, Route 611, Warrington PA. Advance registration is $4.00 and includes admission to the 12th annual Pack Rats Hamarama on Sunday, October 2, 1963, at the Bucks County Drive-In Theater, Route 611, Warrington PA. Admission to the flea market is $3.00 and selling spaces are $5.00 each (bring your own table). For advance registration, phone Lee A. Cohen K3MXM at (215)-635-4942, or send a check to Hamarama '83, PO Sox 311, Southampton PA 18966.

CEDAR RAPIDS IA
OCT 2

The Cedar Valley Amateur Radio Club (W0GO) will hold its 9th annual ARRL CVARC Hamfest on Sunday, October 2, 1983, beginning at 7:00 am, at the Hawkeye Downs Exhibition Building, Cedar Rapids IA. Tickets are $2.00 in advance and $3.00 at the door. Tables are $5.00 for the first and $7.00 for others. There is an overnight camping area, picnic facilities, ample parking, and a concession stand. There will be movies, manufacturers, dealers, and ARRL representatives featured. Talk-in on 146.16/.76, .52, and 223.34/.94 MHz. For advance tickets or reservations, write CVARC Hamfest, PO Box 994, Cedar Rapids IA 52406.

YONKERS NY
OCT 2

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Fair and Giant Flea Market on Sunday, October 2, 1983, from 9:00 am to 4:00 pm, rain or shine, at the Yonkers Municipal Parking Garage, corner of Nepperhan Avenue and New Main Street, Yonkers NY. Admission is $2.00 each and children under 12 will be admitted free. Gates will be open to sellers at 8:00 am and there will be a $6.00 admission per parking space which will also admit one (bring your own tables). Refreshments, free parking, and sanitary facilities will be available, as well as unlimited free coffee. There will be live demonstrations all day and a giant auction at 2:00 pm. Talk-in on 146.265T/146.865R or .52 direct. For more information, write YARC, 53 Hayward Street, Yonkers NY 10704, or phone (914)-969-1053.

REVERE MA
OCT 16

The 19-79 Amateur Radio Association of Chelsea MA will hold its annual fall flea market on Sunday, October 16, 1983, from 11:00 am to 4:00 pm (sellers admitted at 10:00 am), at the Beachmont VFW Post, 150 Bennington Street, Revere MA. Admission is $8.00 at the door, if available. Talk-in on .19/.79 and .52. For table reservations, send a check to 19-79 Amateur Radio Association, PO Box 171, Chelsea MA 02150.

BALTIMORE MD
OCT 23

The Columbia Amateur Radio Association will hold its 7th annual hamfest on Sunday, October 23, 1983, from 8:00 am to 3:30 pm, at the Howard County Fairgrounds, 15 miles west of Baltimore MD, just off I-70 on Rte. 144, 1 mile west of Rte. 32. Admission is $3.00. Indoor tailgating is $3.00 additional. Food will be available. Talk-in on 147.735/.135 and 146.52/.52. For table reservations and more information, write Ed Wallace K3EF, 9905 Carillon Drive, Ellicott City MD 21043.

SATELLITES

Amateur Satellite Reference Orbits

Date	OSCAR 8 UTC	OSCAR 8 EQX	RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
Sep 1	0002	87	0055	53	0102	60	0146	68	0111	55	1
2	0006	88	0050	53	0046	58	0137	67	0108	56	2
3	0011	89	0044	53	0031	55	0127	66	0105	57	3
4	0015	90	0039	53	0015	53	0117	65	0103	58	4
5	0019	91	0034	53	0000	51	0108	64	0100	59	5
6	0024	93	0028	53	0143	78	0058	64	0057	59	6
7	0028	94	0023	54	0128	76	0048	63	0054	60	7
8	0032	95	0017	54	0112	73	0039	62	0051	61	8
9	0037	96	0012	54	0057	71	0029	61	0048	62	9
10	0041	97	0007	54	0041	69	0020	60	0046	63	10
11	0045	98	0001	54	0026	66	0010	59	0043	63	11
12	0050	99	0156	85	0011	64	0000	58	0040	64	12
13	0054	100	0150	85	0154	91	0150	87	0037	65	13
14	0058	102	0145	85	0138	89	0140	86	0034	66	14
15	0103	103	0140	85	0123	87	0130	85	0031	67	15
16	0107	104	0134	85	0108	84	0121	85	0029	68	16
17	0111	105	0129	86	0052	82	0111	84	0026	68	17
18	0116	106	0123	86	0037	80	0101	83	0023	69	18
19	0120	107	0118	86	0021	77	0052	82	0020	70	19
20	0124	108	0113	86	0006	75	0042	81	0017	71	20
21	0129	109	0107	86	0149	103	0033	80	0014	72	21
22	0133	111	0102	86	0134	100	0023	79	0012	72	22
23	0137	112	0057	87	0118	98	0013	78	0009	73	23
24	0142	113	0051	87	0103	96	0004	77	0006	74	24
25	0003	88	0046	87	0047	93	0153	106	0003	75	25
26	0007	89	0041	87	0032	91	0143	106	0000	76	26
27	0012	90	0035	87	0017	89	0134	105	0157	107	27
28	0016	91	0030	88	0001	86	0124	104	0154	107	28
29	0020	93	0025	88	0144	114	0115	103	0152	108	29
30	0025	94	0019	88	0129	111	0105	102	0149	109	30
Oct 1	0029	95	0014	88	0114	109	0055	101	0146	110	1
2	0033	96	0009	88	0058	107	0046	100	0143	111	2
3	0038	97	0003	88	0043	104	0036	99	0140	112	3
4	0042	98	0157	119	0027	102	0026	98	0137	112	4
5	0046	99	0152	119	0012	100	0017	98	0135	113	5
6	0051	100	0147	119	0155	127	0007	97	0132	114	6
7	0055	102	0141	119	0140	125	0157	126	0129	115	7
8	0100	103	0136	119	0124	122	0147	125	0126	116	8
9	0104	104	0131	120	0109	120	0137	124	0123	116	9
10	0108	105	0125	120	0053	118	0128	123	0120	117	10
11	0113	106	0120	120	0038	115	0118	122	0118	118	11
12	0117	107	0115	120	0023	113	0108	121	0115	119	12
13	0121	108	0109	120	0007	111	0059	120	0112	120	13
14	0126	109	0104	121	0150	138	0049	119	0109	120	14
15	0130	110	0058	121	0135	136	0039	119	0106	121	15

PHASE IIIB

Recovering from a troubled beginning, Phase IIIB—now AMSAT/OSCAR 10—was boosted into a higher orbit on Monday, July 11. After correcting OSCAR 10's attitude and increasing the exposure of the solar cells, ground stations fired the kick motor for the first time at 2232 UTC. The second firing, which was scheduled for July 20, was to alter the inclination of the satellite. OSCAR 10 planners hoped to have the transponders operational by July 24.

OSCAR 10's transponders operate in two frequency ranges. The general beacon for Mode B is on 145.810 MHz, and the engineering beacon is slightly higher, at 145.987 MHz. The uplink is between 435.025 and 435.175 MHz, and the downlink is between 145.975 and 145.825 MHz. The general beacon for Mode L is on 436.020 MHz, and the engineering beacon is at 436.040 MHz. The Model L uplink is from 1289.050 to 1269.850, with the downlink between 436.950 and 436.150 MHz.

HAM HELP

I need the technical manual for an Eico model 460 oscilloscope. I will copy and return it.

H. L. Church
309 W. St. Louis St.
Lebanon IL 62254-0126

Can anyone supply me with a schematic and operating manual for the Akai VTS-150 color camera and recorder? I will pay copying costs or return the original. I could use similar data on the Morrow MB-6 receiver and the MB-565 transmitter.

Mark R. Nelson AJ2X
4317 Foley Drive
Knoxville TN 37918

CORRECTIONS

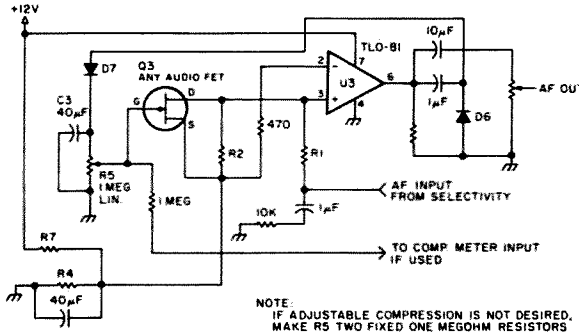

Fig. 1. Compression circuit with adjustable compression modification.

A couple of errors appeared in "What? Another Audio Filter Project?" in the November, 1982, issue of *73*. The compression and power schematic on page 33 was incorrectly drawn; it should look like Fig. 1. Fig. 1 also incorporates an adjustable compression modification. The modification described in the article will not work.

The clipper circuit on page 33 needs different component values to produce a clean output. Fig. 2 shows the circuit and new component values.

In some cases, the unit proved to be rf-susceptible. The cure is to run all of the leads from the filter through ferrite beads as they enter the case, and bypass the lead to ground with small ceramic capacitors.

George Thurston W4MLE
Tallahassee FL

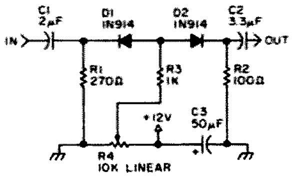

Fig. 2. Clipper circuit and new component values.

On page 12 of the July, 1983, issue, the author of "You Can Build This Code Trainer" was inadvertently omitted. The author of the article is Harry Latterman K7ZOV, 1655 W. Lindner Ave., Mesa AZ 85202.

Avery L. Jenkins WB8JLG
73 Staff

There is a way to improve the accuracy of the "VUM: Volume Units Meter," which appeared on page 72 of the August, 1982, issue. With the given values of R1-R7, the input attenuator has an error of about 10 percent. The following values will give an error of less than 1 percent: R1—6,900; R2—15k; R3—47k; R4—150k; R5—470k; R6—1.5M; and R7—4.7M.

George Thurston W4MLE
Tallahasse FL

REVIEW

SUPER-RATT RTTY/CW PROGRAM WITH RBBS

Surely you have heard the saying "Build a better mousetrap and the world will beat a path to your door." Why not turn things around and build a better "Ratt"? That's what the folks at Universal Software have done. First impressions are only worth so much, but if my judgment is correct, the world of Apple-computer-owning hams is already beating a path to the door of the maker of Super-Ratt. A software-only package, Super-Ratt is meant to be used with a 48K Apple II, Applesoft Basic, and at least one DOS 3.3 disk drive. You also need a terminal unit, one capable of interfacing to the Apple's TTL-compatible game I/O connector.

Though this review deals only with the straightforward RTTY portion of the program, Super-Ratt also offers CW transmit and receive capability and an integrated radio bulletin board (RBBS). The program itself comes on a non-protected DOS 3.3 disk and is accompanied by a professional-looking 65-page manual.

Set aside a couple of hours to get Super-Ratt running. First you'll need to make a working copy of the diskette and perhaps add some canned messages. And you will have to interface your Apple to demodulator and modulator circuits. Just about any of the popular terminal units (TU) should do the job, provided that it is TTL-compatible. Do take care to avoid hooking anything that remotely resembles high voltage to your computer, unless you want to make some repairs. For this review, a slightly modified Flesher TU-170 was used. If you don't have a TU, then you might want to build one of the simple circuits shown in the back of the Super-Ratt manual. A third choice is the Radcom TU which plugs directly into one of the Apple's peripheral slots.

Once the set-up phase is complete, actual operation starts simply: Just insert the disk, turn on the computer, and tune in a signal. There are no menus to deal with; the program goes directly to the receive mode and its standard five-part, 24-line screen display. The top and bottom lines are devoted to prompts and status information such as the mode, speed, and buffer. The received-text area is composed of 13 forty-character lines, while the transmit type-ahead buffer contents are displayed with four lines. Another four lines are used to denote boundaries, and the final line, situated between the receive and transmit display regions, is a scrolling readout of what is being sent during transmit. For tuning purposes, there is a mark/space indicator on the top status line.

Typing a combination of the control shift and P keys stops the receive function and brings up the help screen. There are 27 control codes, some of which you may use numerous times in each QSO; others you may never touch. "Joe Ham" will probably find the following most useful: Control-I inverts the mark/space sense; Control-K is for CW identification; Control-X, when put at the end of the transmit buffer, automatically switches the system back to receive; and Control-T is used for "break-in" operation for times when you want to make a quick reply and not disturb the type-ahead buffer. Other commands switch the speed or mode (Baudot, ASCII, and Morse) and let the operator erase the transmit or receive buffer contents.

The commands mentioned so far give an operator as many or more features than were usually found in an old-time mechanical RTTY station. The remaining 20+ Super-Ratt commands are like the icing on the cake. Among other things, they permit you to use an almost full screen for receiving, load and save disk files, have the buffer contents automatically stored to disk, make entries in a disk-based logbook, define and then use up to eleven different temporary sequences (i.e., the other op's callsign), and relay the last received transmission.

Besides straightforward CW and RTTY operation, Super-Ratt offers RBBS, selcal, and shortwave-listening capability. The following is just a brief introduction to these modes:

• RBBS (Radio Bulletin Board System) "... allows other people to use your computer as a message center. You do not need to actually operate your station yourself. The Apple II will do all the work." (From the Super-Ratt manual.) A quick spin across the RTTY portion of 40 or 80 meters will demonstrate the popularity of radio bulletin boards. If you decide to become a "sysop" (owner and operator of an RBBS), then be prepared to dedicate a rig, antenna, and computer to the project plus be willing to maintain the user-generated files frequently. Note: Be sure to check the FCC rules concerning unattended operation.

The Super-Ratt RBBS software has several unique features. Users can call up to four analog readouts that are based on inputs to the Apple game port, turn on a tape recorder and leave a voice message (VHF bands only), and switch the system to other codes and speeds.

• Selcal, or selective calling, puts Super-Ratt on guard for a password. As soon as it is received, the computer beeps and displays the time.

• SWL or shortwave listening: If you tire of the ham bands, then try tuning across the commercial spectrum. You'll find plenty of RTTY signals, some of which are unencoded. Super-Ratt makes copying these easier by offering a continuous range of speeds and automatic storage.

If you are like me and operating takes a backseat to hardware and software tinkering, then you'll be happy to learn that Super-Ratt is meant for the hacker. The programs are written in Applesoft Basic and come in both remarked and compacted versions. This brings us to "Ratt-Soft," an offshoot of Basic that uses the Apple's ampersand (&) command that allows users to define their own functions. Super-Ratt uses almost three dozen ampersand functions, and the manual includes a short description of each one in case you want to write your own software or make changes in the original program. The author of Super-Ratt encourages you to strike out on your own and, accordingly, the manual gives a brief description of the program variable names, reset parameters, and I/O locations. Obviously, anyone who wants to make use of this information should be acquainted with Basic programming and the Apple computer first.

Even the best mousetrap has some non-distinguishing characteristics, as does Super-Ratt. This program, like other software-only RTTY packages, is only as good as your terminal unit and receiver. (The Egbert II RTTY program is a notable exception. There, the software and computer form the TU.) If you have a simple one-chip pnase-locked-loop demodulator, then you are going to have trouble when fading and noise move in. Other quirks include the cumbersome way in which the time can be accessed if you have a hardware clock in your Apple; the program requires a manual update command to be typed on every occasion the time is sent, and if you are one of those operators who likes to monitor the status of the transmit and receive buffers, you'll find that the information is available but at the expense of shifting out of receive to glance at it. Finally, the mark/space status indicator is no substitute for a scope display or a good meter indicator when it comes time to tune in a signal.

My most serious reservations about Super-Ratt are the result of its sophistication. As a beginning user, at times I found myself typing the wrong command keys. The result certainly isn't fatal but it can be embarrassing. Hams new to RTTY may be intimidated by the array of commands, and the instructions don't always help — they highlight rather than fully explain features. Similarly, if you are a new Apple owner, it might be a good idea to spend a few weeks trying other, less sophisticated operations with your computer before you start interfacing it to a terminal unit and creating a RTTY program disk.

There are a handful of RTTY programs sold for the Apple computer. What makes Super-Ratt special? One, it offers solid performance for day-to-day operating; two, the radio bulletin board system is as interesting and popular as they come; and three, Super-Ratt is a program you can tinker with and grow into. Universal Software has indeed built a better "Ratt." And I suspect that the well-beaten path to their door will soon be turning into a highway.

Super-Ratt sells for $59.95. For more information, contact *Universal Software, 9 Shields Lane, Ridgefield CT 06877*. Reader Service number 490.

Timothy Daniel N8RK
Oxford OH

DRAKE 9000E COMMUNICATIONS TERMINAL

Within the past two to three years, after a rather lethargic period, there has been a resurgence of interest in amateur and SWL RTTY activity. Primarily, this has been due to the state of the art moving rapidly forward, thus making available video-display-type communications terminals, which, technically at least, far surpass the capabilities of teleprinters and their associated equipment.

This revival has also had the incentive of lowered costs of such terminals, together with the popularity of personal computers that has burst upon us within the last few years. Even the most lowly $89 computer can now transmit and receive RTTY and CW. Electronics has never been a standstill industry, and with the advent of the integrated circuit, it was only a matter of time until computers and ham radio merged to form a single path of two extremely exciting interests.

Actively aiding this explosion of interest in communications, the Drake Company of Miamisburg, Ohio, has recently released the Theta 9000E communications terminal.

To say that this terminal is the ultimate terminal would be incorrect, not because of any lack of features, by any means, but because of the very volatility of electronics design. Nevertheless, the Drake 9000E has so many operating features that some owners will probably never get around to using all of them. Let's look at these capabilities in depth and see how useful they can be to the operator or listener.

Features

The Theta 9000E operates in five distinct modes and numerous sub-modes. Not all of these are related directly to amateur radio or commercial monitoring, for several of these are definitely computer-oriented. This is not to say that this aspect may not also be ultimately used for ham operation. In fact, as FCC regulations permit (and it may be hoped these will continue to be brought to within the state of the art), the 9000E will be extremely useful when used in computer-to-computer communication.

Specifications of the 9000E are shown in Table 1. As a communications terminal, the 9000E will send and receive CW, Baudot (RTTY), and ASCII (RTTY and KCS). The last-named, Kansas City Standard, has some restrictions, which will be mentioned later. As a computer, the 9000E has a full word-processor function, useful for writing articles, letters, etc.

A standard and an enlarged video-display format can be used, as well as a memory capability of 14,000 characters which may be scrolled on-screen. A graphics function with an accessory light pen allows drawings to be produced on screen, which may be saved to a cassette tape recorder (not supplied) or transmitted to another Theta 9000E.

It is possible to use the terminal in full-

Drake Theta 9000E communications terminal (Photo courtesy of R. L. Drake Company).

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

duplex mode while using ASCII, and you can also use the unit as an RS-232C terminal at up to 9600 baud. Three frequency shifts are available, and either high-tone or low-tone pairs may be selected. Mark-only or space-only copy can be switched in and out, if required.

The only mandatory external equipment required for terminal operation is a power supply and a video-display monitor.

Additional features will be discussed in greater detail below.

Hardware

Mechanically, the 9000E definitely does *not* look like something kludged up in someone's garage. The appearance is first-class, and the mechanical rigidity is solid. All of the electronics are packaged in an attractively finished satin-black metal case measuring 16¼ inches by 9¾ inches, with the panel sloping from 1¾ inches at the front to 3¾ inches at the back.

The keyboard is standard "QWERTY" in ASCII format. In addition, there is a row of 14 special-purpose dual-function keys along the top of the keyboard. These are dedicated to control functions and are quickly identified as they are colored red with white markings (except one, the RESET key, which is white with black markings). There are numerous other computer-oriented keys on this keyboard, such as ESC (Escape), RETURN, BS (Back Space), etc. Nevertheless, when transmitting Baudot, it will conform to the requirements of FCC Regulations Part 97.69 regarding International Telegraphic Alphabet No. 2.

All of the alpha and numeric keys are colored light gray with white indicia, special control keys are black with white, and function keys are either white with black lettering, or, as in the case of the space bar and shift keys, red and red with white, respectively.

Overall, the keyboard has a very pleasing appearance and a good, definitive touch when the keys are depressed. I found the position of the RETURN key a little far away for my pinky to reach comfortably; it must pass over DELETE on the way. However, this opinion is subjective—nearly every computer now has the ENTER or RETURN key at a slightly different position, and it is a matter of getting used to it. (As will be explained later, there are only a few occasions when it is necessary to use the RETURN key anyway, as full-word wraparound is supported.)

It is necessary to remove the case in order to install two AA-type batteries used for memory retention (good for about one year). This is a simple operation and takes but a moment. LEDs are used to indicate power on and the presence of space and mark signals. Two variable controls, Fine Tuning and Volume, are in a vertical line on the right-hand side of the cabinet.

All connections to the 9000E are made via the rear panel (the internal speaker for the audio monitor faces out from this back panel also). Bringing all of the peripheral cabling out the back is quite satisfactory — the great number of possible connections would otherwise make a rat's nest of cabling. Coaxial cable the size of RG-174 (but not otherwise identified) is supplied for making connections to peripheral equipment, together with sufficient phono connectors. The use of this type of connector, especially for RS-232C connections, is not the best way to go. The parallel printer port has a standard DB-25 connection, which is much more effective. The power cable exits from the back panel, too, and jacks are available for connecting an external oscilloscope for monitoring space and mark tuning, if desired. All FSK and AFSK connection circuits are via high-voltage, high-current optoisolators.

The audio monitor is used for both transmitting and receiving and has its own gain control. Monitoring in Receive can be either the output of the mark signal path or space or the audio output from the agc amplifier prior to the channel filters.

Video-Display Terminal Requirements

The video-display terminal (monitor) may be of any size screen. Drake offers a monitor as an option. The display must be capable of accepting a composite video signal of 1.0 volt p-p at 75 Ohms impedance.

Power-Supply Requirements

A power source of 13.6 volts dc (−1, +2 volts) at 1.3 A is required for the 9000E. (Drake also offers a suitable power supply as an option.) An on-off rocker-type switch is on the back panel.

Functional Description (Communications-Oriented)

RTTY. The first mode to be described, and probably the most important in the eyes of many who are presently operating, is RTTY. RTTY is available on the 9000E in a multitude of modes, shifts, and speeds. Possibly the most common mode currently in use on the ham bands is Baudot operation with 170-Hz shift and 45.45 baud (60 wpm). However, all of the shift frequencies and baud rates shown in Table 1 are available by keyboard selection. Of course, all of those shown are not currently authorized by the FCC for amateur operation in the US.

These frequency shifts and transmission rates are available as AFSK or FSK transmissions, depending upon the output that is selected for use with the transmitter. Reception will be at the selected shift/speed, and, although it is possible to receive at a different shift or speed than that transmitted by using a quick keyboard change, this is a highly unlikely possibilty.

It should be noted that the shift frequencies and speeds shown in Table 1 are available in a high-tone or low-tone output. The choice made is largely dependent upon whether you are operating in the HF bands or on VHF.

ASCII. The other primary sub-mode in RTTY operation is the one that is gaining more and more adherents since being authorized by the FCC — ASCII. This mode will be of interest to computer buffs, too, as they may transmit and receive computer programs and operate remote computers with no translation needed from ASCII to Baudot.

As with Baudot, the ASCII shifts, speeds, and high-low tones are available, but because of the complete differences

1. Code
Morse code (CW), Baudot code (RTTY), and ASCII (RTTY and KCS)

2. Characters
Alphabet, figures, symbols, and special characters

3. Speed
Morse: Receiving 5-50 words/minute (automatic track)
Transmitting 5-50 words/minute (weight 1:3~1:6)
Baudot and ASCII: 45.45, 50, 56.88, 74.2, 100, 110, 150, 200, 300, 600, 1200, 2400, 4800, 9600 baud

4. Input
AF input impedance (CW, RTTY, and ASCII): 500 Ohms
KCS input impedance: 500 Ohms
TTL level input: common to CW, RTTY, and ASCII
RS-232C input: common to CW, RTTY, and ASCII

5. AF Frequency
Morse: 830 Hz

RTTY (Baudot, ASCII):	Mark	1275 Hz (low tone, 2125 Hz (high tone)
	Shift	170 Hz, 425 Hz, 850 Hz + fine tuning
KCS:	Mark	2400 Hz
	Space	1200 Hz

6. Output

Keying output:	CW	80 mA, 200 V	(optoisolator)
	FSK	80 mA, 200 V	(optoisolator)
	Remote	200 mA, 100 V	(optoisolator)
	PTT	100 mA, 100 V	(positive voltage only)

AFSK output impedance: 500 Ohms (common to CW, RTTY, and ASCII)
RS-232C output: common to CW, RTTY, ASCII

7. AFSK Output Frequency
Morse: 830 Hz

RTTY (Baudot, ASCII):	Mark	1275 Hz (low tone), 2125 Hz (high tone)
	Shift	170 Hz, 425 Hz, 850 Hz + fine tuning
KCS:	Mark	2400 Hz
	Space	1200 Hz

8. Display Output
Composite video-signal output impedance: 75 Ohms

9. Interface for Printer
Centronics compatible parallel interface

10. Number of Characters Displayed
Screen format (keyboard selectable):
80 characters × 24 lines = 1920 characters
40 characters × 24 lines = 960 characters
Possible number of characters displayed: 14,000 characters
Graphics mode: 80 elements wide × 72 elements high

11. Battery-Back-Up Memory
256 characters × 7 channels

12. Buffer Memory
3120 characters

13. Output Impedance for Oscilloscope
200k Ohms

14. AF Output
150 mW
Output impedance: 8 Ohms

15. Power Supply Requirement
Dc +12 V, 1.3 A

16. Dimensions
415mm × 245mm × 45mm~78mm

17. Accessories

Instruction manual	1
Pin plug	13
Fuse	1
Coaxial cable	4m
Light pen	1
3P connector	1

Table 1. Specifications for the Theta 9000E terminal.

in the codes of Baudot and ASCII, the 9000E has dedicated keys to permit selection upon power-up of either one or the other.

One other aspect of ASCII operation will be of interest: the so-called Kansas City Standard (KCS). This operation may be used for recording on a cassette recorder, so that in effect you have a "tape system" capable of storing text or RTTY pictures for future use.

CW. This is the third mode available for transmitting and receiving with the 9000E. This, too, is selected using a dedicated key. Similar to the Baudot and ASCII modes, the CW mode may be effected with several sub-types of operation. But in the case of CW, these probably are more valuable than in the RTTY mode. For example, you may transmit to the screen and built-in audio monitor any approved CW character. The latter is a "local" mode and is not transmitted (you could do that, too, of course). Also, if you need the practice, you may place the terminal in automatic cipher mode and it will send random five-letter group characters forever, if you would like that. You may also direct these groups to a tape recorder or a printer. Using your hand key, bug, or keyer, you can send manually and have it sound on the speaker and appear on the screen. Be-

cause of the acute character-recognition attributes of the 9000E, your sending had better be flawless or nearly so. This will be discussed again later on.

You may also send manually but receive by way of the terminal; technically, you could do the reverse by using the keyboard to transmit and listening and copying manually. You may even do this and use the keyboard for typing what you are hearing and have the screen or printer display your copy.

CW transmitting speeds are pre-selected, with the initial power-up state being 11 wpm. Nine other speeds may be keyboard-selected: 5, 6, 8, 14, 18, 23, 30, 39, and 50 wpm. Ten steps of weighting may be set, also by keyboard control.

CW reception speeds are automatically tracked. If there is a sudden switch from a higher speed of reception to a lower one, several characters may be dropped until synchronization is achieved.

The speeds shown above are not a fixed factor. A refinement of 1/64th higher or lower than the existing speed is possible by a double-key entry. (Using the 9000E for code practice, you could select a goal of speeding up 1/64th each day.)

Description
(Computer-Oriented)

If the preceding modes could be described as "communications," then the next can be called "computer." Nevertheless, these, too, may be used in communications where authorized or by direct wire using a modem.

Word Processor. The word-processor mode operates just as any computer word-processing program would, but it does not have all of the embellishments of some of the more esoteric computer programs or dedicated word-processing terminals. Notwithstanding that statement, it is still quite adequate for letter-writing, small article preparation, lists, logging, etc.

For those hams who may not be familiar with computer operations, word processing is the ability to compose, write (type), delete, modify, and move characters, sentences, and blocks of words on the video display until the material is satisfactorily composed. This is like typing something and then being able to change or correct any of it *before* committing it to the printed page.

The word-processor mode is accessed by pressing two keys simultaneously. The baud rate will be 300, and the AFSK output will be 2400 Hz mark and 1200 Hz space (KCS). Up to three pages of 65 lines are available for preparation purposes, with the video presenting 24 lines of 80 characters. The screen splits vertically in this mode, with the leftmost eight character columns comprising an "operation" area and the next 72 columns allowed for "data" — in this case, this is your text area.

In the word-processing mode, you may connect to a tape recorder as well as a printer. Full cursor control is obtained by using the labeled arrow keys, and the cursor may be moved up to 99 lines in one move (depending upon its location at the moment) by three keystrokes.

A great many other standard word-processing functions are available using similar key motions, such as block text change, line insertion/deletion, left and right margin justification, insert and delete spaces, and numerous others. Even one of the more useful and highly desirable functions found in good commercial word-processing programs is within the capability of the 9000E — character search. "Character" may be a single character or a sequence of characters, known in the computer field as a

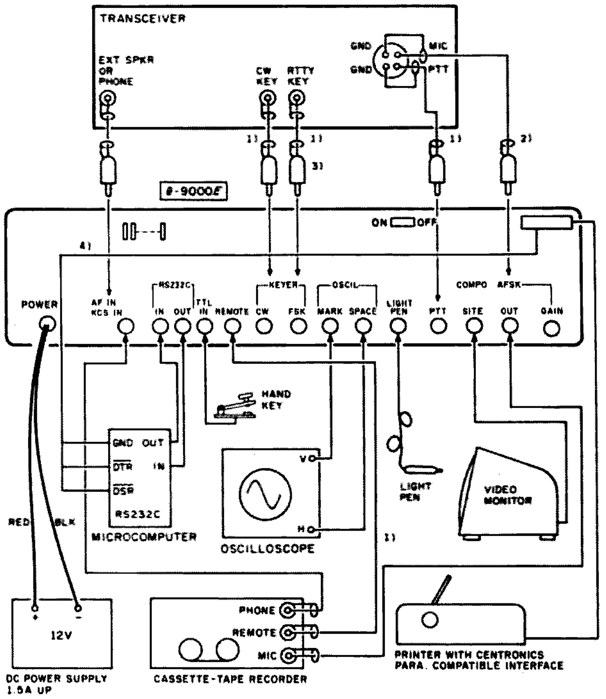

Fig. 1. Peripheral equipment interconnections.

"string." Merely by typing one letter plus the string being sought, the 9000E will search for and display the string upon locating it. This may take a second or two or a fraction of a second depending upon how far the string may be into the text from the start of the search. When found, the screen will scroll to the line where the string is located and the cursor will stop at the beginning of the line that the string is in. If no such string exists, the screen will display "NO DATA." Once found, the string may be deleted, modified, or moved, using the commands for these functions.

A rather unusual function, and one that is not customarily found in many word-processing programs, is the ability to draw vertical and horizontal lines on the screen or printer. A dual keystroke followed by a numeral will draw either one of these from the cursor position to the extent of the numerical quantity that has been entered. The manual describes this operation as the drawing of horizontal/vertical "lines," and the way it is presented is a little confusing. For instance, if nine horizontal "lines" (manual terminology) are to be drawn, nine hyphens in a row will appear. The manual indicates that each hyphen is a "line," which is not really the concept. Of course, you can draw nine truly individual *broken* horizontal lines by requesting the required number of hyphens for each of the nine lines desired. The same applies to vertical "lines." In this case, the vertical "lines" are colons presented vertically down the screen. Regardless of how this is presented in the manual, the ability to draw lines such as these is an excellent way to quickly lay out tables and charts on the screen and the printer.

The 9000E memory may be used for the retention of repetitive material used in the word-processing mode, the lines mentioned above, or names and addresses, etc., for instance, and these may be accessed as required. The memory function will be described in more detail presently in connection with the other functions.

Graphics. The final major function of the 9000E is the graphics mode. This will be mentioned in this review as a major mode, although in the 9000E manual it is relegated to a category of sub-functions that includes split-screen operation and selective calling.

The graphics mode, however, is not only unusual for a communications terminal to have, but also its output may be transmitted to other Theta 9000E terminals and could be useful for rough schematic drawings or block-diagram transmissions.

Graphics are created using a supplied light pen. Once again, for those not too familiar with computer techniques, a light pen may "read" or "write" data to and from a CRT by touching the light-sensitive tip of the pen to the screen. This is exactly what happens with the 9000E, but using the pen to read characters does not apply with this equipment. Any characters created on the screen may be transmitted to either a tape recorder or another Theta as mentioned.

Initially, in the graphics mode, the screen will display a full grid of small light squares (pixels). To use the light pen, the tip is touched against the display, and, while holding one key down, the pen is moved vertically and horizontally, as required. This creates a pattern of small inverted "U" block characters wherever the pen touches a pixel while the key is depressed. When finished, a single command erases all of the remaining pixels, which leaves the sketch as composed.

Memory

The impressive memory capabilities of the 9000E are sufficiently important to warrant review consideration in some detail. Memory in the RTTY mode is like having a built-in paper-tape capability. In this instance, however, you may modify and store data ready for transmission or other use in an instant, and without the noise of a paper punch.

The memory is available for use in all modes. In fact, some data stored in memory may be applicable and used interchangeably in RTTY *and* CW, for instance. But protocol will dictate actual usage: CW abbreviations have limited use, if any, in a RTTY QSO; on the other hand, words spelled out are seldom used in CW, except for traffic handling when this could be particularly useful. (For traffic handling, you can transmit the "received" screen, too.)

A 3120-character buffer memory may be utilized in split-screen mode on the lower portion of the screen. This is a volatile memory. A Random Access Memory (RAM) capability of 256 characters each in seven different channels is also available. Data is maintained in this area with the batteries mentioned under "Hardware." Data in this area may be changed at any time, and in any channel, without disturbing the contents of other channels. It should also be mentioned that data in the buffer may be changed even while being transmitted, if necessary (before it is keyed, of course).

One memory channel (channel 6) has 16 subsections with space for 16 characters each in it, and another (channel 7) has eight subsections of 32 characters each. Transmission of data in the first five channels (256 characters each) may be repeated up to nine times. Channel 6 with its 16 subsections may "chain" or overwrite into a subsequent channel if the number of characters in one exceeds its limits. Thus it, too, may be utilized for 256 characters if necessary. This channel also may be repeated up to nine times.

The operation of channel 7 is similar; however, subsection 7 of this channel has the "QBF" message written in it ("THE QUICK BROWN FOX..."), and "CW ID FOLLOWS" is in subsection 8, which will also normally contain your call. No repeat function occurs in channel 7. A stored "RYRY" is present, too.

Operator's Manual

Until I began reading the manual, I honestly believed that the 9000E was of US manufacture (not yet having looked at the serial-number plate). Almost immediately it was evident that the manual was written in Japanese-oriented English. Not that this pattern is particularly difficult to understand in this instance, but a few of the sentences and phrases throughout the manual are convoluted to the extent that you may ask, "What does this mean?"

In addition, the manual suffers from a lack of good organization, with a number of explanations either redundant or scattered piecemeal in different parts of the manual. A good English editorial treatment of the manual could cut its volume by a third and at the same time make it far more easy to read and understand.

Physically, the manual is composed of 75 pages of sharp typewriter-font copy; it is very legible, being printed on good quality, coated white paper. Sectional numbering is maintained throughout, although there is a preponderance of section, subsection, paragraph, and item numbering, which becomes quite confusing when looking for a particular subject.

All of this is bound in a stiff cardstock blue cover. Unfortunately, the book is glued along the spine, making it impossible to use it open and flat. (I cut the spine off, punched three holes in it, and bound it in a three-ring binder.)

There is a Table of Contents, but no Index, which would be helpful, inasmuch as the breaking up of information as mentioned above may place important information in more than one location.

One section, "Introduction to All the Function Keys," is a valuable inclusion. All keys, used singly, dually, or triply, are shown as they refer to the various functions they perform together with an ex-

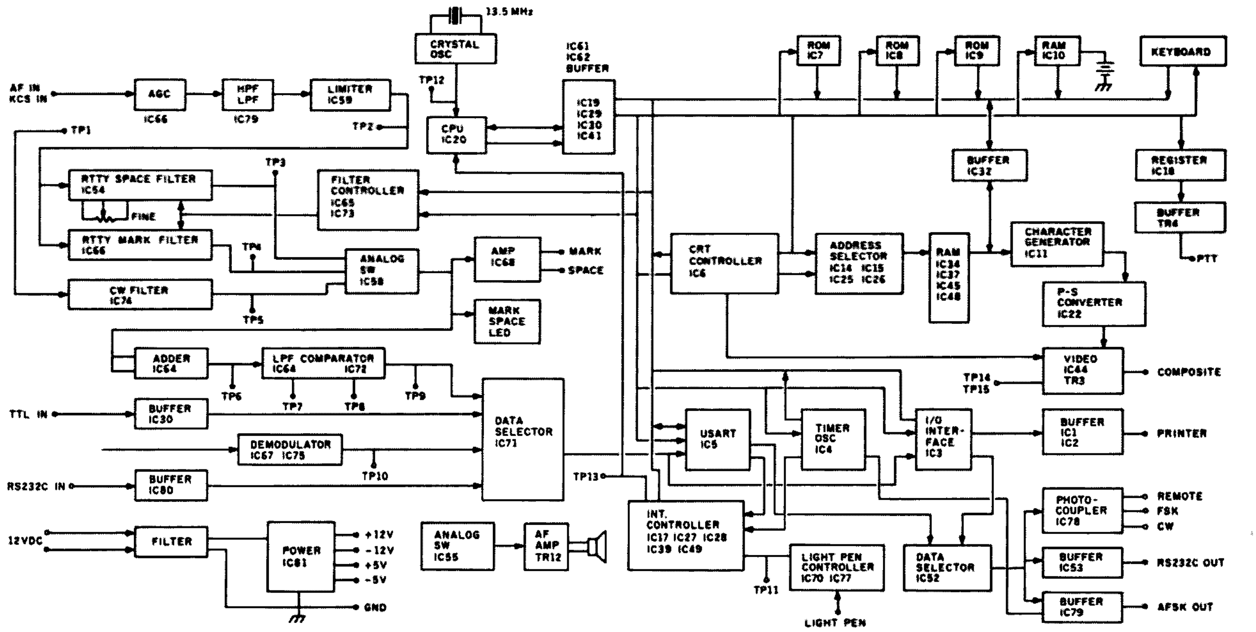

Fig. 2. Drake 9000E block diagram.

planation of exactly what occurs when they are pressed. The keytop identifications, as shown in this section as well as wherever they appear throughout the manual, are uniquely displayed and leave no doubt as to how they are to be used. This lucid system works this way: A keytop drawing is shown as a rectangle. Within it is the letter or word as it appears on the keytop, e.g., "SHIFT." If another key is used immediately afterward as a part of the function, it is shown as well, but with a space between the two. However, if two keys are to be pressed simultaneously, there is no space between the two keytops, just a single line dividing the two rectangles. This is one of the best ways I have seen to describe multi-key operations — and there are many required in computer activities.

There are two photographs in the manual, one of the keyboard (similar to the one shown here, but with callouts) and another of the rear panel of the terminal. Both of these are glossy photographs and were pasted into my copy, which would indicate I received an early copy of the manual (or perhaps that is the way the photos will be provided in all manuals). There are many line drawings explaining how the various screen displays will appear. There is also a good interconnection line drawing, an interconnection drawing for a selcal system, and one for using the 9000E as an RS-232C terminal with an external computer. There are other drawings showing connections to peripheral equipment (printer, recorder, etc.), an input-output circuit drawing, and a block diagram of the entire terminal. There is no schematic, however, and there's a dearth of detailed technical information.

In discussing the latter situation with Drake marketing personnel, I was advised that this was the extent of the information that was available at the present time. This is unfortunate, for although I would probably never attempt to do any serious troubleshooting on this complex unit, I would like to be able to analyze the circuitry. I am sure, too, that prospective owners would like to be able to make specification comparisons. This also raises a question in my mind as to just how Drake proposes to repair these units, under warranty or otherwise, if they have no technical data.

Back to the manual, briefly. Several tables at the back of the manual are useful. One shows the relationship of every key, both in upppercase and lowercase, of each CW, Baudot, and ASCII character and their representation on the monitor screen. Another table shows the CW signal, in dots and dashes, for every applicable key on the terminal. A table of control codes is also included.

Overall, it is a good manual, despite my criticisms. It is amply illustrated, with sometimes more being learned from these line drawings than from the text. Some prior operating experience on the part of the reader is a must in reading it, nevertheless.

Operating the Theta 9000E

Operating the 9000E in any mode is a pleasure. When first turned on, the top line of the video display reads, MODE? You now have a basic choice of selecting any of the available modes of operation simply by pressing one of the dedicated keys. Briefly, here is a typical example of operating supposing you had selected the key labeled MORSE.

Immediately, there is a status display across the lower third of the display. The information provided is MODE (in this instance it will read MODE = CW), TYPE, SENSE, INPUT, PTT, CH = 0, CASE, AUDIO = AGO, CR/LF = OFF, SPEED = 11 WPM, DIDDLE = OFF, and FUNCTION, with each of these indicating the default. It's a wealth of information, and more will be added as you select various functions.

It takes a while to become acquainted with the significant items. I say "significant" because, as the more knowledgeable among the readers will know, all of the function-status items shown above are not required in CW operation. For instance, DIDDLE will be used in RTTY if wanted, but not in CW — that's why it is OFF. The same applies to SENSE. RX = N and TX = N means "Normal," that is, not inverted — another RTTY assignment. It would probably be desirable in the status display if those items not applicable to the mode were not shown.

If you wish, you may now change the screen display from 80 characters of 24 lines to 40 characters of 24 lines, approximately doubling the size of the characters. At the same time, the status display will change to the larger character size and will now require four lines. Whatever is done is purely a matter of preference — many persons have difficulty reading an 80-character screen on a nine-inch monitor, for instance, and will opt for the larger characters. Then, too, some monitors will not accept an 80-character display.

Continuing with this typical CW session, you can now enter information relating to the type of operation to be used. If you will be receiving only, then no further preparation is necessary (assuming your input is audio from the receiver, thus AF in the status line). But if you plan to transmit (or send only to the audio monitor in the terminal) from the keyboard, the default transmitting speed of 11 wpm may need to be changed. One control key followed by one of the numeral keys will provide this change. Key 0 changes the output speed to 5 wpm. The remaining keys move the speed up as 6, 8, 11, 14, 18, 23, 30, 39, and 50 wpm. Also, you can fine-tune the transmitting speed, as has been described before.

The weighting adjustment can be performed within ten limits of 1:3 through 1:6. If you do not wish to enter optional parameters each time you fire up the terminal, you can store them in memory for automatic selection, but of course they may be changed at any time.

You will not change anything for receiving; the 9000E will track CW over the range 5 to 50 wpm. Dots that are less than 20 ms may be regarded as noise. Previous comments regarding the accuracy of the CW for copying apply — there are very few terminals, if any, that will copy rotten CW or what must be termed "non-International Morse." This terminal tends to print what is sent; if it forms a Morse character, it prints; if not, nothing!

Tuning CW is extremely easy. You just tune the receiver on the desired signal until the SPACE LED on the keyboard panel pulses with the signal. At this point, the audio signal is passing through the bandpass filter, which has a center frequency of 830 Hz. Tuning may also be done using the audio-monitor output, but this entails an extra keystroke to set up.

When you are ready to transmit, you may do so by applying whatever system your station requires to do so manually or by merely depressing the PTT key (yes, even on CW or RTTY, Push to Talk). When this is done, depressing any key will immediately start transmission. Pressing a two-key combination returns you to receive.

In CW, standard prosigns operate both in transmit and receive. Barred KN, AR, AS, and VA are available, for instance, and punctuation symbols such as colon, hyphen, right and left parentheses, etc., transmit the International Morse signals for these characters or print their deciphered representation. Barred BT is represented as " = " and barred AR as the " + " symbol, for example.

Initializing in either Baudot or ASCII RTTY mode is the same as for CW but by pressing the appropriate single keys for these modes. When the status display comes up, you enter whatever parameters you will be operating. The default in Baudot will be low-frequency tones, 170-Hz shift, and 45.45-baud operation. Any selection made will apply to both AFSK and FSK operation, which will have been chosen beforehand. As shown in the specifications, the 9000E accommodates both low and high tones. The protocol in ham operation is that the low-frequency shifts are used for HF operation and the high-frequency shifts (e.g., 2125 and 2295 Hz for a 170-Hz shift) are used in VHF operation.

You can change the default to a shift of 425 Hz or 850 Hz in both low- and high-tone groups. If 170 Hz in high-tone shift is needed, then this too must be entered as it is not the default. There is one other shift for KCS, which has mark at 2400 Hz and space at 1200 Hz. This is set from the ASCII mode.

In addition to the many sub-functions that have been mentioned before, you also have several other options designed for RTTY operation: ANTI, which will bring in anti-noise filtering and thus prevent garbage from printing; the optimum line length before carriage return (80, 72, or 84 characters, not to be confused with screen character width); and defeat of the carriage return. The latter action would be desirable if you were transmitting or re-

ceiving RTTY pictures, for instance. Speeds will also be set at this time, keeping in mind the previous comments about approved speeds. (It is extremely interesting to watch a stream of data displaying at 9600 baud, but don't try this on the air if you are operating lower than 50.0 MHz!)

DIDDLE (sometimes called IDLE) has a default of OFF and the function is not too often heard on the ham bands. This is a Letters code continuously transmitted whenever a printing character is not being transmitted, indicating the frequency is being used and the RTTY signal is not just a carrier (slower typists appear to use it to some extent). USO (Unshift on Space) can also be programmed, but this is not a function that can be placed into memory. Its use, too, is infrequent, but it is of great assistance when receiving weak signals. This places the terminal back into Letters case upon receipt of a space signal, thus preventing the printer or display from hanging up in Figures case for more than a few characters. Associated with this, the CASE = statement on the status display will show at all times the Letters or Figures status being received or transmitted at the moment it is occurring, except in ASCII mode. In the latter operation, ASCII will normally be operating as a typewriter would: in lowercase except for capitals and punctuation, with numerals transmitted as lowercase characters. (This does not preclude operating with all capitals in ASCII, however.)

Operation in RTTY is essentially the same as for CW. Depressing one key puts you on the air (or to tape, screen, or printer). You may operate one-on-one so to speak, whereby as soon as you stop transmitting and sign over, you are back to receiving; incidentally, there is not too much dialog-type operation (semi break-in) going on on the ham bands with RTTY. This is unfortunate, because the 9000E is ideally suited for this. As it is, most of the operation we see is of the type whereby one station transmits a long monolog and then waits for the same from the other station. If this is your style, the 9000E is perfectly compatible for this, too.

Splitting the screen facilitates this technique. A keystroke places all received data in the top nine lines of the screen. The transmitting screen is eight lines below this, with a blank line between. Following another blank line, the status display appears (two lines in 80-character mode) and remains always visible. Below the status display, there are three lines reserved for buffer memory. With this arrangement, while the other station is sending CQ, for example, you can be typing your call into the buffer and entering the automatic CW ID FOLLOWS command. As soon as the station signs, pressing just two keys transmits your buffer data. As it dumps out of the buffer, it will disappear off to the left of the screen, letter by letter, to reappear in the transmitting area of the screen as it is transmitted. You now have a record of the receiving and transmitting screens if you are making hard copy at the same time.

Nothing could be easier, and there is a great advantage in being able to compose your replies while the other station transmits, with your transmission streaming out at the full speed at which you are operating. Until the buffer is emptied, no one will know that you can type only five words per minute. Most operators will probably be able to keep up with the buffer at 60 wpm, especially if they have a few lines started before the other station signs over. Higher speeds will tax the skill of even the fastest operator.

CW operation can be just as much fun, with the restriction already noted about good CW being needed. No problems were noted in 100% copy at 35 wpm from W1AW taped bulletins and a number of commercial press stations at speeds of 20 to 40 wpm.

Selective Calling (Selcal)

Selcal can be used in any mode for receiving and transmitting and is one of the easiest to prepare for operation with this terminal.

Your identifying characters are stored in one of the memory channels prior to operation, and selcal is left activated. Upon receiving the same characters as stored in memory, the data being sent will be stored in a memory block and printed or displayed if activated. It may also be printed later, of course.

If you have stored data waiting for transmission, receipt of your END OF TEXT data, also previously prepared, will automatically transmit your data from memory. Although most applications of selcal operation will be in RTTY operation, as noted above it may be used in any mode, which includes CW.

Receiving Commercial Stations

No difficulty whatsoever was experienced in receiving any RTTY appearing on the ham bands where everyone generally was using 170-Hz shift and 60, 75, and 100 wpm. ASCII is being used to some extent, but it is necessary that its characteristics be recognized in order to place the terminal in ASCII mode for reception, even though you can switch from Baudot to ASCII at the touch of a key.

Tuning commercial RTTY stations required considerable patience in most cases. This is due to the fact that although a multitude of stations are scattered throughout the HF and LF spectrum, they are using odd frequency shifts, inverted signals, and numerous transmission speeds, so that it becomes a problem to immediately decipher the mode, speed, etc. Some will never be attainable and others, even when they are copied, are of little interest unless you are into cryptography.

There are tuning aids on the 9000E that make it easier to copy such stations, though. By carefully tuning so that you obtain both mark and space indications on the LEDs on the panel and then using the fine-tuning control, it is possible to establish the shift width. Of course, this may mean going through the operation for 170-, 425-, and 850-Hz positions. You may then need to determine the speed of transmission to have copy appear on the display. And in each situation you may need to determine whether or not the signal is inverted.

All things considered, tuning commercial stations can be a challenge. A good commercial station list such as published by Universal Electronics, Inc., in Reynoldsburg, Ohio, is invaluable in locating and tuning these stations. These guides give the transmission frequency, shift, speed, inversion, and type of transmission for hundreds of stations.

Problems and Criticisms

There was one unexplained action that occurred under certain circumstances but which cannot properly be considered a problem. This was when an attempt was made to perform a function that the terminal was not programmed to do at the moment. For instance, when a tone shift was attempted but a non-applicable secondary key was pressed, the speaker in the audio monitor chirped briefly. This could be some sort of alerting signal, but if it was, it was not mentioned in the manual. The R. L. Drake Company had no explanation for this either, except to agree that it might be a warning signal.

One other possible problem that appeared to be originating in the terminal was a slight non-linearity in the display about mid-screen. This gave the effect of sloping letters on a line. This occurred with three different monitors and could be a voltage-regulation problem. This corrected itself after about ten minutes of operation.

The connectors that were described earlier could eventually cause intermittent contact problems. The use of BNC-type connectors would probably increase the end-user cost by about ten dollars, but this would be in keeping with the other professional aspects of this terminal.

When the 9000E was connected to a Yaesu FRG-7700 receiver which used a wire antenna directly to the antenna terminal, the RFI from the 9000E microprocessor completely obliterated all signal reception — this notwithstanding statements of minimal radiation problems. Connecting the receiver via coaxial cable to another antenna (vertical) located 40 feet away from the terminal eliminated any vestige of RFI.

Some improvements could be made to the Operator's Manual. Additional technical information, and *at least* a schematic, would be an asset.

Summary Evaluation

As a multi-function dedicated communications terminal, the 9000E meets all of the requirements. It is mechanically and electrically well-constructed and has a pleasing appearance. All controls are ergonomically correct, and the keyboard has excellent tactile response.

Although it was not possible to evaluate filtering bandwidths without laboratory specifications, the filtering appeared adequate under all situations. The crystal-controlled AFSK signal appeared to be well within tolerance, but no specification was given for this either.

From an operation viewpoint—and this could be the proof of the pudding — the 9000E came up to all expectations and beyond. Every function operated as specified and operating ease was exemplary.

This is an excellent communications terminal; beginners, experienced operators, and anyone in between will feel very comfortable with it. I can recommend it highly for anyone looking for an outstanding piece of equipment, one which not only allows full on-the-air capabilities, but also is excellent for line communications and computer and word-processing operations.

For more information on the Theta 9000E communications terminal, contact the *R. L. Drake Company, 540 Richard Street, Miamisburg OH 45342.*

A. A. Wicks W6SWZ
Agoura CA

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HEATHKIT ULTRAPRO CW KEYBOARD

Have you ever felt that your CW sending could sound better? Have you felt perhaps, too, that to improve from where you are would take more time and effort than you would like to invest? You need to consider the new Heathkit Ultrapro CW keyboard (HD-8999).

Hams more familiar with a Stillson wrench than a keyboard soon become proficient at keyboard sending, with the promise of perfection which a keyboard offers. If you're ahead of the Stillson wrench group and know where the keys are on a typewriter or computer, with the Ultrapro, you too can be on your way to a dramatic improvement in your keying.

Buffer Memory

The Ultrapro is a compact gem of a keyboard that tends to turn the operator into the pro that the name implies. The crucial element in the keyboard for accomplishing this perfection is its buffer memory. The Ultrapro has a 64-character buffer, which is ample for high-speed sending.

Given my typing ability, a buffer of more than five to ten characters is gilding the lily at 45 to 50 wpm. What the buffer does is accumulate any characters I can type into it faster than I have set the keyboard to send. This affects my sending in three ways.

First, Ultrapro will stack those characters next to each other for perfect spacing of letters and, with the stroke of the space bar, the spacing of words. This action eliminates the little imperfections in timing that occur even with rhythmic typing on a keyboard without a buffer. If I have a momentary distraction, again, it won't show up in the middle of a word or sentence as a gap. Such gaps can be even more distracting to the person attempting to copy high-speed code.

A second effect is the minimization of keying errors. If I realize I have punched the wrong key, I can simply backspace one space ("delete" on the Ultrapro) and retype. The backspace both erases the error and resets the position in the word for the right letter. If my error is three letters back in the word, I backspace three and retype all three. Because I'm obliged to retype anything following the errors, I don't have to count forward to be able to start where I left off.

If I'm not sure of the entire word, or of even two or three words, I can shift/delete and, with each punch of delete, the last word or part of a word will drop out, leaving the space after the remaining word intact. Then, I merely continue to add to the buffer by typing in the correct words.

The third thing the buffer gives me is time to think of what I'm going to send next without having to throw in some potentially annoying (punctuation) dashes. The overall effect of the buffer, then, is to smooth the test into what we used to call tape-machine perfection.

In addition to the rapid correcting which the buffer memory affords, the two-key roll-over feature also facilitates fast typing. Simply stated, if I punch a second key before I let up on the previous one, the letters are entered in order as long as I let up on the first key before the second. Without this feature, neither might be entered or, possibly, only the first letter.

Commands also can be stored in the buffer so that, while typing ahead, I can tell the board to speed up ten words a minute right after I say I will. Weight and spacing changes may be accomplished in the same manner. The board will then type on at the previous setting until the buffer empties to the command that I gave. This can be a slight disadvantage if I decide that I want the change right away during a transmission. If I have any text in the buffer, I must wait until that text is transmitted before my command is fulfilled, unless I want to dump the buffer contents with the stop key, make a command, then retype what was dumped. This shows up as a short hesitation in my transmission

Hold Function

A distinctively larger hold key freezes the emptying of the buffer into the transmitter. This feature is good for a couple of reasons. If I'm operating QSK and think I hear a breaker, an interfering signal, or the person I'm talking with, I punch hold. If it's nothing that requires a response, I punch the hold key again and the buffer continues to transmit from where it left off. If a response is required, I punch another larger command key, the stop key. Then I can begin filling the buffer memory with my response if the signal from the other station continues. If the transmission is short, or stops, I punch the hold key a second time to re-enable the transmission of whatever I now type into the buffer.

Hold is also useful when the other station is about to turn it back to me. I punch hold. This condition is displayed on the LED digit display until I punch hold a second time. I then insert perhaps the other station's call and add my ID from the 495-character programmable memory. I'll write more about that later. Then I can type "R R" and start typing my reply into the buffer. As quickly as the other person signs "K", I hit hold the second time and continue to type into the buffer while it starts transmitting for me. This feature gives me more of that time we were talking about to think, type, make errors, and correct them.

Programmable Memory

The second type of memory in this board is intended to be filled with parts of transmissions that are recurrent in QSOs. There is available in this memory 496 characters worth of space. This memory is addressable at ten points by punching shift and then one of the digits from zero through nine. I don't have to cramp each message into a space 49.5 characters in length, either. That's because this memory has what is called soft partitioning, which enables me to mix long and short messages up to the full utilization of character spaces. I don't even have to enter them in numerical order.

Filling or changing any particular segment is easy, too. I punch set, the number of the compartment, and load. When I finish loading, I punch stop. This stops further entry into the programmable memory and enables the board for immediate sending. To delete a compartment to make more space available, I hit set, the number of the memory I'm sacrificing, load, and then stop. Each of these messages can be protected from the above by a protect command with the number of the compartment.

Inserting the command into the buffer memory to read one of these segments in the programmable memory takes up only one character of space in the buffer. This maximizes its available space. On the other hand, commanding a speed, weight, or spacing change will take up three or four spaces in the buffer.

Contesting

For the contester, aside from the board's handy programmable memory described above, it will send serial numbers - one each time you command its transmission. If you need to repeat a serial number in a QSO without the number's increasing, you command the previous serial number as many times as you need. While you are using this feature, the serial number is displayed continuously on the LED digit display instead of the transmitting speed, which is usually displayed.

The LED digit display is effective in providing the status information the operator needs. A punch of the weight or spacing keys results in a brief display of the parameter, then a return to the wpm value. Loading any of the programmable memories results in the display of a number anywhere from 495 to zero, depending on the remaining space available in these memories. Eight colored bars, five green, two yellow, and one red, denote the consumption of spaces in the 64-character buffer memory, eight letters at a time. During the time that the buffer memory is referring to one of the programmable memories doing a transmission, a small green dot on the LED display signals this to the operator.

An interesting feature of the circuit is its ability to evaluate itself. A flick of the reset switch on the back of the board runs the microprocessor and integrated-circuit diagnostic tests. If all is well, the buffer-status bars will light briefly, and the speed will set and indicate at 20 wpm on the LED digit display. If one of the ICs or the microprocessor is faulty, the circuit component number (e.g., U-2) will be displayed. This feature could take a lot of guesswork out of troubleshooting the keyboard.

Memory of the sending parameters as well as of the programmed material is preserved with minimal current from a battery if the unit is disconnected from its power source. The unit will operate from a range of 7.5 to 11 V ac or 11 to 16 V dc of either polarity.

Code Practice

The code-practice mode offers several useful features to those so inclined. In addition to the usual, some of these features are: (1) selection of type or types of characters on which you wish to concentrate; (2) selection of desired speed, spacing, and weight; and (3) selection of copy mode, using which you must press the correct key after hearing the character before the board will give you the next one. The code-practice mode utilizes random-length and five-character-length groups, not words. My feeling is that this mode might be useful to the early learners of CW to whom the owner of the keyboard might like to be of assistance. I can't recommend staying long with copying random groups to the person interested in learning code at higher speeds.

The Ultrapro keyboard is light (shipping weight 7 lbs.) and stable on a desktop or held on the lap. The keytops are slightly sculpted and the action is without wobble, giving touch and sound feedback that is not obtrusive. A shift/tone command will add level-adjustable sidetone. The key spacing approximates that of my electric typewriter and feels optimal to me. The feel of the board is one of an electromechanical device designed for long, trouble-free service.

Conclusion

As if all the foregoing features weren't enough to commend this new Heathkit, the price for the kit seems quite reasonable: $249.95. And if those features don't quite qualify you sending for Ultrapro status, sprinkle it with the exclamation point, parentheses, semicolon, and colon — these should heighten the color of your QSOs (I've been too fainthearted to use them)! I recommend this kit to anyone who is interested in making a significant improvement in his sending, whether he or she communicates best at 5 wpm, 99 wpm, or somewhere in between.

For more information about the HD-8999 CW keyboard, contact *Heath Company, Benton Harbor MI 49022.* Reader Service number 489.

David Learned W8DFI
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EGBERT II RTTY PROGRAM

Most of the gear I review comes carefully packed in one or more large cardboard cartons. The Egbert II RTTY program was an exception. It arrived in a plain, large-size manila envelope. But Egbert II's inauspicious size and packing material are certainly made up for by its features. Simply put, Egbert II offers all that you need to turn your Apple computer into a RTTY terminal. (Well, not quite all... you will need some cables to go between the rig and computer, but that's it.) No terminal unit, no interface card, no extra demodulator circuits. It is all right there on one floppy diskette.

To use the Egbert package, a 48K Apple II, II+, or IIE with one disk drive and Applesoft Basic is required. A printer is optional. If you are a Franklin Ace 100 or Ace 1000 owner, then you must provide some sort of modulator and demodulator since the Egbert program typically utilizes the Apple's cassette interface not found on Franklin computers. Also available under the Egbert name is a CW transmit-receive program for the Apple and a program for transferring Applesoft, Binary, and Integer disk files. This review deals only with the RTTY portion of the package.

The software comes on a single 13-sector copy-protected disk with the user's callsign already embedded. Getting on the air is very simple. First one must create a 16-sector message disk and hook up cables to the receiver audio output, transmitter mike input, and, if desired, the push-to-talk line. The only interface circuitry that may be needed is a 10k-Ohm pot for adjusting the mike drive level and a transistor switch to work between the Apple's TTL level T/R and your rig's push-to-talk line.

It takes about 30 seconds to load the software and insert a message disk. Each initialization step is menu-driven and can be passed through quickly to reach the default mode of 60-wpm RTTY with a standard 170-Hz shift. Or you can enter in your own parameters: Baudot at 60, 67, 75, and 100 wpm, ASCII at 110 baud, any desired mark-space combination, and tone reversal to invert the mark and space frequencies.

The final step before operation is setting the receive frequency. High-resolution graphics are used to display the relationship between the software-driven filtering and the actual mark-space frequencies. You may tune in a signal by adjusting the receiver until the display lines up or by shifting the computer filtering via one of the Apple's arrow keys. With tuning complete, you press RETURN and start receiving. During reception, the graphics are replaced by two flashing stars, allowing you to make minor adjustments in the tuning.

Egbert II offers split-screen operation; received data is displayed on the upper portion of the screen while the bottom three lines are devoted to a type-ahead buffer for your response. If the op on the other end is long-winded, then you might want to use the receive buffer. This saves the received text to memory while it is being displayed. A separate set of commands saves the buffer to disk. Viewing the data is done through the Print Buffer option and can be done via the screen or a printer. Another option is the real-time print option where incoming data is both displayed on the screen and printed out. Although I didn't test this feature, the printer program can accommodate a Votrax speech synthesizer so that words are spoken as they are received.

Transmit features include the type-ahead buffer, a quick break that allows your reply without disturbing the transmit buffer, and automatic CW ID at the end of each transmission. If you are using a message disk, then it will take only two keystrokes to transmit any one of nine canned messages. Each message has an independent length, with a total of 4800 characters allowed for the group. Another help is the inverse display for every 65th character typed. This is handy when working a station with a mechanical teletype machine, indicating that it is time to insert a carriage return.

In addition to normal transmit and receive operation, the Egbert II program offers limited mailbox capability. The computer operates unattended, saving incoming messages to memory and then to disk when the memory is filled. Two options are available: You may store all incoming messages on a particular frequency or just those that are preceded by a special recognition code. Unlike some of the more sophisticated mailbox systems, the Egbert II program is limited to receive-only operation.

The hardware-free approach of Egbert II warrants a closer look. At the heart of the system, you'll find the Apple's seldom-used cassette I/O and some unique software. The cassette input circuitry is merely a level detector, converting the incoming sine wave into a square wave. The Egbert II software does the rest of the job, measuring the frequency of the signal and determining if it is a mark or space.

This approach is not without drawbacks. Signals must be strong and in the clear. Remember, there is no filter to prevent a signal adjacent to the one you want from being read by the Apple. In practice, I found the Egbert II hardwareless design to work quite well and was able to copy the majority of the stations I heard. Judicious use of the rig's (a TS-830) filters was a great help. If your receiver is lacking in this department, then I recommend using a tunable audio filter between it and the Apple.

For serious HF operation, you may want to use a terminal unit. The Egbert program accommodates this by using the Apple game port as an alternative input. The TU must have TTL-level outputs for the received mark and space signals and be compatible with a TTL signal for transmit.

The high-resolution tuning display is a nice touch, but I usually dispensed with it and relied on the simpler two-star tuning aid. With a bit of practice, I was able to tune in a signal in just a few seconds. The fancy tuning display needn't be forgotten, though; the instruction manual suggests that it can also be used as a graphical frequency counter.

My only complaints center on the Egbert II transmit operation. The type-ahead buffer has a backspace feature that is handy for making corrections, but unfortunately there is no cursor to indicate where a correction will take place, making it easy to get lost. A second drawback is the way in which the type-ahead buffer disappears every time you switch to transmit, even if it is only for a quick break. The information is still in memory ready for the next transmission, but there is no way to find what it is without going back to transmit.

A seasoned RTTY operator may find the Egbert II software to be too simple for day-to-day use. However, I feel that the lack of bells and whistles makes the program ideal for beginners. All the necessary commands are displayed on the screen and you can become an expert in a half hour or less, including the time it takes to interface your Apple to a rig. Sure, the software-driven terminal unit won't equal the performance of a dedicated circuit, but you just might be surprised at how

well it does work. One thing's certain: Hams that own an Apple won't find a more painless or less expensive way to try their hand at RTTY.

The RTTY portion of this program is available for $39.95. For more information, *contact the W. H. Nail Co., 275 Lodgeview Drive, Oroville CA 95965.* Reader Service number 486.

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RTTY89 RADIOTELETYPE COMMUNICATIONS PROCESSOR FROM COMMSOFT

As digital communications slowly but surely revolutionizes amateur radio, many firms have taken a stab at producing computerized RTTY programs. Few companies have accomplished this task more skillfully than Commsoft, makers of RTTY89, a radioteletype program for the Heath H89 All-in-One microcomputer. RTTY89 was written by Howard L. Nurse W6LLO and is designed to make maximum use of the special function keys and 80-column video display capabilities of the H89. This combination of computer and software, along with the best instruction manual in the business, comprises a truly outstanding RTTY system.

Specifications

In the simplest terms, an H89 computer running the RTTY89 program is merely a solid-state substitute for a mechanical teleprinter. But that's only the tip of the iceberg. Unlike any mechanical unit I know of, RTTY89 allows you to switch between any of four Baudot and three ASCII speeds at the push of a button.

In common with all of the better computer RTTY programs, RTTY89 features a split-screen display. The upper portion of the video screen shows the incoming message, while you simultaneously use the lower portion to compose your response. Your message is stored in what Commsoft calls the "pretype buffer" until you press two keys to begin transmitting. Both incoming and outgoing data can be automatically sent to a printer or floppy disk for a permanent record of your RTTY contacts.

A number of permanent messages are stored in the program and may be called up for transmission at any time. These include a "CQ" with your call inserted in the appropriate spot; a line of "RYRYRY..." or its ASCII equivalent, "U*U*U*...", for testing and tuning; a special preamble for the start of your transmission featuring a CW ID, time, and date; and a similar closing for the end of your messages. In addition, you can create three short, custom messages of up to 70 characters each. Both the permanent and user-created messages may be called up for transmission with a single keystroke. Longer messages of your own design, such as brag tapes, can be created at your leisure using a word processor and stored on a floppy disk. Then they can be recalled from disk during RTTY operation and inserted into your outgoing message.

Among the other outstanding features of RTTY89: no loss of received information when loading text from disk; the ability to send messages with justified right margins and distinctly customized left margins; the option to repeat the previous transmission; editing of the last letter, word, or line in the pretype buffer; automatic activation of transmitter push-to-talk when sending; automatic CW ID at an interval you select; and word wrap-around at the end of a line (a word is never split in two).

The Hookup

The RTTY89 program uses the RS-232C serial input/output port of the H89 to communicate with the outside world. In this case, the "outside world" is a RTTY terminal unit (TU) connected to an amateur transceiver. A cable is run between the RS-232C connector on the rear of the computer and the TU. The TU, in turn, is connected to the mike socket and the headphone jack of the transceiver.

In my shack, the terminal unit is the popular Flesher TU-170. Like a number of other TUs, the 170 does not have an RS-232C interface as standard equipment. Fortunately, the Commsoft instruction manual contains a schematic for a simple RS-232C circuit which can be built from Radio Shack parts and added to an existing TU. I did this with my TU-170, and it worked perfectly. If your TU has RS-232C capability, so much the better.

On the Air

Once the wires are connected and RTTY89 is initialized with the time of day, your callsign, and other pertinent information, it's time to tune in some RTTY. In my case, I simply tuned the rig to 40 meters and Bingo! Beautiful RTTY printouts began marching across the video display of my H89 computer. I was in business!

After assuring myself that the receive portion of the system was working properly, it was time to try transmitting. After all, RTTY reception is only as good as your receiver and TU; it's on transmit that RTTY89 would really shine.

And shine it did. I found a WA4 station calling CQ and carefully tuned him in. As he called, I composed a response on the lower portion of the split screen. Hesitantly at first, then with more confidence, I built up my message in the pretype buffer. First, I hit the computer's Blue function key to enter the preamble (CW ID, RTTY ID, time, date), then a control-V let me enter his callsign, along with my call, name, and QTH. Pressing the Red function key twice repeated this information two more times. The White key entered a closing, with a CW ID. I then entered control-R to put the system back into receive after the transmission.

Remember, all of this was done while the WA4 was sending his CQ. RTTY89 stored my whole response in its pretype buffer while never missing a bit of the WA4's message. Soon, the CQer completed his call. To send my entire response, I merely pressed control-T, then sat back to watch my message being sent out by the computer, complete with CW IDs in the right places.

This business of function keys and control keys sounds pretty complex, but it's amazingly straightforward in practice. For starters, Commsoft's manual does a terrific job of explaining each command. Also, the most often used commands are mostly single keystrokes or easily remembered (control-T for transmit, control-R for receive). Finally, RTTY89 includes a compact prompt card to be posted at the operating position. The card neatly summarizes all 46 (!) commands and gives brief examples of typical operating procedures—extremely helpful.

Summary

I've had the opportunity to use seven different computer RTTY systems, and in one way or another, many of them have proven awkward to use. Some are poorly conceived from the start. Others are badly documented, so that only a RTTY expert can puzzle out how to make them work. Some otherwise fine products have been ruined by poor instructions.

RTTY89 stands out because it works smoothly and efficiently with a minimum of fuss. It is superbly designed and documented and more easily understood than systems with half the number of commands. The ease with which complex messages can be built up with a minimum of keystrokes is remarkable and allows even slow typists like me to have great fun on RTTY. The designers of programs for today's low-cost computers should take a lesson from RTTY89. It's too bad there aren't more H89s around.

The Commsoft RTTY89 program sells for $34.95 from *Commsoft, 665 Maybell Avenue, Palo Alto CA 94306.* Reader Service number 488.

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DX

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SPRATLY ISLANDS— DX DISASTER

The widely-scattered reefs and rocks of the Spratly Island group in the South China Sea have long been one of the oddballs in the DXCC "Countries" list. Claimed by every country in the region, and (until recently) uninhabited, the 100 or so tiny islands offer a severe challenge to the determined DXpeditioner. And that challenge proved too much for two German amateurs who died in an April, 1983, attempt to operate from Spratly.

What *really* happened to the group led by Baldur Drobnica DJ6SI? Baldur has put the rumors to rest with a cassette tape, relayed through Ralph Hirsch K1RH, and translated with the assistance of the language department of Southern Connecticut State University.

But first let's review the amateur radio history of the Spratly group. The infamous Don Miller W9WNV claims the first operation from Spratly in the mid-60s. Don used the call 1S9NWN, the first use of a prefix beginning with 1, which is not issued by the International Telecommunications Union (ITU). Don claimed operation from the largest island of the group, Spratly.

Photo A. Phil Weaver VS6CT kept the amateur radio world informed of the progress of the search for Baldur's ill-fated Spratly DXpedition. Phil provided additional details at the Visalia International DX Convention this past spring.

The next Spratly operation was engineered by Don Reihbott K7ZZ, from Vietnam, in 1973. Don commandeered W4EBG, N5TP, and others to mount a major DXpedition to Spratly Island, well documented by Don's ever-present Super-8 movie camera.

Spratly worked its way up the Most Wanted list until 1979, when K1MM and K4SMX boarded VK2BJL's yacht for another attempt at the island group. Their goal was Amboyna Cay (about 100 miles southeast of Spratly Island), as Spratly was firmly in the grasp of trigger-happy Vietcong. Amboyna Cay was also inhabited by unfriendly natives, and the group retired abruptly when gunfire erupted from Amboyna. They moved to a tiny sandbar, Barque Canada Reef, a few miles to the northwest. Several less-courageous (more reasonable?) members of the trip stayed in Brunei while the three intrepid DXpeditioners operated from an unadministered island too close to Malaysia to count as a separate DX country under DXCC rules.

Many other DXpeditioners who watched Spratly move up the Most Wanted list investigated the possibility of another trip to the region, but maritime warnings, the advice of the US Department of State, and the experience of the last DXpedition to the area discouraged most amateurs.

Which brings us to DJ6SI's attempt. Forty-eight-year-old Baldur Drobnica originally aimed for a DXpedition to St. Peter and Paul Rocks (PY0) off the coast of Brazil, but a recent DXpedition had knocked PY0 out of the top 25 of the Most Wanted list. Of the other DXCC countries on that top 25 list, most had political rather than logistical reasons for lack of amateur radio activity (see this column, December, 1982). Heard Island was well covered (see this column, August, 1983), and the season was wrong for an assault on Bouvet, 3Y1. So Baldur narrowed his choice to Clipperton (FO0) and Spratly. Clipperton required a long trip through Tahiti, as well as special permission

since a previous DXpedition had to be rescued from their Pacific reef. So Baldur chose Spratly.

Baldur first contacted a fellow West German in Brunei to locate a boat to sail to one of the Spratly islands. Despite the close proximity to Spratly (or perhaps because of it?), he was unable to locate a boat and crew for the DXpedition. So Baldur turned to Singapore, a few hundred miles further away. An ad in a sailing magazine led to negotiations with the skipper of *Sidharta*, a 50-foot catamaran, and the trip to Spratly was on!

Warren Gough 9V1VC provided invaluable local assistance, especially in locating the generators, fuel, etc., needed for the DXpedition. This help reduced the time the West German DXpeditioners had to spend in Singapore to a mere two days. On March 31, four amateurs left Cologne for Singapore. After locating a couple of 5.5-meter aluminum poles for antenna masts, the amateurs and crew set sail on April 3 from Singapore harbor.

On board the yacht were Baldur, Norbert Willand DF6FK, Gero Band DJ3NG, and Dietheim Mueller DJ4EI, along with the captain, Peter Marx, and his wife Jenny Toh Swee Neo. After dodging shoals leaving Singapore harbor, the group headed for the Natuna Islands, halfway to Spratly. Their 5-knot speed was putting the group behind schedule, and they still wanted to operate for five full days from Spratly, so they changed their plans to end their sail at Brunei.

As they reached the open water past Natuna, heavy seas forced a slight change in course from 65° to 75°, so they sailed into the Spratly group somewhat east of their intended course toward Barque Canada Reef. They spotted Amboyna Cay, which was covered with military structures and other buildings, but no people, as far as they could tell. But as they changed their course from Amboyna to Barque Canada Reef, about 30-40 kms away, gunfire erupted from Amboyna.

The yacht was about a mile or so from Amboyna, and clearly sailing *away*. Pat N0ZO/DU2 was in radio contact with the yacht, and other stations were undoubtably listening in to the progress of the DXpedition. The first round from Amboyna fell short—the proverbial "warning shot"? The *Sidharta* sailed as fast as possible away from Amboyna, but the next shot hit the yacht, wounding captain Peter Marx in the chest. The group was fighting to get out of range of the gunfire when a third round hit 120 liters of gasoline stored on board. Dietheim Mueller DJ4EI, who was standing next to the gasoline when it exploded, was never seen again. He couldn't swim.

Photo B. Dr. San Hutson K5YY was recently elected to the CQ DX Hall of Fame. Congratulations, San!

The rest of the group ducked down the hatchway to escape the gunfire, with the FT7 still on the air. "Fire on board, Fire on board!" was the last radio communication heard from the now burning vessel. The group, now certain they would have to abandon their craft, escaped the cabin through the skylight. They grabbed a 70-liter fresh water tank and lashed empty fuel barrels to it to keep it afloat, but their dinghy was hanging from the stern of their yacht, which was engulfed in flames.

When the propane bottles for cooking exploded, the group abandoned the *Sidharta*. Jenny swam around the burning yacht to rescue their dinghy, which fortunately had been freed from the yacht as its lines burned through. The shelling continued as the group piled into the tiny 14-foot boat, and one round opened a hole in the dinghy. They used what little clothing they had brought with them to block the inflow of water, but they had to bail continuously thereafter.

Meanwhile, they continued to call for DJ4EI, but they saw no trace of Mueller after the third shell. Their careful salvage of the fresh water tank was for naught; it drifted out of reach. Water in the other tank was contaminated with seawater and undrinkable. The gunfire continued as the dinghy drifted slowly away from Amboyna under the pressure of southwest winds. Fortunately, the high seas screened them from most of the gunfire, but the group huddled in the bottom of the little boat as shells rained down around them.

At first, the spirits of the five remaining members of the DXpedition were good, despite the ordeal of losing their good friend Mueller, the yacht, and radio gear, not to mention the end of their DXpedition plans. They knew they had been in radio contact up to the minute they abandoned ship, with their location well known. It wouldn't be long, they reasoned, before a plane would drop a well-equipped life raft and supplies, followed by eventual rescue.

But days began to pass without a plane in sight. Baldur inventoried their supplies in the dinghy: their bathing suits, a couple of T-shirts, Baldur's parka, a woven basket, a glass jar, a screwdriver, and a couple of empty fuel cans. They rigged the empty cans as sea anchors to help stabilize the tiny craft, and used the screwdriver to remove a stainless-steel plate at the stern of the boat, where the outboard motor would be attached. They intended to use the shiny plate as a mirror to attract the attention of rescue craft.

Peter Marx, an able seaman with a German license, provided invaluable advice on survival in the open boat. Without food or fresh water, they could not exert themselves in any way, so they dismissed the idea of rowing. As the sun beat down and there still were no rescue planes, the survivors fashioned a rough tent-like cover from Baldur's parka and Jenny's sarong, but it provided little shelter. Baldur tried to catch fish with the woven basket, but his only luck was with tiny, finger-sized minnows. The still-living fish were difficult to swallow without water, and most of the survivors gave them up even before the basket drifted away.

Baldur, now deeply concerned that they would not be rescued, scratched an account of what had happened on the back of the steel plate, using the screwdriver. Even if they all perished, the world would know what had taken place. Days continued to pass, with a NNE wind blowing them slowly toward shipping lanes to the south of the Spratly group. On the sixth or seventh night, a brightly-lit ship passed a short distance away, but they had no way to attract attention. The shiny metal plate was useless at night. As they drifted through the more heavily travelled shipping lanes, they saw more ships, but only at night.

Meanwhile, Gero Band DJ3NG grew steadily weaker and began to hallucinate that they had been rescued. He drank some seawater under the delusion that it was fresh, and this may have led to his death a short time later. At about 1:00 pm on April 18, Gero died, and was buried at sea, just 30 hours before the survivors were finally pulled from the sea.

Baldur, too, began to hallucinate, dreaming that a voice told him he would be rescued on the tenth day. As that tenth day in the dinghy without food or water ebbed into sunset, a large Japanese ship, the *Linden*, passed close by. The survivors couldn't yell with their dry throats, and the *Linden* sailed on by. But then Jenny noticed the ship had changed course, steaming around in a circle, back toward their dinghy! Rescue was finally at hand, after 243 hours!

The *Linden* pulled alongside, and Baldur scrambled aboard, the only survivor with the strength to do so unassisted. The Japanese crew of the Panama-registered *Linden* then took careful care of the weakened DXpeditioners. Small amounts of warm fresh water first, and then long-awaited showers began to restore their strength. Their medical problems were mainly sunburn, especially severe in Willand's case. The Japanese treated burn blisters on their hands, feet, and faces, and soothed the sores caused by sitting in wet bathing suits on rough wood for ten days. Strained rice soup and clean sheets completed their first evening after rescue; Baldur thought they were in heaven as he slipped into bed!

End of Part 1. Coming next month: The aftermath. Unanswered questions abound, and the last chapter of the Spratly saga has not been written. Copyright 1983, by Baldur Drobnica DJ6SI.

DR. DIGITAL

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The most important development in the history of amateur radio came on October 28, 1982, and, unfortunately, it went by unnoticed. What was this event? The legalization of *any* digital (i.e., computer) code on the amateur frequencies above 50 MHz (except for the CW-only portions of 6 and 2). As long as the codes are not intended to make one's communications secret and a detailed record of the format of the digital codes is maintained, it is legal. For the complete rules, see part 97.7.

Why is this so important? Well, for one thing, hams are now free to *experiment*, something that was severely restricted under the old rules. In the past, it has been amateurs who pioneered various methods of communication; now hams can continue being pioneers.

It is impossible to go very far these days without encountering a microprocessor. These devices, in some form, can be found in everything from automobiles to watches. Amateur radio, being no different from anything else, also has been computerized. Practically all the new transceivers are microprocessor-controlled. Many hams have taken up the study and use of computers as a hobby. It is only natural that a person interested in electronics would want to learn about computers.

The typical ham's use of a computer, however, has been far from revolutionary. Sure, many hams have replaced their noisy Model 19 Teletype* machines with the silent CRT, but that really isn't enough. Computers can do so much more than simply send RTTY or CW, and one needn't spend a fortune to use a computer in other applications.

Computers can be used to assist with practically every mode of communication. Slow-scan television and facsimile can easily be enhanced using digital (computerized) techniques. Even voice communications can be digitized. Using a technique called pulse-width modulation sound input can be digitized (converted from analog to a digital representation) and sent as digital data. Various techniques for compressing the data exist and on the receiving end, the voice can be recreated using a digital-to-analog converter. Recent advances in integrated circuit technology make experimenting along these lines well within the reach of any dedicated amateur.

The purpose of this column is to show other uses for a computer besides RTTY. Sure, RTTY is wonderful with a computer but computers can do so much more. I will try to provide examples for all the popular microcomputers so that no one will feel left out. Particular emphasis will be on the lower-cost microcomputers. Where possible, I will show how some fancy software can take the place of elaborate hardware. By doing this, I hope to provide somethin

for everyone, including those hams who don't have the kilobucks to spend!

Hams must get their computers talking to each other. Murray (Baudot) code at 60 wpm simply is not the most efficient way for two computers to communicate. What is needed is a faster, more reliable method with error-correction and error-detection. Not only text can be sent, but programs, graphics, and even data representing music and sound!

Before hams can start getting their computers on the air, some standards must be established. In the coming months, I will set forth my own ideas regarding such standards. Now you may be saying to yourself, "Who is this AF2M to go around setting standards?" Well, why not? I am not affiliated with any ham radio or computer manufacturing company, so I will be completely objective. My suggestions for a digital communications standard are:

1) Low cost. No expensive or unusual hardware should be required.

2) Easy implementation on any computer. Individuals with a Timex 1000 and an IBM PC should be able to communicate.

3) Software over hardware. I favor the software solution to an interfacing problem. In my opinion, it is much easier to tinker with op codes than with chips.

4) Reliability. There should be error detection and correction.

I would like to see computer graphics exchanged over the air, even between different computer systems. There are some graphics standards around now; it is time to start implementing them!

I think I'll get off the soapbox now and start in with the fun stuff.

CASSETTE-PORT QSO

The new FCC rules now allow for cassette-port QSOs. If you are on VHF, you can exchange programs or data over the air with the cassette I/O. Of course, it is only possible to exchange data with someone who has the same type of computer (or an emulator). It takes a little fiddling with the volume levels, but it is possible. Better results can be obtained if the audio is regenerated before it is sent to the computer. Regeneration is almost always necessary with the VIC-20 and VIC-64 computers. However, fairly good results can be obtained with the Apple, TRS-80 I or III, and the Timex/Sinclair computer with no additional circuitry. Once the proper volume levels are established, the data transfers can be just as reliable as cassette tapes are.

If you have an Apple, TRS-80, or Timex/

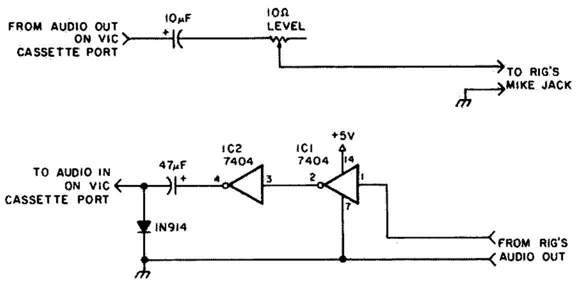

Fig. 1. VIC-20 cassette-port-to-ham-rig interface.

Sinclair, simply connect the cassette output to the microphone input of the rig and the audio output of the rig into the computer. Make sure to use shielded cable to prevent the rf from the computer from interfering with the radio. Fortunately, on the VHF and UHF frequencies where this type of operation is legal, computer RFI becomes less of a problem. Carefully monitor your transmitter output and adjust the microphone gain for a normal amount of deviation—about the same as you would expect from a voice signal. To set the proper receive level, use the same procedure as you would to set the level of the cassette recorder. It might take a little experimentation, but once the proper settings are found, you won't have to worry about them again.

With a Commodore VIC computer, try the circuit shown in Fig. 1. The integrated circuit is just a 7404 hex inverter to ensure that a perfect square wave goes into the computer. To feed audio into the rig, the 10-µF capacitor improves the audio quality. Fig. 2 shows the pinout of the VIC-20 cassette port. Note that you can power the interface circuit from pin B-2. It is important that you ground pin F-6; this makes the computer think that the cassette recorder is connected and the Play switch has been depressed.

Cassette-port I/O isn't the best way, but it sure is cheap. With just a minimal amount of experimentation, you can have your computer on the air and start exchanging programs!

ERROR-CORRECTING CODES

When transmitting data, it is useful to have some way of detecting errors and correcting them. There are many methods of accomplishing this. Let's begin with a discussion about parity.

When data are sent over a computer, they are usually encoded in any one of several standard computer "alphabets." The one used by most of the computer industry is called ASCII (pronounced askey). In the standard ASCII code (there are several variations of it), each character takes up seven elements called *bits*. When transmitted serially, the least-significant bit is transmitted first and the most-significant bit is transmitted last. In order to ensure that no bits were lost during transmission, a parity bit can be generated and sent as an eighth bit.

There are two types of parity: even and odd. In even parity, the parity bit is sent so as to make the *total* number of "1" or "ON" bits (including the parity bit) even. In odd parity, the total number of "1" bits is made odd. For example, if the ASCII code 1011001 was to be sent, the parity bit would be a zero if you were using even parity, and it would be a one if you were using odd. At the receiving end, if odd parity was being used, any byte with an even number of "1" bits indicates an error. For even parity, an odd number of "1" bits received means an error. There is no advantage to using even parity over odd parity; it would be nice if everyone used the same.

The software for generating or checking parity is very simple. They both involve the use of a logical exclusive OR (XOR). In case you are not familiar with the various logic functions, study the truth tables in Fig. 3. Note that the exclusive OR is similar to addition except that the carry bit is ignored. To generate the parity bit, perform the following algorithm:

1. Initialize a temporary data bit (0 for even parity, 1 for odd).
2. Take the first data bit and exclusive OR it with the temporary bit.
3. Repeat step 2 for the next six bits.
4. The temporary bit is now equal to the parity.

If you are receiving ASCII data, *compare* the generated bit with the received bit. If you are sending ASCII, *transmit* the parity bit as your eighth bit.

Now that you can detect errors, it would be nice if you can correct them as well. In order to do this, some redundancy must be introduced. The greater the redundancy, the more errors can be corrected, but efficiency will be sacrificed. The simplest method of error-correction is called the longitudinal-redundancy check (LRC). This is simply having a "vertical" parity across several bytes, in addition to the "horizontal" parity. For example, suppose the following bytes are to be transmitted (using odd parity):

00010000
10100001
00000001
11110001

The bit on the right is the parity bit. To use the LRC, a fifth byte is generated. (I simply chose to have the four-byte block; it can be any fixed length.) We'll use the odd system throughout. The sum of each column, except for the parity column, must be odd. That would make the LRC byte equal to:

10111110

The algorithm for generating the LRC is similar to generating parity:

1. Initialize a temporary byte (0 for odd, 1 for even).
2. Exclusive OR the first byte in the block with the temporary byte.
3. Repeat step 2 for the next three (or n-1) bytes in the block.
4. Generate a parity bit for the temporary byte, and put it in the MSB position.
5. The temporary byte now contains the proper LRC value.

Using the LRC to fix an error is simple. When data are being received, the computer is generating its own parity and LRC information. If what the computer generates doesn't match what was sent, an error has occurred. Suppose that the second byte in the example was received incorrectly as 10000001. The computer would know this was wrong because there is an even number of bits (2) and we are using odd parity. The LRC byte would also be wrong; 10011111 would be generated by the receiving computer while 10111110 would be transmitted to it. To correct the error:

1. Exclusive OR the generated LRC byte with the received LRC byte (ex. 10111110 XOR 10011111 gives 00100001).
2. AND the parity bit of this result with zero, thus setting it to zero.
3. Exclusive OR the resulting value with the byte that had the parity error.

That's all there is to it. The erroneous bit will be flipped back to the proper value!

The LRC certainly isn't the best method for error-correction, but it is the easiest to understand and implement. There are better methods, known as cyclic-redundancy checks (CRC), that can't be "fooled" as easily as the LRC. I will go into the CRC in a coming column.

Coming up also will be a detailed discussion of the various cassette-port standards and how to make them more reliable for over-the-air use. Also, we will be examining some inexpensive computerized methods of generating and decoding SSTV.

If you are doing anything with computers and ham radio, please drop me a line. I would also appreciate any comments regarding standards for computer-to-computer communication, expecially with regard to the encoding of computer graphics.

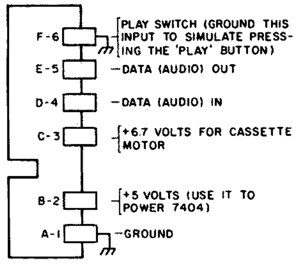

Fig. 2. VIC-20 cassette-port pinout.

TRUTH TABLE FOR EXCLUSIVE-OR (⊕)

x	y	x⊕y
0	0	0
0	1	1
1	0	1
1	1	0

TRUTH TABLE FOR LOGICAL OR (+)

x	y	x+y
0	0	0
0	1	1
1	0	1
1	1	1

TRUTH TABLE FOR LOGICAL AND (•)

x	y	x•y
0	0	0
0	1	0
1	0	0
1	1	1

Fig. 3. Truth tables.

HAM HELP

I am looking for literature on Peltier electrodes. I am particularly interested in information on how to make them or use them to make a microsample osmometer.

Carlos P. da Costa MD, PhD
Rua dos Navegantes 541, Apt. 602
Boa Viagem, Recife
PE 50000 Brazil

I need a copy of the schematic and crystal information for an AN/PRT 4A transmitter.

Cletus G. Reinsel W3HWM
RD 1 Box 405A
Oil City PA 16301

I'm looking for schematics for the Wilson 1402-SM HT. I will pay for copying and mailing costs.

Robert Good KA0QBM
613 SE 89th St.
Berryton KS 66524

I would like to hear from anyone who has made receiver modifications to the Kenwood TS-700S or SP, and anyone who has constructed a 2-meter amplifier using the 4CX250 B-R or 8930.

Connie Mercer
HHB 32nd AADCOM
APO NY 09175

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
c/o 73
Peterborough NH 03458

In the last published installment of this column (July), I was leading up to a byte-by-byte look at how to implement a RTTY terminal program on several popular computers. A look was planned at several popular microprocessors in the 6800/6502 families, with the programs to be designed around these chips. Unfortunately, the powers that be, read editors, feel that such a topic is too esoteric for this column. So I shall continue to develop this program over the next few months on the side, and then try to make it available for those interested. Watch this column for an announcement. It will be a bit, though, because as observant readers may note from the top of this column, I am still moving and things get a bit tight now and then. But bear with me, OK?

Let's see what some of you are involved in these days. I am in receipt of a card from Dieter Kaerger, from West Germany, who is interested in various forms of encoded RTTY. Well, in the planning stage is an in-depth look at some of the schemes now in use, including but not limited to AMTOR. I would be interested to hear what the readership has to say on these exciting new techniques which allow almost error-free RTTY under less than optimal conditions. What equipment are you all using? What's good and what's a lemon? Let me know what you have found out and I will see if I can put all this combined knowledge into a useful form for all to benefit from.

This brings up the subject of manufactured equipment mentioned in this column. With few exceptions, I try only to write about equipment I have seen or a close friend has seen. I have tried to avoid rewriting press releases or ads—you can read those as well as I. Normally, the "New Product" blurbs you read in magazines are prepared from such manufacturer-supplied information and are likely to provide all the good points and none of the bad. I have now been burned a few times and will attempt to screen out the truth from the puffery.

Henry Townsend AF2U, up in Cape May NJ, drops me a line. No Cape May diamonds in the letter, though. I remember looking for those beauties on the beach years ago. Henry is looking for a circuit to display RTTY on a converted television set. We have dealt with this many times and my advice still stands. If you can convert the five-level RTTY to ASCII (and the multitude of articles to help you do that have been listed here many times), any of the available terminal boards will do just fine. Scan the ads; there are video display boards capable of building a stand-alone "dumb" terminal available for a reasonable price, and kits for less. I am sending Henry a list of articles published here in the past; those of you who are still confused about this topic should check through previous editions of this column.

Are you at all interested in a compilation of old columns? Drop the editors at *73* and Wayne Green Books a note and send me a copy, too. I would be happy to work up a compilation of the first five years or so of "RTTY Loop" (we are in our seventh *year now), but I need some feedback that* there is a desire to have the book published. This information is here and ready to be assembled, but the folks in Peterborough want to be sure there is a market before starting the project. Let us know.

Barry Travis N4FNZ, in Arlington VA, sends along a letter of distress. Barry has a monitoring oscilloscope, model OSA, using a 913 cathode-ray tube. He has been unable to find a source for this tube in the ads. Anyone out there in RTTYland able to help Barry should write him at 605 N. Irving Street, Arlington VA 22201. Good luck, Barry.

Another ham in need is Lynn Finch W2MSJ, from Port Crane NY. Lynn is using a Commodore 64 on RTTY and has a monitor which he would like to convert to use with the C-64. This was part of an ITT computer, is labeled STANSASB E25240 0000, and was apparently made in Sweden. Lynn is anxiously awaiting any information at Route 369, RD 2, Box 789, Port Crane NY 13833. Don't let him down!

People do help others. In June, I mentioned that Charles Hoppesch was looking for a RTTY program for the TRS-80 Model *III. I have a letter here from William* Buckingham, in Osceola PA, who advises of *The Disassembled Handbook for TRS-80*, a five-volume set from Richcraft Engineering which apparently contains a RTTY program for the TRS-80. I have not seen the book or program, but Bill indicates that it is quite a program and that he has it up on his computer. You might keep an eye out for this book in your local computer/ham shop. If I get more information on this one, I shall pass it along forthwith.

I would like to point out, by the way, to folks like Ernest Nyberg K4GYI, in Lake Worth FL, that this program is also adaptable to the old TRS-80 Model I. Now, this rig had its share of problems with TVI and RFI and the like. But it is a good machine underneath it all, and if you can lick the in*terference problem, this book may be* of some use to you as well. I would be interested to hear from you when you get the Model I on the air. That's not *if*, but *when!*

The VIC-20 has some new folks using it. One of them is SFC Lawrence (Skip) Barley, Jr., overseas with the US Army. Yes, Skip, you can use the VIC-20 on RTTY, but you will have to use a program designed for the VIC-20, as opposed to the TRS-80 program mentioned above or one for some other computer. We have touched on a few of these in the past and you mention in your letter that you will be looking at back editions of "RTTY Loop," so I hope you have seen some of the information we have printed. I have not had any feedback either way on the several hardware adapters on the market nor have I tried any of them. But watch this column for future information as it becomes available.

Regards to Dale Parfitt WA2YPY, a devoted 6800 user from West Palm Beach FL. Dale indicates that a score or more hams in his area are using 6800s and would like RTTY programming. Hang in there, folks, I hear you. I will have something for you in the not-too-distant future. And thanks for your support.

Hey, how many of you are using RTTY mailboxes of one sort of another? Why not drop me a short note, listing the boxes you are using, protocols, likes and dislikes, stuff like that. I will try to publish what I receive so that good ones get better and super ones rub off on the rest. Just drop a note to me in care of *73* for now, and be sure to enclose an SASE if you would like a personal reply. But be patient, OK?

AMTOR, remote mailboxes, ASCII—we have all come a long way from an old Model 15, haven't we? The range is huge, but every month I try to distill it down to potability here. Let's see what turns up next month in RTTY loop.

LETTERS

MAILBOX FULL

HELP! Because you were thoughtful enough to publish my letter (March) setting the record a little straighter about life and living in Latin America (particularly on the Emerald Coast of Colombia), I have been deluged with mail from your readers.

So, may I, through your "Letters" column, assure them I am most delighted with their responses and will eventually answer each and every letter? Muchas gracias!

Juanita Bird
Santa Marta, Colombia

DUSTY DESIRES

We would like to ask your assistance (and that of your readership) in a project that our museum is involved with. We have a need for our displays for World War Two US communications equipment. Specifically, we need both portable (manpack) and vehicular radio sets along with all related components including vehicle shock mounts. These will be incorporated into our displays to complete vehicles. Our needs do not include radios or components unique to fixed station, shelter-mounted, or aircraft application.

There can be no question that the quality and quantity of US communications equipment was a significant factor in the success met on the world's battlefields. We feel that it is very important that selected items of this material be preserved and displayed. We would very much like to hear from individuals who have such equipment, no matter how insignificant it may seem, and who would like to aid us in this project.

Terrill M. Aitken
Capt. SC ORARNG
Curator
Oregon National Guard
Military Museum and Resource Center
Camp Withycombe
Clackamas OR 97015

AMTOR WARNING

As you know, the latest form of RTTY communications to be of interest to hams is called AMTOR, which has been used by the maritime services. The AMTOR processor board converts the synchronous signals to standard Baudot 60- or 66-wpm signals for the terminal.

For a number of years there has been a video terminal advertised that has been quite popular in this area. It is a low-cost unit that operates in both the Baudot and ASCII modes at 45 to 300 baud. This is a high-quality unit that has been well worth the cost. I am referring to the Xitex SCT-100.

There are a few items in the SCT-100, however, that are problem areas. When the unit receives a quote character, it displays the numeral 5. When it receives an exclamation character, it displays a quote. Typing a quote character transmits an exclamation mark and, if you type an exclamation, nothing is transmitted.

The problem becomes major when using the SCT-100 with an AMTOR converter. The "over" signal used in TOR is quote/question mark. Since the SCT-100 will not transmit the quote, it cannot, therefore, be used with TOR. The "over" signal is not just an indicator for the other station to begin transmitting; it actually controls the TOR circuits and is necessary for mode A operation. I think that there are probably many SCT-100 users out there who will try to use their 100s and perhaps wonder why they will not function properly.

Bob Roehrig K9EUI
Batavia IL

Bob, stop griping about the problem and get me a modification of the SCT-100 so owners can cope with AMTOR—Wayne.

RYAN'S HOPE

Wayne, you're the "devil's advocate." I call you that because I'm sure that, had you chosen a career in the clergy of the Roman Catholic Church, you would have early on filled that post in Rome.

I feel that you are, *unfortunately*, at least fighting a losing battle in trying to reform the members of our mutual hobby with respect to their manners (I refer to the letter from Bill Skipper KØARG in the May '83 "Letters" column). It's impossible! You're attempting that which all the priests, rabbis, and other assorted clergymen over the past 10,000 years of human history have not been able to accomplish. After all, all hams (at least most of them, anyway), are members of the human race.

One need only listen in on 14.230 MHz sometime (that's where the SSTV folks hang out on 20 meters) for a while. Not only is there squabbling between those running SSTV and those who suddenly appear on frequency for other purposes (we won't even mention the habits of the DX and contest workers), but there's also even squabbling among the SSTVers themselves as to whether the frequency is for SSTV OSOs or SSTV "technical discussion" nets, etc. I've gone no further into this mode of our hobby than buying K6AEP's 7.4 SSTV program and probably won't, with all the squabbling. I can safely think of other modes to invest my dollars in (such as RTTY). No one can stop the squabbling—not even, should they try, the FCC. My, they even squabble over

which SSTV system is the best and knock, badly, what each doesn't have (or support). Now that's squabbling for you! In 29 years, in this hobby, I've never heard folks knocking other folks' equipment. It's an education in itself.

I can't agree with everything you apparently advocate, as I smoke cigars (no smoking) and am a retired police chief (some of your arguments against radar). However, I defend your right to speak out. Furthermore, I agree with your attempts to advance the hobby into the twentieth century (never mind the twenty-first) by pushing the various newer modes of transmission. Unfortunately, as John Edwards' "Fun!" column's annual poll results indicate, apparently the interest in any newer mode of operation (i.e., RTTY, SSTV, OSCAR, etc.) doesn't exceed 30%, and that only for the potential use of the OSCAR satellites. One gets the impression that, in reality, approximately 6-10% of hams are interested in advanced (post-1963) modes of operation. It's a pity, but considering the fact that it's a hobby and hobbies reflect the social habits of the predominant generation at the time, perhaps it's understandable. (I'm not knocking the younger generation, but simply making a statement of apparent fact. The next one, being brought up on home/school microcomputers, will be different.) (I wonder if all the CW enthusiasts have considered the fact that, as a mode, it's really digital!)

To reiterate, this is, after all, a hobby, and most hams drift in and out of activity, from mode (or interest) to mode throughout their hobby career, in varying cycles (almost like one's biorhythms). We are living in a world of increased specialization (look at the programming field, for example) and our hobby is becoming more varied daily. There will be more of this, as time goes on (your *73* for example, will probably become as specialized as *80 Micro* or *Hot Coco*). Don't fight it. Even *QST* and the league can't be all things to all people.

Enough of this. You and your publications serve a good purpose in the hobby, so whatever you do, don't get discouraged.

Joe Ryan WB5LLM
Florence MS

I dunno, Joe—once I saw everyone's slow-scan pictures I stopped tuning around 14,230, so I've missed the beefing. Me iscouraged? Ha!—Wayne.

MINI-DOOMSDAYS

I appreciate your many editorials attempting to increase the size of amateur radio. You have suggested more interest in the clubs on a local level, more reading of ham magazines, and more encouraging of computer hobbyists to join the ham fraternity. I have read every editorial in *73* for the last year and you have overlooked one very important recruitment tool: emergency communications.

You did mention ham involvement in doomsday communication in the event of a nuclear war, but I am referring to floods, tornados, hurricanes, etc. This is when the spotlight falls on radio amateurs and our ability to communicate during emergency conditions for the public welfare.

All amateurs should remember that assisting official agencies with emergency communications is part of our charter. As we begin to interface our computers with our rigs, let us not forget the valuable role this equipment potentially has in an emergency.

Wayne, I believe your editorials will show less frustration if you forget about the old cronies standing in the way of progress. I do not think it is wise to repeatedly exhort this older group to "get with it." My experience has shown me that it is fruitless to attempt to budge this segment of amateurs.

I think it is more critical to prevent enthusiastic new hams from becoming lackluster, disinterested, out-of-date amateurs. I have seen emergency communications provide that stimulus to many hams. Whether it is a training drill on a weekend or providing communications for a walk-a-thon or air show, these activities really encourage direct ham involvement in which the amateur can really see his or her contribution to the community. At the same time, the ham receives the thanks of local residents.

I trust I have not overlooked any of your efforts in this area, Wayne; if I have, please forgive my oversight. I thank you for publishing a great amateur magazine.

David Sweigert WB9VKO
Beeville TX

You're probably right about the old-timers. One of our advertisers called the other day to tell us that his ads in 73 out-pull those in QST by a wide margin because, as he put it, "too many copies of QST end up in convalescent homes." It is fun gearing up to handle emergencies and we should get what few youngsters we have involved with it. If we plan our emergency communications systems so that they will be able to work even after doomsday, then they'll be duck soup for ordinary disasters such as earthquakes and floods—Wayne.

MARS POTENTIAL

Your publisher has waxed eloquent on several occasions on what is wrong with ham radio and on what should be done to correct it. At times his zeal may have drawn him into simplistic or impractical solutions (e. g., I suspect that getting kids into high-school radio clubs is not the complete answer to the Japanese ascendancy in electronics and autos; there may be some managerial and political ramifications, too). But he touches on something for which there may be a solution in place and ready for development when he deplores the lack of an effective emergency amateur radio system. I refer to MARS.

Before throwing more brickbats at the Military Affiliate Radio System, consider what it is and what it might become. I have been a member of MARS for nearly 30 years and have served as State Director of two states, so I know the good and the bad of it pretty intimately. And I have developed some thoughts about what it needs.

What it does not need is further ignoring by the ARRL and other sources of support and publicity. MARS is "of, by, and for amateur radio operators" and deserves much more recognition than it gets.

If it were better, maybe it would get some of that recognition (and maybe it would represent more of a threat to the TCPN than it does). Its function of operating phone patches for overseas servicemen is well known and respected. But little else about MARS is heard. And, in truth, there is much about it that rates criticism.

Nevertheless, it is a network of dedicated amateurs, nation- and worldwide, with the equipment and training to operate in emergency conditions. More important, it has the *potential* to build on the framework of the system-in-being to make a formidable answer to the need for emergency communications.

What it needs is money and support. When I first joined, there were six regional directors of the system; now there are only three. Where each office used to have at least adequate personnel to handle the vast paperwork and hardware requirements, now the eastern third of the US is administered by one sole individual. This is a result of government cutbacks in funding and it is hurting the system. What is the source of funding? Congress, of course. Letters to your congressmen are needed.

One glaring fault in MARS seems like it would be easily correctable: the fact that there are three separate MARSes. They should be integrated. Each state has an Army, a Navy, and an Air Force MARS, and they can't talk to each other! But nobody in authority has been willing to take this one step that would improve MARS about 500% in traffic handling and bring an enlarged system into much more contact with technically-skilled operators. They're out there but, splintered as MARS is, there isn't too much incentive to get things going.

Even with all the shortcomings inherent in association with the government and the military, government *with support* can get things done. MARS membership is an aging population, but more support and a revitalized system would reflect itself in more aggressive recruiting. Young people are welcome in MARS but they aren't showing up. MARS languishes, badly in need of just a few sparks to set it off.

73 would do inestimable good if it threw its formidable clout behind MARS. MARS is perfect for some boat-rocking, which *73* seems to enjoy. You are not bogged down with old fogies that hate change. And you have influence. How about it: Give us some help? Twist some arms; boost us some; encourage hams to look into MARS; hell, even bad-mouth us if you want to. At least that's better than being ignored!

John A. MacGahan W2DJM
Haines Falls NY

MARS could get a new lease on life if some of the members would take the interest to write about it explaining what, if any, the benefits are from joining. And while I don't think I've anywhere suggested that getting kids interested in amateur radio is the entire solution to the Japanese problem, I'm not sure how MARS fits in as a solution either. If there are more benefits to joining MARS than costs, get the word out and you'll get members—Wayne.

BILAL

Some of my customers have found that it is very difficult to find me. They must be using old journals and are assuming that I am out of business. I'm not. My correct address and phone number are:

Ralph Bilal
Bilal Company
S. R. 2
Eucha OK 74342
(918)-253-4094

MEXICAN NET NEWS

During the past few years and presently, the North West Radio Amateur Club of Obregon, Sonora, has been operating the Mexican Emergency Net on 7.090 MHz, LSB, from 0300-0400Z (the time may change by an hour seasonally to seek optimum propagation for the coverage of the entire Mexican Republic.)

Its purpose is to handle emergency traffic, contact air, maritime, and land-mobile stations, and receive check-ins from amateurs throughout Mexico. We believe this net will be of value to the amateurs in bordering regions in the event of any joint emergency.

Christopher Petroff XE2BSG
Chihuahua, Mexico

Take your favorite H.T. out for a drive tonight.

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For $69.95 you get the most efficient, dependable, fully guaranteed 35W 2 meter amp kit for your handy talkie money can buy.

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✓See List of Advertisers on page 114

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

BRITISH COMMONWEALTH AWARDS

Through the cooperation of the Radio Society of Great Britain, I was able to obtain complete details of this great organization's awards program.

The following rules and conditions apply to all HF certifications and awards issued by the RSGB and should be read in conjunction with those governing awards and certificates individually.

All members of the RSGB will be afforded awards at no charge. Others must enclose at least 6 IRCs for each award. Applicants within the United Kingdom must submit QSL cards directly to the RSGB to justify their claim. All others may use the general certification rule with an affiliated society of a national organization.

Endorsements will be given for all-phone, all-CW, and/or single-band accomplishments.

Commonwealth DX Certificate (CDXC)

This certificate may be claimed by any licensed amateur who can produce evidence of having made two-way communication with stations located in at least 50 call areas listed on the Commonwealth call area chart. All contacts have to be made on 14 MHz, and an additional 50 contacts must be made in Commonwealth call areas on other bands. In the case of "other" bands, a particular call area may be claimed only once, irrespective of the band on which the call area was worked. The other call areas do not have to be the same as those worked on 14 MHz.

British Commonwealth Radio Transmission Award (BCRTA)

This award may be claimed by any licensed radio amateur who can produce evidence of having effected two-way communication with stations located in at least 50 of the call areas on any band or combination of bands. A five-band endorsement is available for 50 call areas on 5 bands.

Worked British Commonwealth Certificate (WBC)

This certificate requires the applicant to work at least one British Commonwealth station located in at least five of the recognized continental areas as defined by the ITU and noted in the List of British Commonwealth Call Areas. For the purpose of this award, North and South America count as one continental area.

IARU Region 1 Award

This award may be claimed by any licensed amateur who can produce evidence of having worked stations located in IARU Region 1. There are three levels of operating achievements: Class 1 requires contact with all countries in IARU Region 1. Class 2 requires contact with 35 countries within IARU Region 1. Class 3 requires contact with 20 IARU Region 1 countries.

To be eligible, all contacts must be made after January 1, 1979. Special endorsements are given for single-band or -mode achievements.

Members of IARU Region 1 are: Algeria, Austria, Bahrain, Belgium, Botswana, Bulgaria, Cyprus, Czechoslovakia, Denmark, Federal Republic of Germany, German Democratic Republic, Faeroes, Finland, France, Ghana, Gibraltar, Greece, Hungary, Iceland, Ireland, Israel, Italy, Ivory Coast, Jordan, Kenya, Lebanon, Liberia, Luxembourg, Malta, Mauritius, Monaco, Netherlands, Nigeria, Norway, Oman, Poland, Portugal, Rhodesia, Romania, South Africa, Sierra Leone, Spain, Sweden, Switzerland, United Kingdom, USSR, Yugoslavia, and Zambia.

To apply for any of the awards sponsored by the Radio Society of Great Britain, forward your application along with the award fee of 6 IRCs to: C. R. Emary G5GH, Westbury End, Finmere, Buckingham Bucks, England.

Cheshire Award

This award is issued in three categories: Applicants receive a gold award for accumulating 50 points, a silver award for accumulating 30 points, and a bronze award for accumulating 15 points.

Contacts must be made with only radio amateurs in the Cheshire County of England and there are no band or mode restrictions nor any date limitations.

Points can be claimed for all valid QSOs according to the example in Fig. 1.

Should you contact an amateur who resides in the County Town of Cheshire in Cheshire County, you may claim double point value.

The fee for this award is US $3.00 or 10 IRCs. This includes postage of the award which is attractively printed on parchment with an embossed seal signifying the category.

GCR apply; however, the Award Manager reserves the right to request QSLs prior to issuance of the award.

Mode	UK Stations	European Stations	DX Stations
CW/SSB/AM	1	2	5
FM	1/2	5	10
SSTV/RTTY/OSCAR	5	10	15

Fig. 1.

AFRICAN AWARDS

F. van Greunen ZS1IT wrote on behalf of the South African Radio League (SARL) and provided details for their very popular African awards program. A detailed description follows.

All Africa Award (AAA)

This award, sponsored by SARL, is made available to DXers throughout the world. Below is a list of areas in Africa from which QSL cards will qualify to obtain this award.

Confirmation must be submitted for one contact from each of the six ZS call areas as well as one contact from Botswana (A2), Lesotho (7P8), and Swaziland (3D6), plus one contact from 25 different areas of the remaining groups of country prefixes shown below.

A list indicating callsigns, mode, date, and time must accompany QSL cards submitted. Applicants who belong to IARU-affiliated clubs or societies may have

LIST OF BRITISH COMMONWEALTH CALL AREAS

EUROPE	
British Isles	
England (including Isle of Wight and Isle of Scilly)	G
Channel Isles: Jersey	GJ, GC
Guernsey, Alderney, and Sark	GU, GC
Isle of Man	GD
Northern Ireland	GI
Scotland (including Orkney, Shetland, and Western Isles)	GM
Wales	GW
Gibraltar	ZB2
Malta	(ZB1) 9H
Gozo and Comino	9H4
AMERICA	
Canada	
Maritime Provinces	VE1
Sable Isle	VE1
St. Paul Isle	VE1
Province of Quebec	VE2
Province of Ontario	VE3
Province of Manitoba	VE4
Province of Saskatchewan	VE5
Province of Alberta	VE6
Province of British Columbia	VE7
Yukon Territories	VE8
Northwest Territories	VE8
Province of Newfoundland (including Labrador)	VO
Bahama Islands	(VP7) C6
Barbados	(VP6) 8P6
Belize	VP1
Bermuda	VP9
Cayman Islands	(VP5) ZF1
Falkland Islands	VP8
Grahamland	VP8
Guyana	(VP3) 8R
Jamaica	6Y5
Leeward Islands	
Anguilla	VP2
Antigua and Barbuda	VP2
British Virgin Islands	VP2
Montserrat	VP2
St. Kitts - Nevis	VP2
Sandwich Group	VP8
South Georgia	VP8
South Orkney Islands	VP8
South Shetland Islands	VP8
Trinidad and Tobago Islands	(VP4) 9Y4
Turks and Caicos Islands	VP5
Windward Islands	
Dominica	VP2
Grenada and Deps	VP2
St. Lucia	VP2
St. Vincent	VP2
CALL AREAS WITH RESTRICTED DATE LIMITS	
Before June 1, 1961	
Union of South Africa:	
Cape District	ZS1
Cape Province (including ZS1)	ZS2
Marion and Prince Edward Island	ZS2
Southwest Africa	ZS3
Orange Free State	ZS4
Natal (including Zululand)	ZS5
Transvaal	ZS6
Before July 1, 1960	
British Somaliland	VQ6
Before April 25, 1964	
Zanzibar and Pemba	VQ1
Before December 1, 1967	
Aden	VS9
Kuria Muria	VS9
Kamaran	VS9
Before February 1, 1972	
Pakistan	AP
OCEANIA	
Australia	
Australian Capital Territory	VK1
New South Wales	VK2
Victoria	VK3

their QSLs verified through their affiliated organization.

All stations contacted must be fixed land stations. Islands around Africa or its coast do not count for this award. All contacts must be made after November, 1945, with a minimum CW report of 338 or phone report of 33. This award is issued free to SARL members; it is $.50 US or 10 IRCs for nonmembers.

Countries List: Algeria, Angola, Sudan, Congo Kinshasa, Burundi, Rwanda, Somali Republic, Cameroons, Egypt, Eritrea, Central Africa Republic, Republic of Congo Brazzaville, Gabon, Chad, French Morocco, French Somaliland, Ivory Coast, Dahomey Republic, Volta Republic, Mauritania, Senegal, Niger Republic, Republic of Guinea, Gambia, Ghana, Kenya, Liberia, Libya, Mozambique, Nigeria, Zambia, Malawi, Portuguese Guinea, Sierra Leone, Rhodesia, Spanish Morocco, or Ifni or Rio de Oro or Spanish Guinea, Tangier, Tanzania, Tunisia, Togoland, Uganda, Botswana, Lesotho, Swaziland, Southwest Africa, Republic of South Africa (ZS1-ZS6), Transkei, Bophuthatswana.

Applications and the appropriate award fee should be addressed to the attention of: F. van Greunen ZS1IT, Awards Manager, South African Radio League, PO Box 3911, Cape Town 8000, South Africa.

AWARDS FROM CERTIFICATE WORLD

I was very pleased to receive a letter from a new subscriber and to learn of his new adventure of collecting various amateur operating awards. Meet Stu Herring WB5ULD from Fulton, Mississippi. Stu features some very attractive awards for the parchment pursuer.

Representing Certificate World, we find his awards are made available to all US and foreign amateurs for two-way communication in the separate award areas. All modes of communications are accepted with the exception of those contacts via repeater.

All awards have a fee of $1.00 each or 6 IRCs. GCR apply. Apply by sending your list of contacts to: Certificate World, Rt. 2, Box 72, Fulton, Mississippi 38843.

The Old South Award

This certificate depicts a scroll listing the ten states of the Old South. It is awarded for contacts from each of the states of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

Old Man River Award

A certificate picturing the mighty Mississippi River and the ten states bordering the river can be yours for contacting the states of Arkansas, Illinois, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Tennessee, and Wisconsin.

Mississippi State Award

If you thought your first Mississippi QSO was hard to get, try making a total of ten to earn this award. A state outline and statistics add up to an interesting award for your hard work.

Capitals of the United States

This one will not come easy. You must have two-way communication with all 50 US state capitals, plus Washington DC. Fifty-one QSOs will earn you an award listing some facts about the US Capital and proof of a lot of hard work and fun.

There's a good chance you may have already qualified for some of these awards. If not, good luck on earning them. Let Certificate World hear from you and be sure to tell our friend Stu WB5ULD that you read about it in *73's* Awards column.

SMIRK AWARDS

Ray Clark K5ZMS, representing the Six-Meter International Radio Klub (SMIRK), has forwarded some very impressive achievement awards for fellow six-meter enthusiasts to pursue.

To become a member of SMIRK, applicants must make 2-way contact by any normal emission with other members of SMIRK. US stations must log 6 contacts, while stations outside the US must log at least 3 member stations. All contacts must be made after October 14, 1973. Once this is accomplished, forward your claim along with $4.00 for a lifetime membership certificate.

Once a member, you then become eligible to apply for the other awards sponsored by this six-meter group. Separate awards are given for making contacts with 100, 250, 500, and 1000 SMIRK members, utilizing the same guidelines already mentioned. Cost is free to members of SMIRK.

And for those who want the ultimate challenge on 6 meters, SMIRK offers the DX Decade Award for having contacted ten DX countries on six meters. Endorsements are given for 15, 20, 25, etc., in increments of 5 DX country contacts.

To apply for the DX Decade Award, list all logbook information and enclose $3.00 for ten countries and $1.00 for each 5-country endorsement seal being applied for. For all correspondence with the SMIRK group, write: WA1KYH, SMIRK Award Manager, 18 Laurel Drive, Medfield MA 02052 USA.

ROCKWELL COLLINS

The amateurs at Rockwell-Collins will be manning ADØC within the Collins Telecommunications Products Division complex throughout the rest of the year (phone: 28600, 21300, 21355, 14280, 14210, 7275, 7190, 3950; CW: 30 kHz up). The station will commemorate the 50th anniversary since the incorporation of Collins Radio Company in 1933. A special QSL card will be available for amateurs contacting the station during 1983. QSL to Rockwell-Collins, Box 728, Cedar Rapids IA 52498.

CHELSEA FAIR CERTIFICATE

A special certificate will be presented to any ham radio operator making contact with the Chelsea Communications Club from August 30 through September 3. Contact can be made with WD8IEL on 40 and 80 meters from 2300Z to 0100Z. Send an SASE to 104 East Middle Street, Chelsea MI 48118.

OK CORRAL

On Labor Day weekend, September 3, 4, and 5, 1983, the famous OK Corral in Tombstone, Cochise County, Arizona, again will be the site of a special-event station. Operations will be carried on only a few feet from the actual site of the shoot-out between the Earp and Clanton factions. This station (KB7KZ) will operate in conjunction with the second annual Rendezvous of Gunfighters. Operations will begin at 1500 UTC, September 3, and continue through 2400 UTC, September 4, on CW and SSB. Frequencies as follows: SSB—28680, 21380, 14280, 7280; CW—21130, 7130. A certificate will be awarded to all who work us as well as SWLs. Please send a large 8½ × 11 SASE (40¢ postage) to KB7KZ, PO Box 36032, Tucson AZ 85740.

NORWALK OYSTER FESTIVAL

The Greater Norwalk ARC will operate a special-event station, WA1RXA, from the Norwalk, Connecticut, Oyster Festival on September 9, 10, and 11. Any ARS contacting WA1RXA will receive a special certifi-

Queensland	VK4	Tuvalu	VR8
South Australia	VK5	Willis Island	VK4
Western Australia	VK6	AFRICA	
Tasmania	VK7	Agalaga and St. Brandon	(VQ8) 3B6, 3B7
Northern Territories	VK8	Aldabra Islands	VQ9
New Zealand		Ascension Island	ZD8
Auckland District	ZL1	Lesotho	(ZS8) 7P
Wellington District	ZL2	Botswana	(ZS9) A2
Canterbury District	ZL3	Chagos Archipelago	(VQ8) VQ9
Otago District	ZL4	Des Roches	VQ9/D
Auckland and Campbell Islands	ZL	Farquhar	VQ9/F
Australian Antarctic Territory	VKØ	Gambia	(ZD3) C5
British Phoenix Islands	VR1	Ghana	(ZD4) 9G1
British Solomon Islands	VR4	Kenya	(VQ4) 5Z4
Brunei	VS5	Malawi	(ZD6) 7Q7
Chatham Island	ZL3	Mauritius	(VQ8) 3B8
Christmas Island (Indian Ocean)	VK9	Nigeria	(ZD2) 5N2
Cocos-Keeling Island	VK9	Rhodesia	ZE
Cook Islands (including Rarotonga)	ZK1	Rodriguez Island	(VQ8) 3B9
Fanning Island (including Christmas & Washington Islands)	VR3	St. Helena	ZD7
Fiji Islands	(VR2) 3D2	Seychelles	(VQ9) S7
Gilbert and Ocean Islands	VR1	Sierra Leone	(ZD1) 9L1
Heard Island	VKØ	Swaziland	(ZS7) ZD5
Kermadec Group (including Sunday Island)	ZL1	Tanzania	(VQ3) 5H3
Lord Howe Island	VK2	Tristan da Cunha and Gough Island	ZD9
Macquarie Island	VKØ	Uganda	(VQ5) 5X5
Malaysia East	(VS4, ZC5) 9M6, 9M8	Zambia	(VQ2) 9J2
Manihiki Group	ZK1	ASIA	
Nauru Island	(VK9) C21	Andaman and Nicobar Islands	VU
New Guinea (Including Bismarck and Admiralty Islands)	(VK9) P29	Bangladesh	S2A
New Hebrides Condominium	YJ8	Cyprus	(ZC4) 5B4
New Zealand Antarctic Territory	ZL5	Hong Kong	VS6
Niue	ZK2	India	VU2
Norfolk Island	VK9	Laccadive Islands	VU4
Papua	(VK9) P29	Malaysia West	9M2, 9M4
Pitcairn Island	VR6	Maldive Islands (Gan only)	VS9M
Samoa	(ZM6) 5W1	Sikkim	AC3
Tonga or Friendly Islands	(VR5) A3	Singapore	9V1
Tokelau or Union Islands	ZM7	Sri Lanka	(VS7) 4S7

cate upon sending an SASE to Joseph Beck, 26 Ambler Drive, Norwalk CT 06851.

Times: Sept. 9: 2200 to 0100 GMT, Sept. 10: 1500 to 0200 GMT, and Sept. 11: 1500 to 0000 GMT.

Frequencies: phone: 3890, 7240, 14305, 21385, 28600; CW: 3720, 7120, 14090, 21090, 28090.

BEAR BRYANT

The West Alabama Amateur Radio Society (WAARS) will operate a special-event station on Saturday, September 10, in commemoration of the birthdate of college football's winningest coach, Paul "Bear" Bryant.

WAARS will operate station W4WYP from 1300Z to 2400Z on that date. Frequencies will be the bottom 25 kHz on the General 40-15-meter phone band. The club will also work Novices on the bottom 25 kHz of the Novice band. The club will offer a handsome commemorative certificate of the event to any station worked by sending $1 and a large SASE to the West Alabama ARS, PO Box 1741, Tuscaloosa AL 35403.

STARVED ROCK RADIO CLUB

The Starved Rock Radio Club in Oglesby, La Salle County, Illinois, will operate their club station, W9MKS, on all amateur bands from their clubhouse on September 10 and 11. A suitable QSL is being designed for this period of operation, in celebration of 50 years of amateur radio in central Illinois.

JESSE JAMES DAYS

The St. Paul Radio Club (KØAGF) will operate a "railroad mobile" special-event station aboard a steam-powered train operating out of Northfield, Minnesota, during their Jesse James Days celebration. Operations will be from 1400 UTC until 2300 UTC each day, September 10 and 11. Frequencies: SSB—3.948, 7.267, 14.288, and 21.377. CW—3.552, 7.107, 14.057, and 21.057. A special certificate and QSL will be issued to those furnishing a 9 × 12 SASE (37¢ postage) and a QSL to those furnishing an SASE with 20¢ postage. QSL to St. Paul RC, PO Box 30313, St. Paul MN 55175-0313.

GEN. STERLING PRICE DAY

The Chariton Amateur Radio Society of Keytesville, Missouri, will operate KBØCC from 1400 to 2200 UTC on September 17, 1983, in celebration of the town's 150th anniversary and the annual General Sterling Price Day, honoring its favorite son of Civil War fame and governor of Missouri. Frequencies: phone—7.280 and 21.240.

LARGEST BLAST FURNACE

The Inland Steel Employees' Repeater Association is sponsoring special-event station KB9PQ, whose theme is "The Largest Blast Furnace in the Western Hemisphere, #7 At Inland Steel." The station will be set up in the Inland Steel parking lot and will be on the air from 1300Z Saturday, September 17, to 2400Z Sunday, September 18, operating all bands in the first 10–15 kHz of the General and the Novice portions of the band. The station will also be on 146.52/.52 FM. Certificates (a full-color picture of a blast furnace) will be available from ARS KB9PQ, 7605 Southeastern, Hammond IN 46324.

APPLE FESTIVAL

The Smithfield Apple Festival, held at Smithfield OH, is sponsoring a special-event station. Operation will be from 2300 UTC to 0400 UTC on September 23 and September 24, 1983. Operation frequencies will be: SSB—3.900 plus or minus 5 MHz; Novice—7.110 plus or minus 5 MHz. The station call will be N8CUX. Special certificates depicting the bed race will be sent to those who send a 4½" × 9½" SASE to Robert Carson N8CUX, 259 Hill St., Smithfield OH 43948.

NEW PRODUCTS

IC-751 HF TRANSCEIVER

Icom announces the IC-751 HF transceiver, featuring a new generation of technology and computer control. Icom's new CPU, with internal-battery memory backup, provides 32 memories with memory storage of mode and frequency, and the scanning capability to cover large segments of the spectrum very slowly, or to scan the memories by selected mode.

The IC-751 provides instantaneous band selection and has a 3-speed tuning system. Other features included are full break-in keying, passband tuning, notch filter, RIT and XIT with separate readout, FM built in as standard, a very steep-sided FL44 sideband filter, continuously adjustable noise-blanker levels, dual vfo operation, and all-mode squelch. A two-color fluorescent readout showing the frequency in white and the control functions in red, for visibility in all ambient light conditions, is standard. The IC-751 is equipped standard for operation from 12 volts dc, and there is an optional internal ac power supply.

For more information, contact *Icom America, Inc., 2112-116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

RTTY FOR THE VIC-20

Microfish Software Products has released two programs which use the Commodore VIC-20 as an inexpensive Baudot and ASCII RTTY terminal. These programs, RTTY3K and RTTY8K feature 60-, 66-, 75-, and 100-wpm Baudot, 110-, 300-, 600-, and 1200-baud ASCII, CW ID with the operator's callsign built-in, keyboard-operated transmit/receive control, and special-display-screen formatting for a more readable display.

These programs allow the VIC-20 to be connected to any terminal unit, commercial or home-brew, allowing flexibility in choice of RTTY equipment. Simple hookup instructions are given for connecting the VIC-20 to the TTL, RS-232, or current loop input/output of the selected terminal unit as well as the PTT connections to the transmitter or transceiver.

The RTTY8K version includes 10 large message buffers. These buffers are part of the program and do not have to be typed in or loaded from tape each time the RTTY program is loaded. All 10 buffers can be programmed and reprogrammed easily by following the instructions supplied. These buffers can also be changed easily while operating by using simple keyboard functions.

To eliminate repetitive typing, RTTY8K features three automatic messages. The automatic CQ message keys the transmitter, sends CQs followed by DE and the operator's callsign, sends the CW ID, and then unkeys the transmitter, all at the push of one key. Similarly, the automatic start-of-transmission message sends DE followed by the operator's callsign. The automatic end-of-transmission message sends the other station's callsign followed by DE and the operator's callsign, the CW ID, and then unkeys the transmitter.

On-screen status display is accomplished by an "intelligent cursor" that indicates whether Baudot or ASCII is in use, the speed, which message buffer is being sent, transmit or receive mode, and other special functions.

RTTY3K requires 3K of memory, while RTTY8K needs an 8K memory expansion. Both programs are available on cassette and include complete installation and operating instructions.

For more information, contact *Microfish Software Products, PO Box 920342, Norcross GA 30092.* Reader Service number 477.

THE TU-470 TERMINAL UNIT

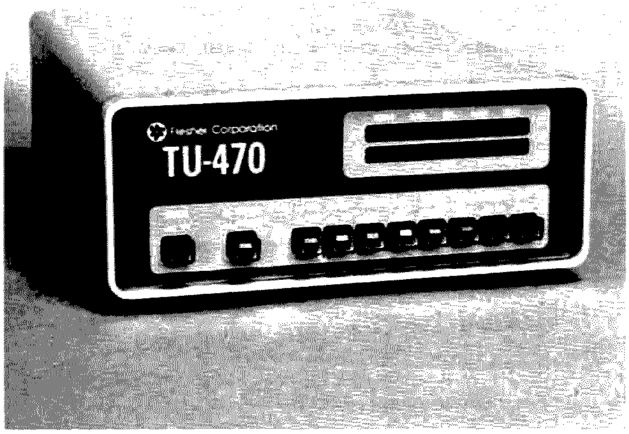
The New Flesher Corp. TU-470 RTTY/CW terminal unit offers many standard high-performance features for your money. It receives up to 300 baud on all three shifts, provides TTL- and RS-232-compatible I/O including bipolar CW and PTT outputs for complete remote control and isolation of computer-level I/O keying.

Each TU-470 RTTY filter board is a high-sensitivity, high-Q, 3-stage, 6-pole active bandpass filter which provides excellent stability and sharpness. A signal-balance restorer circuit has been incorporated to allow reception of nonstandard RTTY shifts on mark only. The CW filter/demodulator has a 3-stage, 6-pole filter centered at 750 Hz for CW reception.

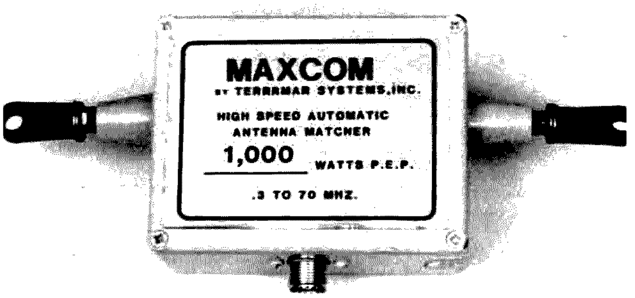
The TU-470 also provides crystal-controlled AFSK, FSK, a 170-Hz narrow preselector filter, built-in 20- or 60-mA loop supplies, autostart, threshold control, 5 LED indicators, bar-graph tuning, scope outputs, reverse receive, and reverse transmit.

For more information, contact *Flesher Corporation, PO Box 976, Topeka KS 66601; (800)-HAM-RTTY.* Reader Service number 479.

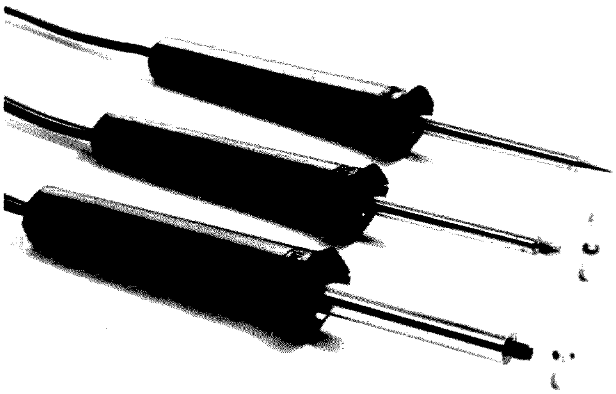
Icom's IC-751 HF transceiver.



The TU-470 RTTY/CW terminal unit from the Flesher Corporation.



The MAXCOM high-speed antenna matcher.



New soldering irons from Ungar.

ANTENNA MATCHER

Magnum Distributing has introduced its MAXCOM automatic high-speed antenna matcher.

By using the latest in solid-state technology, MAXCOM will automatically tune one antenna from .3 MHz to 70 MHz with a vswr of less than 1.5, without external control leads, in either the dipole or long-wire configuration. MAXCOM matchers are available in three models covering 200, 1000, and 2000 Watts PEP. Their light weight and small physical size make them ideal for self-supporting dipole installations. (MAXCOM 200 and 1000: weight, 2 lbs.; size, 4.75" W, 3.75" H, 2.25" D. MAXCOM 2000: weight, 4 lbs.; size, 7.50" W, 4.75" H, 2.25" D.)

MAXCOM matchers are manufactured by Terramar Systems, Inc., of Fort Lauderdale FL and were initially developed for military and commercial applications that required extremely wide-spectrum, high-speed transmit and receive capabilities.

For more information, contact *Magnum Distributing, Inc., 1000 S. Dixie Hy. W #3, Pompano Beach FL 33060; (305)-785-2002.* Reader Service number 484.

FUNCTION BOARDS FOR S-100-BASED COMPUTERS

Industrial Computer Designs has announced four special function boards for S-100-based computers, together providing calendar, clock, alarm, timer, and 64-channel analog-digital-analog conversion capabilities.

The CCA-100 calendar/clock/alarm board can be used to display hours/minutes/seconds and day/month/year on a CRT, time events in second increments, and produce musical alarm tones over a four-octave range. Its brother CCT-100 calendar/clock/timer board can control events with 1/100th-second accuracy, keep track of computer time used, or calculate days elapsed between dates, all as hardware functions. Time/date information may be sent to a printer or stored as data, with all functions under software control. Both cards have long-term battery backup and utilize a minimal number of Z80/8080 ports for operation.

The D/A64-100 produces 64 analog outputs with 8-bit converter resolution, while the sister A/D64-100 board performs A/D conversion with similar accuracy. Voltages may be generated or read over a 0-to-5-V-dc range in 255 increments. The boards are port-selectable so that multiple cards may be used to create large systems as controllers for energy management, security, industrial control, or robotics.

ICD products are available through computer hardware distributors and dealers throughout the US and Canada, and will be supported by advertising in both trade and consumer publications. An owner's operation/service manual accompanies each card, which includes application and support software listings.

For more information, contact *Industrial Computer Designs, 31121 Via Colinas #1005, Westlake Village CA 91362; (213)-889-3179.* Reader Service number 482.

UNGAR INTRODUCES NEW SOLDERING IRONS

Three new low-priced "consumer" soldering irons with Thermo-Duric heaters have been introduced by the Ungar Division of Eldon Industries, Inc.

Thermo-Duric heating elements reach soldering temperature faster, use less energy, last longer, and take less space than earlier wire-wound heating elements. Since the heaters were developed for industrial soldering systems, the new "consumer" line has soldering qualities and dependability appropriate for electronics technicians and prices to attract hobbyists and do-it-yourselfers.

The CM-25 has an integral nickel-plated cone tip suitable for small and large connections. The 25-Watt iron heats to 750 degrees F. The 45-Watt CM-45 and 80-Watt CM-80 can use any of 11 standard Ungar screw-on tips, and have three-wire cords to prevent leakage current damage. The CM-45 comes with an iron-plated pencil-tip point. Operating temperature is 700 degrees F. The large-capacity CM-80 comes with an iron-plated chisel tip and operates at 800 degrees F.

Slimmer, cooler handles were made possible by the efficiency of the "Thermo-Duric" heaters.

Further information is available from *Ungar, 100 W. Manville St., Compton CA 90220; in Canada: Eldon Industries of Canada, Inc., 500 Esna Park Dr., Markham Ontario L3R 1H5; (416)-495-9407.* Reader Service number 481.

PERSONAL HAM-TAGS

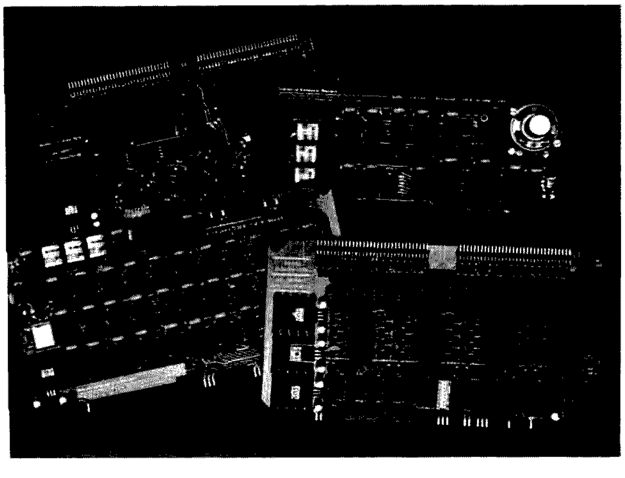
BHC, Inc., has announced its new "Ham-Tags." Ham-Tags are license plate frames personalized with ham radio callsigns. These frames are made from black molded ABS, the same material used for trim on most new cars.

A set of Ham-Tags consists of two black frames with white, permanent vinyl letters in the large imprint area. License plates differ from state to state, so you would have to check your plate to see if your call would go at the top or bottom of the frame. In states that have only one plate, BHC will furnish a frame for the rear and a plate for the front.

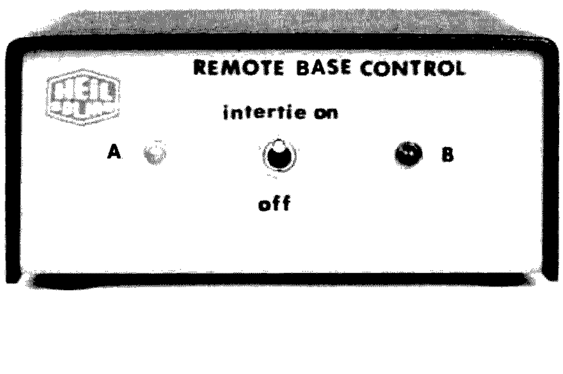
For more information, contact *BHC, Inc., 1716 Woodhead, Houston TX 77019; (713)-522-5755.* Reader Service number 483.

REMOTE-BASE CONTROL

A new intertie control has been introduced by Heil, Ltd., of Marissa IL. The RB-1 allows two-way control of two FM transceivers. A 2-meter transceiver can be connected to a UHF or 10-meter FM transceiver for remote-base operation. Sepa-

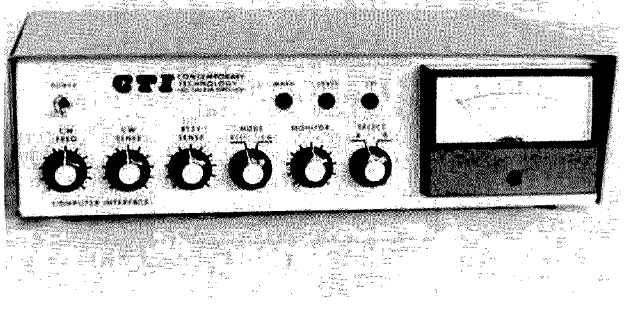


Function boards for S-100-based computers.



The Heil RB-1 remote intertie.

The Bird wattmeter field-strength plug-in element.



Contemporary Technology's TMC-1B computer interface.

rate squelch and audio lines are fed from each rig, as is the PTT control line.

As the squelch of one rig is activated, the RB-1 will turn the transmitter of the second transceiver on. The reverse of this also happens, allowing complete remote-base control between the two transceivers.

The RB-1 can also be used as a complete repeater control for simple repeater systems or emergency operation.

For more information, contact *Bob Heil, PO Box 68, Marissa IL 62257; (618)-295-3000.* Reader Service number 476.

PROKEY SOFTWARE FOR THE VIC-20

The Prokey (and Prokey Deluxe) Software turns your VIC-20 into a full-featured CW keyboard. Of the two programs, one is designed to run on an unexpanded VIC-20. This program will provide normal CW keyboard sending with a ten-character buffer and a visual indication when the buffer is starting to get full. It also provides the capability of storing three user-programmable messages which can be changed while the program is running. You can also display the stored messages in order to check them. An abbreviated version of the serialized-contest-number generator is included, and an electronic notepad will let you keep track of the station you are talking to.

The second program requires a total of 7K of user memory and therefore expanded memory for the VIC-20. This program includes all of the features for the basic program and some special additions. A built-in clock will send the time in Morse code with just a single keystroke; a real-time clock will display the time on the corner of the screen; the beacon mode will allow a beacon message to be sent at any interval up to 23 hours 59 minutes; the logging mode will display log information automatically when you send $\overline{\text{SK}}$; and a screen-sized buffer allows editing capabilities.

For more information, contact *Jim Grubbs K9EI, PO Box 3042, Springfield IL 62708.* Reader Service number 478.

WATTMETER FIELD-STRENGTH PLUG-IN ELEMENT

The latest addition to the line of plug-in elements used with Bird directional wattmeters is an extremely sensitive relative field-strength element. Model 4030 expands the usefulness of Thruline™ wattmeters in the field by helping to optimize the radiated signal of any transmitter from 2 to 1000 MHz.

It is easy to increase the reach of business or personal transceivers, to extend the range of HTs by tuning, adjusting, and positioning antennas for maximum meter indication on the host wattmeter.

Model 4030 employs modern broadband circuitry instead of the highly reactive resonant networks of most field-strength meters. The element consists of a flexible receiving antenna, a single high-pass network, and a variable gain rf amplifier/detector. A battery-saving feature turns everything off when the element is removed from the wattmeter.

Typically full-scale deflection is obtained from a one-Watt CW source at 150 MHz through a quarter-wave antenna 8 feet distant. Dynamic range is at least 30 dB, and battery life is 100 hours or more.

For more information, contact *Bird Electronic Corporation, 30303 Aurora Road, Cleveland (Solon) OH 44139.* Reader Service number 480.

MOBILE PRODUCTS FROM BEALE ELECTRONICS

Beale Electronics has announced several new products for the mobile operator.

The CH-20 mobile antenna, designed by W0CZR and modified by KD0U, is compatible with Hustler and Hy-Gain masts. The antenna consists of a resonator and whip which, when added to your mast, has an overall height of 10 feet. This antenna has a broad bandwidth and is designed to handle full legal power.

The DX-15 mobile antenna is also available. It is similar to the CH-20 antenna and also has an overall height of 10 feet.

A new mobile mast has also been introduced. It can be ordered in one 54-inch section, two 27-inch sections, or three 18-inch sections, or it can be custom cut.

The Power Cable Package includes all the connectors, wires, fuses, and plugs you need to connect a solid-state transceiver to your vehicle. The package also includes a cigarette-lighter plug for temporary installations.

Top it all off with the Beale magnetic mount. It has a 5-inch-diameter base and is compatible with standard HF mobile masts. The mount comes complete with coax, PL-259 connector, and cord for mast stabilization.

For more information, contact *Beale Electronics, PO Box 2641, Evergreen CO 80439.* Reader Service number 492.

TMC-1B COMPUTER INTERFACE

Contemporary Technology has announced the TMC-1B computer interface for RTTY/CW. The TMC-1B will work with most home computers, including Commodore VIC-20, Commodore 64, Apple, Atari, and more. Software for the VIC-20 is included at no extra charge.

Some of the features of the TMC-1B include auto-start circuit on RTTY with a variable control on the front panel—you can adjust it to print only when you are on a solid RTTY signal; LC-tuned-circuit filter with a Q of 300 which offers greater sensitivity to weaker RTTY signals and also is more selective with crowded band conditions; and CW sense and CW frequency controls which give a threshold setting to copy a CW signal. With the CW frequency-adjust control you are able to adjust your rig farther from noise; it also will allow you to use most CW audio filters.

CTI has a built-in monitor speaker to allow you to hear the signal as it is sent in CW and RTTY mode. Also, an external speaker can plug into the TMC-1B for a loop through from your rig (or rigs) to a speaker.

The TMC-1B interface uses a CW LED to tune in CW. Mark and space LEDs indicate that you are on the RTTY signal, allowing you to see mark and space on an incoming RTTY signal.

With CTI, there is a single switch between two rigs (HF and VHF)—no plugs and cables to move. And no need to worry about + or − keying since CTI uses reed relays on the output for compatibility. There is high front-end gain (90 dB) for a wide-range in volume adjustment.

Other features included in the TMC-1B are: an RS-232 interface, a built-in printer loop supply (just add an optional transformer and power relay for printer motor), and an amateur 170-Hz shift as well as a 425-Hz shift for monitoring commercial signals.

The CTI TMC-1B is solidly housed in an 11"W × 3½"H × 10"D metal case for rf shielding. Simple hookup used RCA jacks for hookup to transceiver. Just run a line to MIC, to PTT, to speaker, and to CW key. Only one cable to the computer. All plugs for the computer are supplied as standard. The TMC-1B will work up to 300 baud ASCII.

The TMC-1B is fully guaranteed for one full year on all parts and labor.

For more information, contact *Contemporary Technology, Inc., PO Box 1083, Salem OR 97308; (503)-399-1370.* Reader Service number 491.

HUSTLER ANNOUNCES FIXED-STATION ANTENNA

The all-new Hustler 220-MHz vertical fixed-station amateur antenna, designated the Model G7-220, was recently introduced by Hustler, Inc. The G7-220 marks Hustler's entry into the now popular 220-MHz band and complements their existing base and mobile amateur antenna line. The 7-dB gain of the antenna for both transmitting and receiving makes it the most powerful omnidirectional 1-1/4 meter antenna available. The all-new design keeps the signal radiation pattern at the lowest possible angle to the horizon for maximum efficiency and longest range.

The Model G7-220 has an swr of 1.5:1 across its entire 5-MHz bandwidth, with swr at resonance of 1.2:1 at the antenna. The radiating element is dc-grounded, and the antenna has a 50-Ohm base impedance.

This new Hustler 220 MHz vertical uses the best available corrosion-resistant materials for long life. Only Hustler uses all stainless steel hardware in amateur and professional products.

The 122" long vertical element and four 14-3/4" long radials of the G7-220 are made from high-strength, heat-treated aluminum. Each radial is 3/16" o.d. The N-type connector used on all new Hustler amateur verticals provides an all-weather seat and virtually perfect rf characteristics under all conditions.

The antenna weighs only 7 pounds and is easily mounted on any capable vertical support up to 1-3/4" o.d. Wind loading is only 26 pounds at 100-mph velocities.

For further information on this or other Hustler amateur products, write: *Sales Department, Hustler, Inc., 3275 North Avenue, Kissimmee FL 32741.*

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 6

group that puts out *Computerworld, Infoworld,* and so on...a company several times the size of my firm in sales. The date was significant to me because it was eight years to the day from when I called the editor of a small micro newsletter to come up and discuss starting a magazine—and we agreed to give it a try. Five weeks later, the first issue of *Byte* went to the printer. Those were five frantic weeks, I'll tell you.

Getting *Byte* started was exhausting work but fun. We'd just gotten it off to a good start when the editor and my office manager moved the magazine out in the middle of the night, a stunt which I still haven't gotten over.

The merger means that we'll be able to do more promotion of our current magazines. It means we'll be able to start more magazines—and I have a bunch of them all planned out. Each magazine is going to require a staff, so we'll be needing 200 or 300 people to help out—editors, writers, technicians, programmers, people for advertising sales, typesetting, graphic arts, circulation, data processing, and so on.

Then there are a number of special projects such as my planned technical/business college. We're going to need management teams to get these projects going and run them. Most of this is going to be done in New Hampshire, but eventually we'll be growing into other areas of the country.

If you are interested in getting involved with some exciting new ideas, you should get a letter off to me telling me what you think you might be able to do. I'm looking right now for nonsmokers with a history of enthusiasm and the ability to make things happen with a minimum of supervision.

There won't be any astronomical salaries when we are starting new projects, but we will plan to make it well worthwhile for those who are the most helpful in starting the new projects.

For instance, there are a number of products that I'd like to have made in Asia and imported for sale here. I've got the contacts in Asia to handle that end, but I need the people to handle the project from the New Hampshire end...setting up the advertising, importation, and distribution of the products. This should be able to grow into a substantial business by itself.

Why New Hampshire? Well, mostly because this is one of the best places in the country to live. The quality of life is wonderful and the cost of living is far less than New York or Silicon Valley. We still don't have any state sales or personal income taxes in New Hampshire. We're in a small town with all of the advantages of a small town. The people are friendly and the crime rate is so low that few people even bother to lock their homes.

If you are looking for the chance of a lifetime to get in on some new projects...and if you think you can hack it...let me know. You're going to have to prove you can get things done. We have no free rides here, just a bunch of enthusiastic people all having the time of their lives working hard and turning out first-rate products. We're working out of old houses, converted motels, barns, and so on. This is not IBM.

You can be old, young, black, white, red, brown, male, female, undecided, but if you smoke, please don't bother me, okay? The air up here is invisible and we want it to stay that way.

We need people who astound us by how much they get done, not people looking for a way to laze through life, producing more baloney than work. We've already tried a bunch of those people and sent them on to work for our competitors.

The merger means that we have a guarantee of the money we need to move ahead on as many projects as I can find teams to work on. And if we run out of projects to get started, I'll have more. I come up with an idea for a good solid project every few days.

When you think about it, by the time you put my six magazines together with those Pat is already publishing, we're a very strong combination. I think we'll be able to parlay this group into a pilot model of the college of the future or into perhaps an educational satellite television network.

Pat is much like me—full of ideas and enthusiasm. I think we're going to really make things hum in the communications field. Care to join us?

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

RADIOTELETYPE

Like most who became involved with radioteletype before the days of microcomputers, my entry into the world of the green keys was not an easy one. While I had no trouble conquering the technical side of the field, finding a functioning teleprinter at a reasonable cost was another story.

After several weeks of searching, it was best-friend Jonathan Bird WA2MJK (now KA0BYW) who located a Model 19 for me. The next Saturday, we headed over to the Garden State to pick up the unit.

I'll never forget the face of the fellow I bought the machine from as we told him we wanted to stuff the unit into my subcompact Mustang II. I'll also never forget almost losing Jonathan and my new machine halfway across the George Washington Bridge.

This month, FUN! looks at the world of RTTY. The column is dedicated to those who got their start in the days when you could tell a radioteletype operator by the musty, greasy smell of his shack.

ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

Across

1) RTTY keyboard setting
5) Full or ______ duplex
8) Amplification factor
9) Adjustable aperture in SSTV camera
11) ______ QSL
12) Audio compression is said to add this
15) Terminal unit (abbr.)
16) Computer section (abbr.)
17) Computer memories
20) Partner to 17 across
21) Austria prefix
22) Slang for CPU: electronic ______
24) Transmitter-generated signal for operator
26) To empty buffer
28) CP/M, 3.3, UNIX, for instance (abbr.)
29) Trademark for teleprinter

Down

1) Local circuit
2) ______ pot
3) Interference type (abbr.)
4) Sweden prefix
6) Popular amplifier brand
7) 3.6125 MHz, 880 kHz, 1 GHz
10) Slang for unwanted output
13) Opposite to 1 across
14) No-keyboard TTY (abbr.)
18) ______ 32
19) Look
23) Discharge between electrodes
24) 170 Hz ______
25) To subject a component to an action
27) Slang for current unit or power booster
28) German prefix

ELEMENT 2—MULTIPLE CHOICE

1) Which of the following amateurs never wrote a RTTY series for CQ magazine?
 1) Wayne Green W2NSD/1
 2) Byron Kretzman W2JTP
 3) John Edwards KI2U
 4) Al Gorithm W2RY

2) At which of the following frequencies can you send data at 1200 baud?
 1) 17000 kHz
 2) 3.625 MHz
 3) 14.090 MHz
 4) 28.300 MHz

3) What does the FCC call Baudot?
 1) Murray
 2) International Telegraph Alphabet Number 2
 3) Morse
 4) The FCC never refers to Baudot

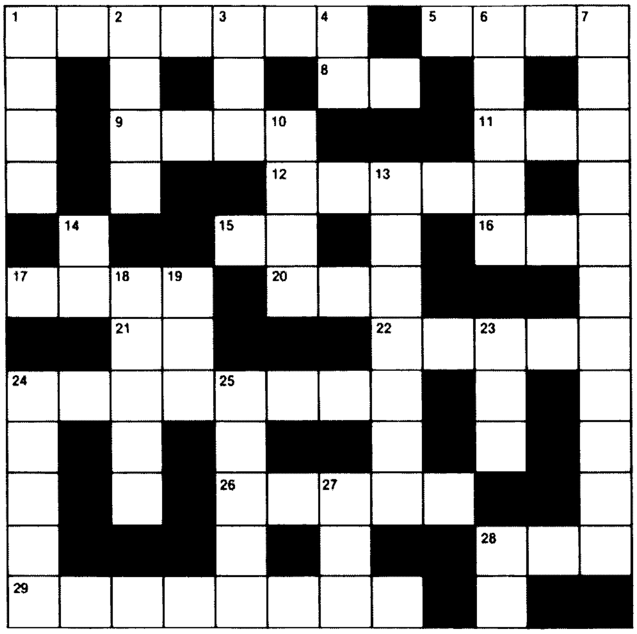


Illustration 1.

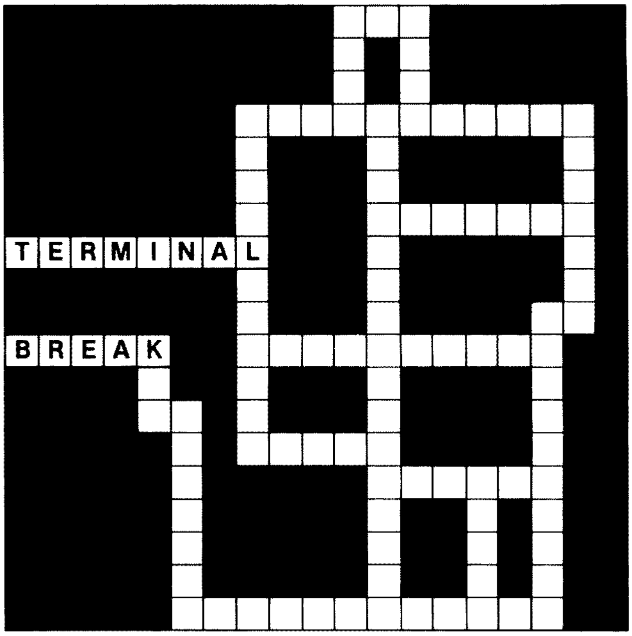


Illustration 2.

4) AMTOR is:
   1) A new, error-free digital transmission method forbidden on amateur frequencies.
   2) A new, error-free digital transmission method permitted on amateur frequencies.
   3) A type of nine-level code.
   4) A teleprinter brand.

5) Which of the following companies has never manufactured teleprinters?
   1) Olivetti
   2) Creed
   3) Seimans
   4) Remington

ELEMENT 3—TRUE-FALSE

	True	False
1) The two signals generated by RTTY are called "mark" and "trade."	______	______
2) The maximum RTTY signal shift permitted by the FCC is 850 Hz.	______	______
3) Baudot and Murray codes are one and the same.	______	______
4) ASCII is a seven-level code.	______	______
5) Baudot is a four-level code.	______	______
6) Novices can send RTTY within Novice bands.	______	______
7) General-, Advanced-, and Extra-class amateurs can send RTTY within Novice bands.	______	______
8) The Teletype® Company is owned by RCA.	______	______
9) Under traditional AFSK standards, the mark tone is the lower frequency signal.	______	______
10) One of the founders of the Teletype Company was Joy Morton, who also was founder of the Morton Salt Company.	______	______

ELEMENT 4—HAMAZE (Illustration 2)

Here's a new type of maze specifically geared to hams. The object is to start at "Terminal" and trace your way to "Break" by filling in the answers to the clues given below. To help you on the way, we've already given you the first and last clue answers. All words read either vertically downward or from left to right. Each new word is on a perpendicular angle to the previous word. Words join on a common letter. Good luck!

1) Computer operating console
2) RTTY power circuit
3) Energy
4) Tuning ______
5) Display unit
6) What this month's column is about
7) RTTY test letters
8) Printing fabric
9) Natural noise
10) What the brown fox is
11) Automatic reply system
12) Skyhook
13) German prefix
14) To joke with someone
15) Make and ______

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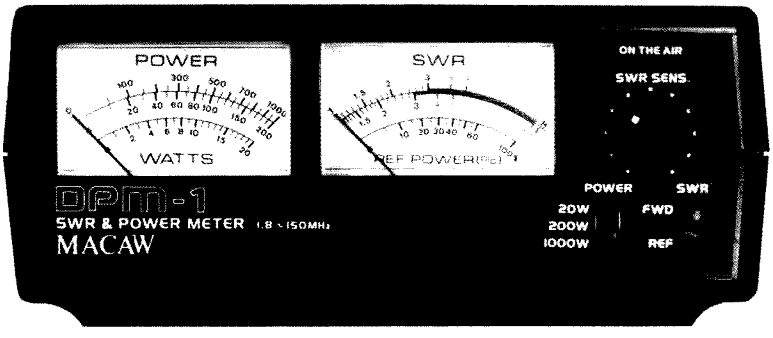

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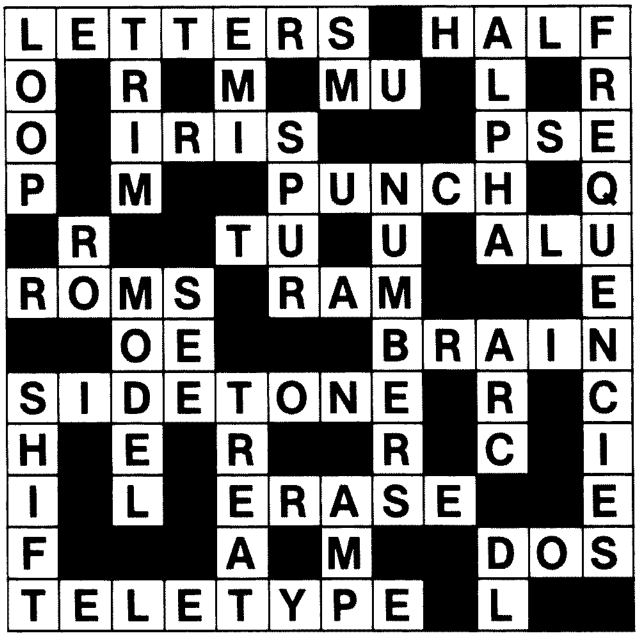

Illustration 1A.

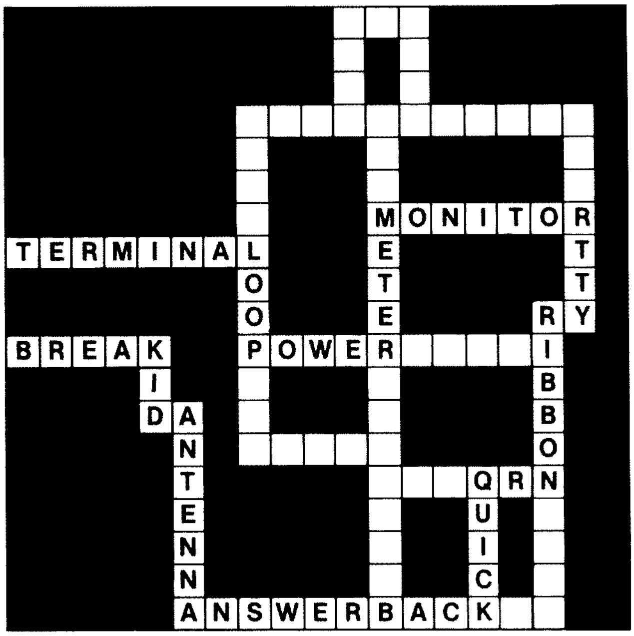

Illustration 2A.

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1—4 And the checks are still in the mail.
2—4 Below 10 meters you're stuck with 300 baud.
3—2 You expected something simple from our government?
4—2 So long, CW jammers.
5—4 And you thought the world began and ended with Teletype.

Element 3:
1—False Mark and space. Trade and Mark are the Smith Brothers.
2—False Nine hundred is the magic number.
3—False A rose is a rose is a . . .
4—False Nope. Eight-level.
5—False Nope. Five-level.
6—False Not yet, anyway.
7—True Let's all confuse the Novices.
8—False AT&T.
9—True Mark: 2125 Hz, Space: 2975 Hz.
10—True Could I make something like that up?

Element 4:
See Illustration 2A.

SCORING

Element 1:
Twenty-five points for the completed puzzle, or one-half point for each question correctly answered.
Element 2:
Five points for each correct answer.
Element 3:
Four points for each correct answer.
Element 4:
Twenty-five points for the completed puzzle, or one point for each word solved.

Are you a friend of the green keys?
1-20 points—You run a CW net on 14.090 MHz.
21-40 points—Know a friend who used to own a Model 12.
41-60 points—Casual operator.
61-80 points—You keep an oil can on your night-table.
81-100+ points—You copy RTTY by ear.

HAM HELP

I am looking for a manual and schematics for an SG12 1800-4400-MHz signal generator. It was manufactured by Empire Devices, Inc.

Bill Stevenson WB3FZV
PO Box 518
Ridge MD 20680

Wanted: schematic for the KLM model 10-160BL 2-meter amplifier and schematics, cables, connectors, and control head for the Motorola U43GCT-1010B transmitter, type CC3006. I also need the solid-state power modules, both low and high voltage, for the T-195B transmitter. And I would like to hear from anyone who has converted the R-392 receiver to solid state.

Tommy Norris KA4RKT
Rt. #1, Box 412
Auburn KY 42206

I need the first part of the assembly manual for the Heath GR-269 color TV. I bought this kit in Mexico, but all of the PC boards and their parts are missing. I have all of the other manuals except the one describing the PC boards. I also need information on the Venus SS-2 TV camera.

Hans U. Nadler XE1HUH
Gabino Barreda 54-B
Cto. Educadores
Cd. Satelite, Edo. de Mexico
Mexico

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73 INTERNATIONAL

from page 78

procedure, and a 9-month freeze on issuing new licenses.

There is an increasing interest in VHF, especially 2 meters. Being in Region 1, we are allowed only 144-146 MHz. 146-147 MHz is a popular commercial band since relatively inexpensive amateur rigs can be used on these frequencies. The first attempt at using a 2-meter repeater was in 1978 when a makeshift repeater was set up in Monrovia. It was not very satisfactory, with limited coverage and frequent breakdowns, but it was a beginning. Then the Bong Mine ARC installed a repeater in 1979 at their commercial site on the top of Bong Mountain at 900 feet altitude. It operates on 145.1 in and 145.7 out on a 7.5-dB gain vertical at 20 Watts output. It has five-county coverage (half of the counties) if proper power and antennas are used.

My path to Zorzor (pronounced zaw-zaw) is the longest path of anyone working the repeater. It is 90 miles over hilly/mountainous terrain. I definitely have the most exotic 2-meter antenna in Liberia. With the help of EL2FE, EL2CA, and the *ARRL VHF Manual* and *ARRL Antenna Handbook*, I constructed a vertically polarized rhombic, 58 feet on a side. It is fed with 300-Ohm ladder line and then matched with a universal stub into a 4:1 coaxial balun and a short run of RG-8/U into the shack. The rhombic is unterminated and bidirectional. It is easier to construct that way, and there is a rather unlikely chance that I will ever be bothered by QRM from 3X only 3 miles behind me. This type of antenna might be very useful for an American ham in a rural area with poor repeater coverage trying to get into a distant repeater.

Getting 2-meter equipment in Liberia is a real problem, especially for Liberians. If there are any repeater clubs or VHF enthusiasts that would like to help promote 2-meter activity in a developing country by sending old but serviceable crystal-controlled rigs that are lying around, please contact me.

Tom Viseh EL2AV has done the first OSCAR work from Liberia. On July 12, 1979, he made the first Liberia-US contact using OSCAR 7, which is about the maximum distance possible. Tom lost interest after his initial success since most of the time "there was no one to hear but myself," and since Tom left, there has been no one to fill the vacuum. I have some interest in OSCAR, but time and equipment are the limiting factors.

For many years, the West African Net has met on 7.060 at 0700Z on weekdays and 0800 on Sundays. This net is quite active and is mostly EL with some regular 9L and TU and occasional XT, 5U, TY, 9G, 6W, 3X, and maritime mobiles.

Liberia has been independent for 135 years and Liberians were probably the first black Africans to be licensed as amateurs. Historically, the first Liberian amateur was John Lewis Cooper who worked for P&T and was licensed about 1938. It seems that some expatriates may have preceded him by a few years but the history is not clear as to who was actually the first ham in Liberia.

The next group of Liberian amateurs was licensed in the 40s and included Henry Grimes EL2M, Robert Taylor EL2H, and Samuel Butler EL2L. These people are presently alive but inactive. In the 50s came Sewell Brewer EL2S, who presently works for the ITU in Geneva. The longest-licensed, presently active amateur in Liberia is Sam Watkins EL2P, who was first lincensed in 1956. Sam has been a key figure in the success of amateur radio in Liberia as the Assistant Minister for Telecommunications.

Walcott "Ben" Benjamin, Sr. EL2BA is the individual I consider Mr. Ham Radio in Liberia. He has been a powerful force behind amateur radio, acting as president of the LRAA and looking after our interests on the domestic and international scenes. Although a busy businessman, he always has time for amateur radio. He is a member of the IARU Region 1 division executive committee. He was an observer with the Liberian delegation to the WARC in Geneva and was a strong force behind the scenes which made the conference a success. He is constantly driving around the country helping to administer tests, and generously loans his personal equipment to those in need. He often buys equipment from departing hams because he doesn't want to see a good rig leave the country and somebody may need it in the future. He runs the QSL bureau and goes personally to LTC to assist others in getting their first licenses or even to renew their licenses. His list of contributions is unending. He has been licensed since 1968.

Other prominent Liberians are Jacob "Jake" Cisco EL2C, first licensed as EL4E in 1970. Jake is Chief Pharmacist for the Ministry of Health and is the man who helps get drugs for our hospital and many others. Ashley Rennie EL2AR was licensed in 1970 as EL4NA and is Communications Manager for the Firestone rubber plantation in Harbel. Henry Hali EL7E is a chemistry teacher at Cuttington University College in Suakoko. Henry was first licensed as EL5NA in 1971 and is very active on 20 meters.

A promising new addition to the Liberian ham community is Kokulo Waiwaiku, a young doctor from Zorzor who worked with me for a year after graduating from medical school. He was my personal recruit into ham radio. First licensed as EL5NB in 1981 and now EL2CQ, Kokulo is presently specializing in pediatrics in Monrovia.

Steve Mmari EL2EM is a Tanzanian who recently finished his studies in physics at the University of Liberia and is quite active. Steve is one of the few Tanzanians—if not the only one—to have a ham license.

Expatriates like myself have a fairly high turnover and usually stay for only 2-4 years. Americans make up the largest number of expatriates. They most likely would be missionaries like myself or sponsored by the US government, such as Voice of America staff, embassy personnel, and development people. Gale "Lee" Ruff EL2FE is one of the most prominent expatriates and is known as "EL2 Fix Everything." Lee has been in Liberia over 10 years and is the top engineering man at the Firestone rubber plantation in Harbel about 50 miles down the coast from Monrovia.

Operating from Liberia is enjoyable. The country isn't on the 10-most-wanted list, but we are constantly informed that we are the first EL contact, and prefix hunters go crazy with EL5 since there are only three of us. Pileups can be generated quickly when there are strong signals during popular operating times, especially with Europe and Japan. The best operators in a pileup are the Japanese, North Americans, and northern Europeans, in that order. The worst are the southern Europeans, eastern Europeans, and South Americans, in that order; operating under heavy pileup conditions with southern and eastern Europeans is impossible without operating split, and often I just shut down. However, unbelievable pileups can be handled without a problem on simplex with Japanese stations.

When signals aren't strong and during off operating hours, often you can call CQ without an answer, or generate a short string of QSOs which trail out and stop (are you listening QRPers?). Fortunately, we aren't so rare that you can't make a QSO with your buddies without being interrupted. We are, however, often asked for signal reports during short breaks, which is not too bothersome.

Stateside propagation is most reliable on 20 meters between 2100 and 0800. I usually keep a sked with my QSL manager, K3RB, at 2200 with universally good results. 15 meters can often be good during those times but drags out a little later in the morning, and quite reliable skeds can be kept at 1100 on this band. The problem with 15 and 20 meters is that they get good when a working family man should be in bed. That's why you hear Africans protesting all the time that they want to go to bed. When 10 meters is open it is usually between 1100 and 1900. On 40, 80, and 160 meters, nighttime is, of course, the best chance for DX, and to the US it is usually early morning before sunrise (0300-0600). Heavy QRN in the tropics quickly dulls your enthusiasm for the low bands.

There can be some nice long-path openings on 20 meters, usually into the West Coast, between 1300 and 1800. I ran a beautiful patch on 1400 MHz by this route recently to my brother-in-law in California. The band is more consistently open into the Pacific, and I once ran a patch into Guam at about this same time.

Other interesting openings include the very consistent 20-meter path to the Pacific and long-path VK at 0700-0900.

Walcott "Ben" Benjamin EL2BA, Kokulo Waiwaiku EL2CQ, and Steve Mmari EL2EM during an antenna-raising party for Kokulo (who erected a home-brew quad on a home-brew guyed tower).

Larry Johnson EL5F is seen here operating Yaesu equipment in his bedroom. Larry is translating the Bible into Kisi, which is the same ethnic group that Henry EL7E comes from. These two guys are certainly the only hams to ever carry out a QSO in Kisi.

Oscar Ocampo EL9A is a Filipino who keeps a regular sked with his DU buddies on this long-path opening. Sometimes there is an unbelievable pipeline long-path into JA at this same time on 15 meters. 15 is good to Africa and Asia in the afternoons between 1600 and 2000. People don't realize how close Liberia is to Brazil, and there can be some tremendous signals from PY on any band at almost any time. EA8 puts in crushing signals. The bands seem to be open almost always to Europe, which is a piece of cake. ZL is over the South Pole and for some reason is difficult to work.

We have ten call numbers. Each of the nine counties is designated a number 1 through 9. (Keep in mind that Liberia is a small country about the size of Indiana and has only 2 million people.) Most hams are in Montserrado County, which is EL2 and includes the capital, Monrovia. My county, Lofa, is EL5. It is the largest in the country and is nearly the size of Massachusetts. The LRAA offers a Worked All Liberia Award (WAEL) if you can confirm all 9 counties with contacts on at least 3 bands. It is not that easy, as all the counties are not presently active.

ELØ is maritime mobile since Liberia has a very large merchant marine. There are only a handful of ELØs and the suffixes all begin with A. Most ELØs are bootleggers; and they usually pick a callsign which *doesn't* begin with A, so they are easy to spot.

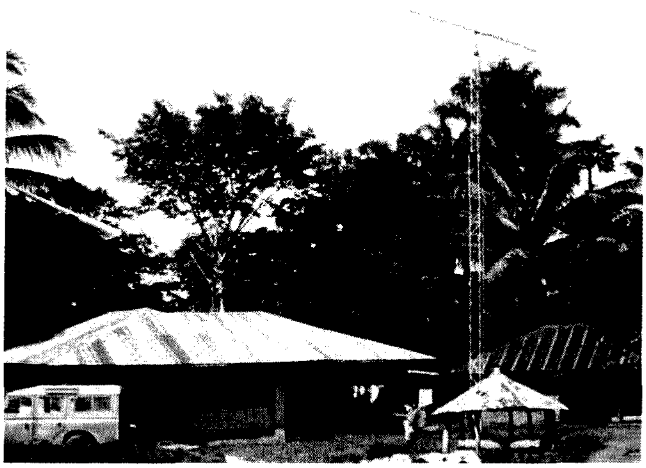
My position as Chief Medical Officer at Curran Lutheran Hospital in Zorzor is very challenging. Our hospital was started in 1924 and has 120 beds. It is hard to imagine, but there wasn't even a road to Zorzor until 1958.

My training is as a specialist in internal medicine, but my job includes everything that walks in the door including surgery, pediatrics, obstetrics, public health, and even chemotherapy. Other things, not usually included in a doctor's job description, include creating a homemade solar water heater, maintaining 15 old Heathkit/HF mission radios, repairing electrocardiographs and spectrophotometers, designing and supervising construction of buildings, and almost anything else.

Amateur radio is a great hobby and has proven to be invaluable for the hospital as well. We have had emergency situations caused by breakdown of critical equipment such as an autoclave for sterilizing surgical instruments. The generous phone-patch assistance of US hams has gotten replacement parts to us in as little as seven days rather than the 2-3 months that conventional methods would take. Another occasion where ham radio saved the day involved a severe eye injury to a blacksmith caused by a splinter of iron (wear your safety goggles). A phone patch to an opthalmologist in Pennsylvania allowed my colleague and I to perform eye surgery which saved the man's eyesight.

Our hospital has a long tradition of ham radio over the years. The maintenance chief in 1972, Dave Urfer EL5B, ran emergency communications with the Centers for Disease Control (CDC) in Atlanta during that year's Lassa fever epidemic which killed 4 people and left 2 completely deaf. This won him a medal from the Liberian government and a page in *73* magazine. Four other doctors who have worked at the hospital are hams.

Hamming is a relaxing hobby for me, and I enjoy construction projects, low-key DXing, and rag-chewing. It is also amazing what help a guy can get if he only asks another ham. If I have a technical problem, I can usually find the answer, anything from aircraft antennas to castrating pigs for a local agricultural project.

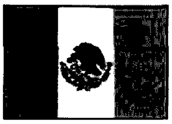


QTH of Larry Johnson EL5F, which is located in Boya less than half a mile from the Sierra Leone border. Boya is about a 5-hour drive from Zorzor when the roads are passable.

My HF rig is an Icom 720A which I recently acquired from a departing ham. I have found it to be as nice as it looks. It doubles as a general-coverage receiver and allows me to pick up football games and my favorite radio program, "All Things Considered," via the Armed Forces Radio and Television Service (AFRTS). It also serves as a frequency standard for my workbench. I have a Clipperton L amplifier which really helps, but it just blew a transformer and I'm waiting for the $145 replacement. I brought a Heights 64-foot, aluminum, foldover tower with me and use a Mosley CL33 tribander at the top of the tower. There is an 8-element quagi on a 4-foot mast above the tribander. I use a half sloper on 80 with a trap for 40 meters. I made a half sloper for 30 meters but was unable to get the swr down satisfactorily, so I am working on a rotatable shortened dipole. My vertically-polarized 2-meter rhombic for repeater work is 109 feet front to back and stands off the side of the tower.

The hospital has two 75-KVA Caterpillar diesel generators which supply electricity to the hospital compound. Diesel fuel is $3.00 a gallon, and spare parts are expensive and difficult to get. We presently have fairly reliable power for 21 hours a day, but I run my complete station except for the HF linear amplifier from a 120-Amp-hour battery with a 10-Amp battery charger. This gives me uninterrupted hamming enjoyment.

I hope you have enjoyed this ham-radio tour of Liberia! On behalf of the vigorous amateur community in Liberia, I invite you to work us on the bands and learn something more about our country.



MEXICO

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Photos by Gabriel Stadtler

According to Aztec mythology, Teotihuacan is where the gods came together to create the sun and the moon. A giant pyre was made and the poor but brave god, Nanauatzin, threw himself fearlessly into the sacrificial fire, thus becoming the sun. The richly-dressed Tecciztecatl, who had boasted of his bravery, hesitated before casting himself into the flames and thus became the pale moon. His light was now only a reflection of the sun's rays. From this legend came the names of the two largest pyramids of Teotihuacan, also known as "The City of the Gods."

DXpeditioners (left to right) Jesus, Leobardo, Daniel, Freddy, Gabriel (photographer), Mark XE1MKT, Ruth XE1MKT, Elvia, Lizzy, Wendy, Joe, Renee, and Chris.

Teotihuacan is the most widely known of Mexico's major archeological zones. Located about 42 miles northeast of Mexico City, the area covers 91 square kilometers. There you will find majestic pyramids of all sorts, temples, and courtyards. Some archeologists estimate that Teotihuacan had some 125,000 people living there, making it one of the largest cities in the world of its time—in the third century BC.

It was more than 2,300 years later that my XYL (Ruth XE1RBT) and I obtained special permission from the National Institute of Anthropology and History in Mexico City to occupy the top of the Pyramid of the Sun (65 meters high) for a 24-hour QSO. We asked for the date of February 12, 1983—our sixth wedding anniversary!

What a way for a married couple of hams to spend their wedding anniversary! Within all those QSO pileups there would certainly be someone who would ask why—and we would be able to answer (and delightedly remind ourselves) that it was just for the fun of it!

The first obstacle that we had had to overcome was getting permission to undertake this expedition to the archeological zone. There is nothing like doing things properly right from the very beginning, so a detailed written petition was presented to Lic. Pablo Elhore Garcia, Director of Legal Matters for the National Institute of Anthropology and History in Mexico City, and Emigdio Arroyo Garcia, Administrator of the Teotihuacan Archeological Zone. The matter was considered and, fortunately for us, approved! Then the real fun began!

February 12 was a Saturday, so we decided the 24-hour QSO would begin that day at 8:00 am and end on Sunday, February 13, 1983, at the same hour. Picture rights were obtained by the Institute, camping equipment was purchased at once, and Gabriel Stadtler (a good close friend of ours) got his camera equipment together and started making a study so as to capture our DXpedition on film, step by step, for *73* magazine (and for our family album, filed under "wedding anniversaries," with the theme: "Just For The Fun Of It"). I made out my list of the radio equipment and antennas that I would be using.

It just so happened that around preparation time I got together a parasitic beam that Ralph Bilal WDØEJA made especially for me in order to work the 15-meter band. I had never before owned a parasitic beam or any other antenna that works by inductance. Results: excellent! I was completely satisfied with its performance, especially because I could cover the entire band and stay within a 1.5:1 swr. This three-element, 15-meter parasitic beam has a coil on each end of the elements. Each is a 15-meter antenna in itself. There is the driven element that is excited directly through the transmission line (50-Ohm coax). The other two elements, each with its antennas, are parasitic and work by inductance from the driven element. The array is a combination of six 15-meter antennas, two on each element. Each antenna is tuned separately by moving the stub on the end of the coil until the lowest swr is reached on a designated frequency. The other five antennas have to be disconnected in order to tune up each one separately.

When all six are tuned up, they are connected up again and you have six 15-meter antennas working on just one beam! The boom is 8'2", excellent for Field Day use without getting into the "big array," and is made out of 7/8" aluminum tubing. The

Thawing out early Sunday morning on top of the Pyramid of the Sun, with sunrise in background.

Returning to ground level.

elements are around 12" long, with the radiating capacitor at the end.

Ralph manufactures three standard Isotron antennas and makes antennas for other spectrums of the 20-meter band for individuals who request them.

Thinking of the cold weather and possible battery-power loss during our 24-hour QSO, I worked on getting together a battery charger, using a small gasoline engine, voltage regulator, and alternator. However, time was pressing and I couldn't locate the gasoline-powered engine, so, knowing of the high winds on top of the pyramid that we would later climb, I mounted fan blades to a wooden structure along with the alternator and voltage regulator. However, our two 12-volt car batteries were enough, and I did not suffer battery loss. We did not have to use the charger system although we could have: When we first reached the peak of the Pyramid of the Sun, winds were high and so were the revolutions of the make-shift contraption that I called an emergency charger.

The day finally arrived for our expedition and we set off to Teotihuacan. With the help of local officials of the archeological zone there, our initial campsite was sought out, ending up right at the rear base of the Pyramid of the Sun. The pyramid stands 65 meters high, although originally, with a temple located up on top, it was said to be 10 meters higher. It has a volume of one million cubic meters, and each of its sides is 225 meters long at the base. Its main facade is situated 15°30' east of the astronomic north.

There we set up our tent and the boys and I got to work on our antenna setup. Ralph's parasitic beam was immediately put together, mounted, and tuned up. I used a two-piece, 9-foot television antenna mast. On its point we mounted a Ringo Ranger two-meter vertical antenna (made in Mexico). Well, there we had it for 15 and 2 meters, so up with the half-wave dipoles, using Hy-Gain's 1:1 baluns, for 40, 20, and 10 meters. We used a few local tall trees to hang them between.

Our permit was for us to transmit from 8:00 am until 9:00 pm within the archeological zone. I was told that over 30,000 tourists visit the area in just one day! So I discreetly began my 24-hour QSO at the back side of the Pyramid of the Sun until visiting hours were over. Then at 7:00 pm there was the first of two beautiful sound and light spectacles that take place twice nightly (except Mondays and mid-October to mid-May). We had to wait until 9:00 pm, therefore, to make our climb to the top and set up camp there, leaving part of our expedition group at our base station with two-meter equipment (Kenwood's TR-7850 and two handie-talkies, one Kenwood TR-2500 and an Icom IC-2AT) for our own intercommunication.

Running in front of the Pyramid of the Sun and leading right to the Pyramid of the Moon is the Old Road, or Highway of the Dead; it was named as such because many human skeletons have been discovered along it. That was our entrance way to the stairs of the Pyramid of the Sun at 9:00 pm, sharp. High winds and cold air greeted us as the six of us slowly made our climb to the peak, loaded with camping gear, radio gear, antennas, transmission lines (feedlines), 12-volt batteries, my "emergency wind-powered charger" contraption, food, serapes, and heavy clothing. A local official from the archeological zone was assigned to stay with us all night long. Another was kind enough to illuminate the entire 65-meter-high stairway with an airplane headlight that he had mounted to his pickup. Good old "Jose Luis" was there when we needed him the most! The Teotihuacan tribe had built these pyramids with some dangerously-steep stairs. Our aim was not to look back until we had made it to the top!

After a few rest stops we made it to the peak, quickly got organized, and began setting up the tent and the antenna system. Have you ever tried erecting a tent and a 9-foot mast with antennas up on top of a 65-meter-high pyramid with high winds in freezing weather? Tent rope was stretched out to different angles and wrapped carefully around protruding blocks of the pyramid (you just don't start pounding tent stakes into a 2,000-year-old archeological monument). We had to be extremely careful not to deface the site in *any* way.

That was just half the fun. Once the tent was set up, we took turns holding up the 9-foot mast as two others tied down the ends of the dipoles, using them as guying wires as well. The others thawed out some within the tent until it was their turn! Oh, what fun! (We saved ourselves plenty of work by using the dipoles on the mast as guying wires. We used the U-clamp provided by Hy-Gain with the 1:1 balun, fastening the balun to the mast one way and the other balun crossing over for a four-point counterbalance when all was tied down.)

"OK, *everybody* inside now!" was shouted. There was a quick scramble for a good spot in the tent as I announced over 2 meters to the group below and other local hams that the continuation of the 24-hour QSO would begin.

After wrestling for so long with those high winds and cold weather, to our surprise everything calmed down suddenly and we had a quite unusual silence until early morning, with the exception of those wonderful sounds carried over to us through radio wave activity!

It was one pileup after another! Real fine propagation! I had some nice conversations on 20 meters with stations such as VK3AQN (Fred in Melbourne, Australia), ZL2AJR (Gordon in Waikanae, New Zealand), and TI2MAO (Miguel in San Jose, Costa Rica), and on 10 meters, with KP4AAN (Pedro in San Juan, Puerto Rico), HK1ESZ (Edward in Cartagena, Colombia), WA4JUP (John on Merrit Island, Florida), and VE3IPP (Bob in Toronto, Canada). We QSOed with dozens of states in the US on 40, 20, 15, and 10 meters and had pileups from islands near Japan and off South America.

Upon scanning the bands, I came across one of those Mideast broadcasting stations playing some eerie chanted music. Up on top of the Pyramid of the Sun about 3:00 am, it produced a most unique setting. I didn't want to be selfish, so I transmitted it on two meters for the group

Mark K. Toutjian XE1MKT works 2 meters, using Kenwood's TR-2500 handie-talkie; the Pyramid of the Moon is in the background.

down below us and just about scared them to death!

Early Sunday daylight on February 13, 1983, came around quick. It was beautiful to see the sunrise over the horizon of Teotihuacan, the City of the Gods, as I concluded my 24-hour QSO "poco a poco." I'd get to joking and even be a little silly on the air with my fellow hams around the world. "Hey! Did you hear the latest Mexican weather report? Chile today and hot tamale!"

We got to thinking about what response or reaction we would have had if ancient Teotihuacan tribes were still living there and saw us transmitting from their temple area on the high peak of their Pyramid of the Sun. (All we were lacking was a time machine manufactured by Kenwood or some other serious-minded manufacturer!) One thing for sure, we would have had no complaints of TVI! We were comforted by the thought that the Teotihuacans were not a violent, but a peaceful tribe compared with others such as the Aztecs, known for their sometimes thousands of human sacrifices each year!

I'm not Speedy Gonzales on the air. I enjoy being conversational with others. For me, that adds the fun to ham radio. I meet and get to know different ones who become real friends, and I have enjoyed long-lasting friendships over the air from all over the world. That's the name of the game for me. I do it just for the fun of it.

We finally left our fine abode on the Teotihuacan Peak, and I'll never forget that hot cup of coffee that awaited me down below or that last celebration, ended by saying adios to our amigos at the famous City of the Gods.

Future DXpeditions may await us here in Mexico, since the country itself is full of original sites such as the famous volcano, Popocatepetl, or Silent Valley, Durango (where astronomical expeditions are held). Mexico is a country with a wide variety of beautiful and unusual settings for field days or technical operations for amateurs. Come on down whenever you wish! Organize a DXpedition as we do—just for the fun of it!

THE NETHERLANDS

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The Netherlands

Sponsored by many local hams, a brand new repeater for two meters is now on the air in the Netherlands. In a small country like ours, a new repeater is quite an event.

The repeater, homemade by Ari Bol PAØQHN, operates on 145.775. The machine is now located on top of an old water tower near Heemstede, and it covers the midwest area of Holland; its callsign is PI3HLM. Now almost the whole country is covered by VHF repeaters, with a total of 19!

The club station PI4HLM of the NCV (a Dutch radio society) will be on the air this year on the 29th and 30th of October, on all bands. Maybe a good tip for special prefix hunters.

In our country of wind and water, it is easier to get a ticket for amateur radio than one for operating one of those old windmills we have. We have four license categories: A, B, C, and D. The easiest way of getting involved is to pass an exam for a D license. It requires only a basic technical knowledge and no code. With a D license, you are allowed to operate a 15-Watt FM rig from 144.9875 to 145.800 MHz.

The next step you can make is to get a C license; it takes a little more technical knowledge but still no code. When you pass this exam, you are able to operate on all bands above 144 MHz in all modes and with a power output of 30 Watts. Due to the introduction of the D license, the two-meter band is very popular in Holland.

Most of the Dutch hams use Japanese rigs, but there are also many guys who work with homemade equipment or converted ex-army and surplus machines.

In Holland, there are three major amateur radio societies: VERON, which is the Dutch section of the IARU, PO Box 1166, 6801 BD, Arnhem, The Netherlands; VRZA, at PO Box 61420, 2506 AK, The Hague, The Netherlands; and NCV, PO Box 2999, 2002 RZ, Haarlem, The Netherlands.

The VERON also has a special club for female hams called the Dutch YL Club. It is there to encourage women to get involved in the hobby, keep contacts with other YLs around the globe, and join in to organize special contests. Address the DYLC at Ir Lelylaan 69, 2103 HN, Heemstede, Holland.

So, if you have any questions, or something you would like to know about amateur radio in Holland, you can write to them. (Don't forget an IRC for return postage.)

NORWAY

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Enebakkveien 208
Oslo 6, Norway

REVISED RULES FOR WALA

"Norges-sertifikatet"—Worked All LA—is available to licensed radio amateurs and SWLs all over the world. Contacts with LA and LB stations made after January 1, 1950, are valid for the award. The required number of contacts must be worked from the same QTH, within a radius of 100 km.

Requirements for HF: Applicants in Denmark, Finland, Faeroe Islands, Iceland, Sweden, and Norway must produce evidence of two contacts on separate bands with each of the 19 counties (fylker) of Norway. Applicants in the rest of the world must produce evidence of one contact with each of the 19 counties on any band.

Requirements for VHF/UHF/SHF: Applicants in Denmark, Finland, Sweden, and Norway must produce evidence of contacts with at least 16 of the 19 counties. Other applicants must produce evidence of contacts with at least 12 of the 19 counties in Norway. Contacts via repeater or satellite are not valid.

Contacts may be made on all legal modes. Crossband contacts are not allowed. WALA may be endorsed as appropriate. Contacts with arctic stations (JW or JX) count for the award. Such contacts may substitute county W, X, or Y.

The counties of Norway are A—Oslo, B—Østfold, C—Akershus, D—Hedmark, E—Oppland, F—Buskerud, Z—Vestfold, H—Telemark, I—Aust-Agder, K—Vest-Agder, L—Rogaland, R—Hordaland, S—Sogn og Fjordane, T—Møre og Romsdal, U—Sør-Trøndelag, V—Nord-Trøndelag, W—Nordland, X—Troms, Y—Finnmark, JW—Svalbard/Bear Island, and JX—Jan Mayen.

The application shall include a list of the stations worked and must be accompanied by QSL cards or the following information extracted from the QSL cards and verified by an officer of the applicant's national radio amateur society: date and time UTC, callsign, signal reports, and QTH of the station worked. Other relevant information may be necessary if endorsements are required.

The fee is N.kr. 20 or 10 IRCs and applications may be sent to the Norwegian Radio Relay League, PO Box 21 Refstad, Oslo 5, Norway, or to the NRRL Award Manager, Erik Jahnsen LA7AJ, Kaupangruta 21, N-3250 Larvik, Norway. Applications will be accepted until December 31, 1983.

DIPLOMA HUNTERS

Last month was about DX and reciprocal licensing, but what about Norway itself for those not too interested in DXing directly? Is there anything to gain for the diploma hunter? Yes, indeed there is. One is WALA, described above. Absolutely the same as Worked All States, WAS, from Norway (maybe a little harder, since there are only 4000 amateurs in Norway). This one could be something for the diploma hunter looking for a real "goodie." Then when you have accomplished the difficult job of working them all, try for an 80-meter endorsement—or what about 5 bands? You surely will have some great times ahead of you.

Where do I find LA stations, you may ask. Well, 20 meters is a good place to start. Around 14.325-.300 MHz, you will hear the Norwegian MM net. Many LAs check in there. SAC, the Scandinavian Activity Contest, is one. By the way, the LAMM net is usually active in the late evenings UTC, or between 2000 to 2400. 40 meters early morning UTC is another good time, and of course I am sure many of the LA boys will be happy to give a call on 2 meters to give you a hand with a couple more counties. Have a good time, and good luck.

PAPUA NEW GUINEA

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PO Box 165
Rabaul, Papau New Guinea

In Papua New Guinea, amateur radio licensing is handled by the Radio Branch of the Post and Telecommunication Corporation. The postal address is PO Box 3783, Port Moresby, National Capital District, PNG. The matter of reciprocal licenses is at present being sorted out. PNG has reciprocal agreements with member countries of the Commonwealth as well as Switzerland and the United States of America, but Japan, France, and the Federal Republic of Germany have not replied to approaches from PNG. Singapore has advised that individual applications will be considered.

Visiting amateurs from these countries will receive a permit to operate in PNG upon presentation of a photocopy of entry visa, photocopy of the relevant page in the passport giving details for identification purposes, and a photocopy of the amateur operator's certificate and current license. A resume giving details of residence and employment over the past 10 years is also required of the applicant. If a visiting amateur presents himself at the Radio Branch with all this information, he will be able to walk away with a permit to operate.

Amateurs who are coming to Papua New Guinea to take up employment are required to submit the same information as visitors. They will then be given permission to operate and a license will be issued after about one month.

As far as maritime mobile operation is concerned, the situation is that when a yacht enters PNG waters it is allowed to operate MM P29, following written application.

While PNG honors licenses obtained in the USA, the reverse does not apply. It appears that an agreement at an intergovernmental level is needed.

The minimum age for an amateur to be granted a license in P29 is fourteen.

News has been received from Keith P29QA at Arawa, Bougainville Island, that 6m activity was very good during April, when he contacted a number of Japanese stations. Bob P29NBF can at times be heard operating aeronautical mobile at 35,000 feet from his company's new 11-seat jet.

Probably a great deal has already been written about the ill-fated Spratly Island DXpedition. However, as I became involved also, I feel that I should set down my experiences.

On 16 April from approximately 1000 GMT, I began to operate on 15m beaming towards Europe, as I frequently do. Signals were excellent and the response very good. At that time, I was blissfully unaware of the Spratly Island DXpedition or any of the events surrounding it.

At 1028 GMT, I was called by a station giving a UKØ callsign who then informed me that a Russian ship had rescued four persons from a boat and that these people had been placed in a hospital in Siberia and were receiving medical treatment. He added that he could not give either the names of the people or the name of the yacht for security reasons. He requested that I pass this information on to the MM Net on 20m. I repeat once more that I then had no idea of the happenings in the South China Sea.

As my license does not permit me to operate on 20m, I was going to ask either Shirley P29SM or Phil P29PM, who were staying with us at the time, to pass on the information. However, before I could do this I was called by Phil VS6CT, who told me to disregard the message as the OM who had passed it on was a well-known pirate who was in the habit of spreading bogus messages. I left it at that and continued to work European DX, but the UKØ station kept on interrupting and repeating the already-mentioned information. Finally, he became very abusive towards VS6CT, and as I was not willing to put up with this sort of QRM any further, I went QRT, not a little bemused.

The following morning, our Sunday (2352 GMT Saturday), I was talking to some of my Australian friends when I was again called by Phil VS6CT. Phil then filled me in on all the events regarding the Spratly Island DXpedition and the yacht *Sidharta* up to that date, as they were known to him. VS6CT and NØZO/DU2 and a number of other stations had maintained contact with the yacht up to its disappearance and since then had kept a round-the-clock watch on the amateur bands, hoping to pick up signals from the *Sidharta*.

The last transmission received had been at 0652 GMT of April 10 on 14.320 MHz, and it was "fire on board." Phil, who was on vacation and due to start an overseas trip, spent most of his days monitoring the bands for a signal from the yacht. He and other amateurs were plagued by bogus distress messages, and a great deal of effort and money had been expended in following up the information while the fate of the yacht and survivors remained unknown. Phil also mentioned

that the OM who had used the UK0 callsign the previous evening had also been known to use a YB callsign. He is easily identified because of his gravelly voice.

Following this QSO, I called in on the VK4 WIA talk-back, passing on details of the events and the callsigns used by the pirate.

About a week or so later I heard that four survivors had been picked up by the Panamanian freighter *Linden* which was on its way from Singapore to Hong Kong. The *Linden* picked up the survivors from the *Sidharta* who had taken to their life raft after being fired at on April 10. One of their group was killed instantly and one was wounded and died some days later in the raft. He was buried at sea. They had been adrift for nine days when the *Linden* sighted them near Amboyna Cay of the Spratly Group of Islands.

Therefore, the information given to me on April 16 by the pirate was a hoax and in very bad taste. This and the bogus CW distress signals caused a lot of people a lot of work and expense, all to no avail. One wonders what could motivate anyone to stoop so low as to deliberately spread false information.

See you next month!

POLAND

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VERIFICATION

On the memorable day of December 13, 1981, use of amateur radio equipment in Poland was forbidden. Possessors of transmitters and sending-receiving devices were obligated to place their equipment on deposit in 48 hours, and their licenses became void. Polish hams ceased to modulate the ether with their signals.

After martial law went into force, other activities of the organization uniting Polish radio amateurs—Polish Radio Amateurs Association (PRAA)—did not cease. The Technical Commission of PRAA began to develop plans for modernizing the equipment used by Polish hams.

A harbinger of a change for this long-lasting hush in the ether came flying on October 23, 1982. On that day, the meeting of the Presidium of PRAA took place in Warsaw. The first action undertaken brought up to date all suspended licenses. As a first step, the main Verification Board at PRAA was called into being. After the meeting of the Presidium of PRAA with presidents of district departments of PRAA, held in Warsaw on November 8, 1982, District Verification Boards at PRAA were in the making. It was decided to enter upon the subject outright. But . . . one swallow doesn't make a summer.

Every member of PRAA—there are no radio amateurs in Poland who do not belong to PRAA—who would like to have his license brought up to date was to complete a letter of application filling out printed forms in duplicate, edited by PRAA. An applicant was to bring to light details of his former activity in PRAA, command of foreign languages, membership in organizations, and so on.

Letters of application would be assessed by the local club of an applicant. Completed forms would be handed over to the District Verification Boards that once more would pass their opinions. District Verification Boards then would turn them over to a District Inspectorate of State Radio Surveillance.

The presence of applicants at meetings of District Verification Boards will not be necessary. In some cases the board may demand logbooks of radio stations or received QSL cards as evidence of previous activity. License updating will last to the end of 1983. Those who don't submit before the day of expiration and want to regain licenses must apply in compliance with obligatory rules, as if they were applying for the first time.

The first sitting of the main Verification Board took place in Warsaw on November 23, 1982. It was there announced that District Inspectorates of State Radio Surveillance will receive instructions relative to investigations of applications. It was decided to first investigate applications of the members of the Head Radio Board—a new body in PRAA that will take care of complying with the rules binding radio amateurs. Their District Verification Boards have begun their work in most districts of Poland.

All Polish radio amateurs are waiting for the moment when the Polish sky will sound with their callsigns and they will be able to establish contacts with their old friends.

THAILAND

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The latest issue of the international *Callbook* testifies to the popularity of amateur radio in Thailand, with some 510 radio amateurs listed and the number growing all the time. But what the *Callbook* listing does not demonstrate is the vast upsurge in interest in radio as a hobby, largely due to a pilot project begun two years ago by Thailand's Post and Telegraph Department.

It was then that the PTD began what it regards as a forerunner for full amateur radio licenses on a broad basis by granting permission for Thais who have passed a written test to own VHF transceivers and operate on spot frequencies in the two-meter band. HS callsigns were *not* granted, however, and the operators received a number, preceded by the letters VR, standing for volunteer radio operator.

Many of these VR operators—who now number over 600, along with a waiting list of others who have passd the test—also hold the HS callsigns found in the *Callbook*, and some are well-known operators internationally.

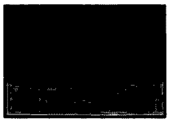
Thus there are a large number of Thai radio-hobby enthusiasts who can be met, in Thailand, only on the calling frequency of 144.500 MHz—but for the time being by other Thais only, as no foreigner has yet to be granted this status.

Many ask where Thailand is on the HF map these days. Recently, Thailand used to be the only country active in Zone 26, and not a few anxious DXers are seeking a contact with Thailand while Burma, Laos, Cambodia, and Vietnam stay QRT for their own differing reasons.

The Thai PTD is currently reviewing the status of amateur radio, and previously-active amateurs still possess licensed HF equipment—on the condition that they do not operate unless granted special permission for the time being. For those eager for an HS contact, the best suggestion was to listen out during the JARL-organized All-Asia DX contest in June or during the SEANET (Southeast Asia Net) contest which was to be in August. The station was to be signing HS0HS, and probably chalked up close to 3,000 contacts if past performance is any indication.

Last November's SEANET Convention was hosted by the Radio Amateur Society of Thailand (RAST) in Bangkok, and some 100 hams from overseas attended to hear several eminent speakers, including ARRL Vice President Carl Smith and *73*'s very own Wayne Green. Events included a trip out to the VOA one-megawatt medium-wave transmitting facility just north of Bangkok, as well as the usual eyeballing and display of equipment.

Next year's event will be held in Singapore from November 18 to November 20, and those seeking further info can write to the Singapore Amateur Radio Transmitting Society or, propagation willing, tune in to 14.320 MHz daily, the Southeast Asia Net frequency. The net begins at 1200 UTC with net control usually in BK2, VS5, VS6, or 9V1. It is not a DX net, but any station desiring to contact a check-in may call "contact" and the NCS will assign them both a clear frequency as standard net procedure.



WEST GERMANY

Ralf Beyer DJ3NW
Opferkamp 14
3300 Braunschweig
West Germany

WARC BEAM ANTENNAS

The Federal Republic of Germany was one of the first countries where radio amateurs were allowed to operate on the new 10-, 18-, and 25-MHz bands. Foreseeing this development, antenna designers in this country were at their drawing boards right after WARC '79. First designs for new beam antennas were presented in 1980. After some refinements, production began in 1982. It is interesting to see what is available today and how to plan ahead regarding antennas in those places where the new bands are yet to be opened.

One manufacturer, the Kurt Fritzel Company (Sonnenwendstr. 41, 6702 Bad Duerkheim), offers a whole range of trap-beam antennas. Let's look at some of the design principles and their implementation. They decided initially that the size of the largest beam should be 11 × 7.5 meters. This corresponds to the size of a 3-element monobander for 20 meters, which constitutes an upper limit for the average ham regarding installation, maneuverability, and appearance of the antenna. However, in the course of the optimization process, they ended up with a boom length of up to 10 meters. Such a length was needed for their largest antenna, a 7-element/6-band beam. They also decided to interlace two 3-element beams for 10/18/25 MHz and 14/21/28 MHz, each with its own coax feedline, in order to achieve 6-band performance. Conventional 3-element trap-beams with a boom length of approximately 5 meters thus can be upgraded by interlacing it with a new 10/18/25-MHz beam. Calculations showed that a 6-band trap-beam with only a single feedline would have required 10 traps for the radiator, which could not be accommodated mechanically.

Four types of beam antennas are illustrated here as examples to demonstrate essential features of their respective class. Fig. 1 is the conventional 3-element/3-band design adapted for the new bands on 10/18/25 MHz. With a boom length of 7.5 meters and a length of the longest element of 10.3 meters, the UFB 33 beam covers an area of 77 square meters—twice as large as the conventional beam. Three elements are active on each band and a gain of 7/8/6 dB compared to a dipole is claimed. The price of 872 DM (US$350) is about 25% higher than for the conventional 3-element/3-band beam.

For only 93 DM (US$38) more, a 4-element/6-band beam for 10/14/18/21/25/28 MHz is offered with the same length of the longest element and the boom length reduced to 5 meters (Fig. 2). The peculiarity of the FB-DX 460 beam is that it has 3 active elements on the conventional bands but only one active element on the new bands. Hence, a gain of 0/7/0/8/0/7 dB compared to a dipole is claimed. However, this antenna gives

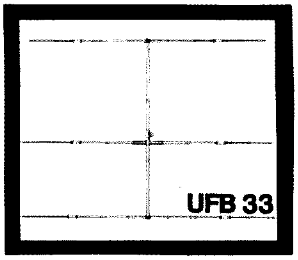


Fig. 1.

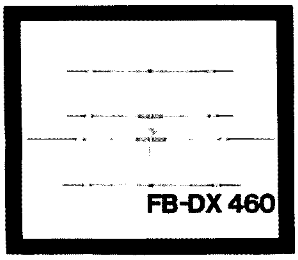


Fig. 2.

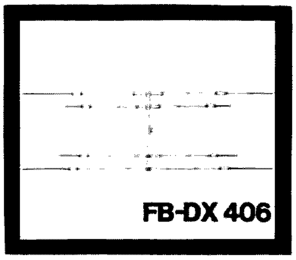


Fig. 3.

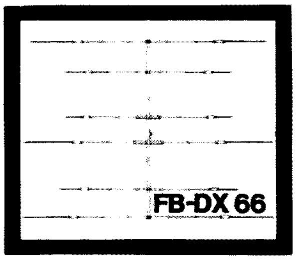


Fig. 4.

6-band performance, is not much larger, and with a price of 965 DM (US$386) is "only" 40% more expensive than a conventional 3-element/3-band beam.

It is surprising to note that for almost the same amount of money, a 4-element/6-band beam (FB-DX 406), with longest element/boom dimensions identical to the FB-DX 460, is available. However, this antenna has 2 active elements on each band and offers a gain of 5/5/4.5/4.5/4/4 dB on the 6 bands when compared with a dipole (Fig. 3).

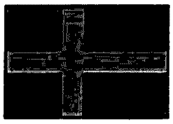
A typical representative of the upper class—6-band performance comparable to the conventional 3-element/3-band beam—is the FB-DX 66 (Fig. 4). With a length of the longest element of 10.3 meters, a boom length of 6.75 meters, 5 active elements on 18/25 MHz, and 3 active elements on all other bands, it offers a gain of 6/6/9/7/9/8 dB on 10/14/18/21/25/28 MHz compared with a dipole. But with a price tag of 1590 DM (US$636), it is more than twice as expensive as the conventional 3-element/3-band beam and costs as much as two separate beams for 14/21/28 MHz and 10/18/25 MHz. But remember, interlacing of the existing 3-element/3-band beam for 14/21/28 MHz with a new beam for 10/18/25 MHz, e.g., the UFB 33, may be possible in order to achieve the same performance at half the price.

Other characteristics of the UFB 33/FB-DX 460/FB-DX 406/FB-DX 66 antennas are: turning radius, 6.5/5.2/5.7/6.5 meters; weight, 23/22/23/38 kilograms; and wind load at 135 km/h, 670/810/840/1200 Newtons.

Trapless beams with up-to-7-band performance (including 40m) are offered by another German manufacturer (W. A. Sommer, Kandelstr. 35, 7809 Denzlingen). But the few examples discussed here illustrate quite well some basic alternatives which are available today for the average ham. And now, what can be expected in the future from the US, Japan, and other parts of the world?

Area	State	Capital	Deg/Min (North)	Deg/Min (West)
1	Zulia	Maracaibo	10 37	71 40
	Falcon	Coro	11 23	69 45
	Trujillo	Trujillo	9 25	70 20
2	Tachira	San Cristobal	7 30	72 15
	Barinas	Barinas	9 37	70 12
	Merida	Merida	8 30	71 2
3	Lara	Barquisimeto	9 55	69 15
	Yaracuy	San Felipe	10 10	68 50
	Portuguesa	Guanare	9 03	69 45
4	Carabobo	Valencia	10 37	68 00
	Aragua	Maracay	10 15	67 35
	Cojedes	San Carlos	9 40	68 36
5	Federal District	Caracas	10 25	66 50
	Miranda	Los Teques	10 21	67 03
	Guarico	San Juan de los Morros	10 05	67 23
6	Bolivar	Ciudad Bolivar	8 00	63 30
	Anzoategui	Barcelona	10 12	64 45
7	Sucre	Cumana	10 28	64 10
	Nueva Esparta	La Asuncion	11 00	64 00
8	Monagas	Maturin	9 42	63 18
	Fed. Terr. Delta Amacuro	Tucupita	9 05	62 05
9	Apure	San Fernando	7 50	67 30
	Fed. Terr. Amazonas	Puerto Ayacucho	5 40	67 35
0	Aves Island		15 41	63 38

Table 1.



SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

SSA ANNUAL MEETING

Sundsvalls Radioamatorer, Club SK3BG, hosted this year's annual meeting of the national league, Sveriges Sandareamatorer (SSA), on the last weekend in April.

This was an opportunity for the members to get together, meet their representatives in the league, and express their opinions at the meeting. Also, of course, the major dealers in ham equipment were exhibiting and selling their goodies, and the Saturday night dinner dance is a nice way of getting to know each other better.

Sundsvall Radioclub had arranged everything under one roof. It was a pleasure to enter the hotel room and to find beautiful flowers, chocolate, and refreshments as a gesture of welcome from the club. Sunday is reserved for the meeting that usually ends by early afternoon, after which many must drive several hours to get home.

Saturday, however, is a busy day for everybody. This is the opportunity to get an eyeball QSO with an old-time friend with whom you have talked over the radio for years but never met personally.

Sundsvall should be well-known to every active DXer. It is the home town of Erik SM0AGD, a member of the DX Hall of Fame. Sundsvall DX Group handles his QSLing and they also do their own DXpeditioning, of which the most recent is the J5AG operation from Guinea-Bissau in Africa. Leif SM3RL, one of the members of the expedition, gave a most interesting talk on their experiences and showed us beautiful slides from the trip. Unfortunately, Erik SM0AGD could not attend because he was on his way to US and the Dayton Hamvention.

The hosts had put together an amazingly well-filled program. The VHF/UHF forum was about the Phase III satellite program. Gudmund SM2BYA talked about the Swedish ionosphere research. Talks were also held about antennas and baluns, as well as fox-hunting and AMSAT. Ulf SM6CVE exhibited his valuable radio stamp collection.

No major controversial matters are under discussion amongst Swedish hams for the time being, but two motions were about the planned change within IARU Region 1 for channel separation on the 2-meter FM band from 25 kHz to 12.5 kHz. With only nine repeater channels, of which two have been taken by the satellites operating on 145.800 MHz and above, this is an issue of concern amongst the fast-growing 2-meter FM population all over Europe.

SSA has a membership of about 7,000. Usually, this annual event draws about 400 members, but many more are taking part in the affairs through proxy. Election of the members of the Board is done by mail. SSA president is Bo Lindberg SM0HDP, and the secretary is Stig Johansson SM0CWC. Every one of the eight call areas has one representative elected by the members in that area.

WSRA AWARD

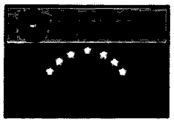
How about getting an award from another of the capitals of the world? Stockholm Radioamateurs (SRA), SK0AR, issues the Worked Stockholm Radio Amateurs Award. The rules are:

1. Any licensed radio amateur can apply for the WSRA award.
2. Two-way contacts with SRA members required as follows: Swedish hams—10 different SRA members; all others—6 different SRA members.
3. The contacts shall be on phone, CW, mixed.
4. All amateur bands can be used.
5. Crossband contacts do not count.
6. All contacts have to be made from the same call area with the same callsign.
7. Contacts made after January 1, 1960, are valid.
8. Send your listing of QSL cards received (but do not send the cards) to WSRA Award Manager, Olle Engdahl SM0IEA, Morbydalen 1, 8 tr., S-182 32 Danderyd, Sweden.
9. Please have the QSL listing verified by two licensed hams and enclose either Sw. crowns 15.–, US$3.00, or 8 IRCs with the application.

SCANDINAVIAN ACTIVITY CONTEST

The SAC is sponsored by the four Scandinavian leagues with responsibility rotating so that each club has the job with the contest logs every fourth year. The contest takes place the two last weekends in September; in 1983, CW on September 17-18 and phone, September 24-25.

This is one of the contests that follow the IARU recommendation for national contests not to cover all of the bands. That is the reason why you in the SAC should leave the lower and higher portions of each band free from contest operation so non-contesters can chew the rag somewhere. The details for the contest are usually published in contest columns. See you in the Scandinavian Activity Contest in September.



VENEZUELA

Luis E. Suarez OA4KO/YV5
Apartado 66994
Caracas 1061-A
Venezuela

Foreign correspondent!! Can you imagine that? It was exciting to receive the offer from *73*'s technical editor, Avery Jenkins WB8JLG. Back home from the mail office, I shouted the news from my home's door. My wife and daughters said almost at once: "You must accept it!" I accepted, and here I am, as a foreign correspondent for *73* in Venezuela.

I'm Peruvian and have been living in this beautiful country for around ten years. I live with my wife Olga and two daughters, Barby, 13, and Susy, 12. I'm a communications consultant and have been a licensed amateur since 1959. As per Venezuelan communications regulations, I'm OA4KO/YV5.

I have talked about me, and now let me talk about the country where I live. Venezuela is one of the eleven independent countries on the South American continent. It was a Spanish colonial possession until April 19, 1810. The national territory is located at the north of South America between the Caribbean Sea, Brazil, Colombia, and the Republic of Guyana. The coordinates at mid-country are 8°48" North and 67° West. So you know roughly where to beam your antenna while listening to a YV. In the accompanying table, I have listed more accurate coordinates. The surface area is 912,050 square kilometers (1/8 the US territory and twice that of France). The population is 14,500,000. There are around 16,000 licensed amateurs and a zillion CBers, both licensed and pirates.

A federal constitution sets forth 20 states, a federal district, two federal territories and 72 islands. Each state has a governor designated by the president and a legislature. There is a federal government with executive, legislative, and judicial branches. The president is elected for a 5-year period, but he cannot be reelected before an elapse of two presidential periods.

The official language is Spanish. There is freedom of religion but most people profess to be Roman Catholics. The people here like baseball, boxing, basketball, and football (soccer), in that order. So, from a sports point of view, we like the same athletic activities as people in the USA. Many Venezuelans are baseball players in the USA and many are well-known in Japan, too. Most baseball games from the US are retransmitted by local TV, and the most important of both the National and the American League games are directly transmitted. Needless to say, the World Series is also transmitted directly. But don't think that baseball is the first sport in South America. No, sir, football (soccer) is number one in all SA countries except Venezuela.

For radio communications purposes, the country is divided into the ten call areas (circuitos) shown in Table 1.

I will write in following columns about requirements for licensing, reciprocity, VHF repeaters, radio clubs, awards, contests, satellite activities, EME, etc., and also include some news about YV6 (Isla de Aves) for all those DX chasers. Furthermore, some paragraphs regarding this country will always be included to let you know more about Venezuela.

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PROPAGATION

J. H. Nelson
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Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	3A	7	7	7A	14	14	14
ARGENTINA	14A	14	14	14	7A	7	14A	21	21A	21A	21A	21
AUSTRALIA	21	14	7B	7B	7B	7B	7B	7B	7B	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7A	14A	21	21A	21A	21A
ENGLAND	7	7	7	7	7	7	14	14A	14A	21	14A	14
HAWAII	21	14	7	7B	7B	7	7	7	14	14A	21	21
INDIA	14B	7B	7B	7B	7B	7B	14	14	14	14	14B	14B
JAPAN	14	14B	7B	7B	7B	7B	7	7	7B	7B	7B	14A
MEXICO	14A	14	7A	7A	7	7	7A	21	21	21	21A	21
PHILIPPINES	14	7B	7B	7B	7B	7B	7B	7B	14B	14	14	14
PUERTO RICO	14	7	7	7	7	7	7A	14	14A	21	14A	14A
SOUTH AFRICA	14	7	7	7B	7B	14	21	21	21A	21A	21A	14A
U. S. S. R.	7	7	7	7	7	7	14	14	14	14	14B	7B
WEST COAST	14A	14	7	7	7	7	7	14	14A	14A	21	21

CENTRAL UNITED STATES TO:

ALASKA	14	14	7A	7	7	3A	7	7	7A	14	14	14
ARGENTINA	14A	14	14	14	7A	7	7A	14A	21A	21A	21A	21
AUSTRALIA	21	14	14B	7B	7B	7B	7B	7B	7B	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7A	14A	21	21A	21A	21A
ENGLAND	7	7	7	7	7	7	14	14	14A	14A	14	14
HAWAII	21	14A	14	7	7	7	7	7	14	14A	21	21
INDIA	14B	14	7B	7B	7B	7B	7B	14	14	14	14B	14B
JAPAN	14	14	7B	7B	7B	7B	7	7	7B	7B	14	14A
MEXICO	14	14	7	7	7	7	7	7A	14	14	21	21
PHILIPPINES	14	14	7B	7B	7B	7B	7B	7B	14B	14	14	14A
PUERTO RICO	21	14	7A	7A	7	7	14	14A	21	21	21A	21A
SOUTH AFRICA	14	7	7	7B	7B	7B	14	14A	21	21	21	14A
U. S. S. R.	7	7	7	7	7	7	7B	14	14	14	14B	7B

WESTERN UNITED STATES TO:

ALASKA	14	14	7A	7	7	3A	7	7	7	7A	14	14
ARGENTINA	14A	14	14	14	7A	7	7B	14	21A	21A	21A	21
AUSTRALIA	21A	21A	14A	14	14	14B	7B	7B	7B	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7	14A	21	21A	21A	21A
ENGLAND	7B	7	7	7	7	7B	7B	7B	14	14	14	14
HAWAII	21A	21	14A	14	7	7	7	7	14	14A	21	21A
INDIA	14	14	14	7B	7B	7B	7B	7B	14	14	14B	14B
JAPAN	14	14	14	7B	7	7	7	7	7	7	14	14A
MEXICO	14A	14	7	7	7	7	7	14	14A	21	21A	21
PHILIPPINES	14A	14	14	14B	7B	7B	7B	7	14B	14	14	14A
PUERTO RICO	21	14	7A	7A	7	7	7	14	21	21	21A	21A
SOUTH AFRICA	14	7	7	7B	7B	7B	7B	14	21	21	21	14A
U. S. S. R.	7B	7	7	7	7B	7B	7B	7B	14	14	14B	7B
EAST COAST	14A	14	7	7	7	7	7	14	14A	14A	21	21

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

SEPTEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
				1 P/F	2 P/F	3 F/G
4 F/G	5 F/G	6 F/G*	7 P/P*	8 P/P	9 P/F	10 F/G
11 F/G	12 F/G	13 F/F	14 P/F	15 P/F*	16 F/G	17 G/G
18 G/G	19 G/G	20 F/G	21 F/F	22 F/F	23 P/F	24 P/F
25 F/G	26 F/G	27 F/G	28 F/G	29 F/F*	30 P/F*	

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Issue #277

73®

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Page 20

Explore 1700m!
Page 34

Miraculous Beverages
Page 10

TRS-80 Contesting
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Super Squelch Club Project
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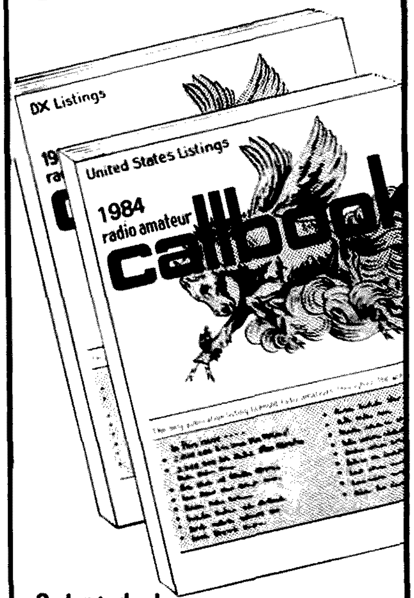

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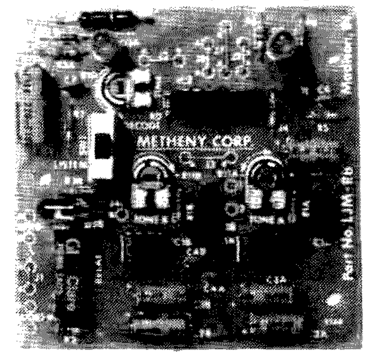

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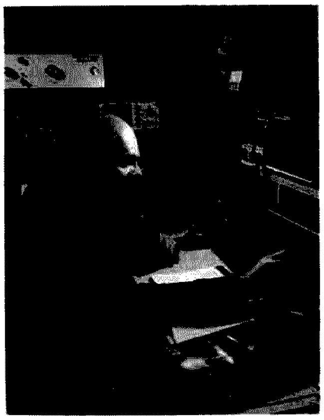
W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



INSTANT GENIUS

Fast quiz: Which is the third largest consumer magazine in America? You may be surprised as I was to learn that *Folio*, the publishing magazine, has announced that *80 Micro* was in third place last year. Not bad for a magazine just two years old.

Vogue was second and *Byte* was in first place. So who conceived of and started two out of three of the largest consumer magazines in America? Yep! We're talking about me...the chap the League has been reviling for years.

Both magazines were original concepts. *Byte* was the first magazine about microcomputers and *80 Micro* was the first magazine devoted to a specific computer system. Both magazines have generated dozens of imitators. Now I have an idea for another completely new type of magazine, one which could be as successful as *Byte* and *80 Micro*. We'll be getting started with it as soon as I can find some people to help.

Just as *Byte* was a powerful force in helping the microcomputer field to grow, *80 Micro* has made it possible for hundreds of small firms to get started in support of the TRS-80 and grow to multi-million-dollar size. My predictions of eight years ago have come true: We've seen more new millionaires in the last few years than ever before in history...all because of microcomputers. And we really haven't seen anything yet.

The recent sale of my publishing firm to the *Computerworld* group for $60 million has generated some respect in ham circles. The gadfly and eccentric now gets listened to a little more attentively. Fine, for I have a message which should be heard. It's one I've been preaching for many, many years.

At the Atlanta hamfest in 1976, I remember trying to convince a small group of sullen hams that if they wanted to, they too could make any amount of money they desired. I pointed out that the microcomputer industry was just starting and that there was an unlimited potential for getting rich if they would only make the effort.

On the bright side, I've had letters from several hundred people who have read my editorials or listened to me talk, have followed my advice, and have become wealthy. That's not enough; I want to see thousands of millionaires, not just hundreds.

I was about 32 when I made my first million. I didn't protect myself against an unscrupulous partner, so first he screwed me out of my share of the firm and then, not knowing how to run the business, he bankrupted it. I was the real winner because I learned how to make money... he only learned how to lose it.

In 1964, I wrote a little booklet, *How To Make A Million*. I found that the America of the 60s was not the place to sell such a book. The kids then were more interested in dropping out and in drugs than in making money. I rewrote and expanded the book during a dull day in Khartoum in 1966, while on an around-the-world trip. One of these days I'll dust off and update the manuscript. The blueprint for getting rich in the book is as valid as ever.

In 1975, with the starting of *Byte*, I again got into the millionaire class, only to see it disappear one night...again lost because of my trusting someone.

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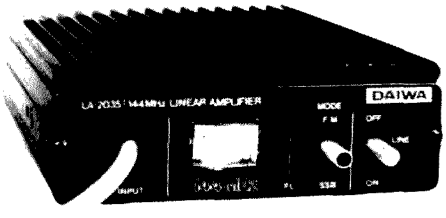

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Maximum output power: 30 watts plus
Power consumption: 13.8VDC at 5A Max
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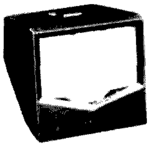
Weight: 500 grams
Coaxial input cable supplied with a BNC connector.
Output connector: SO239



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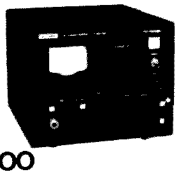

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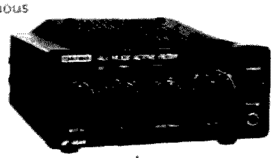

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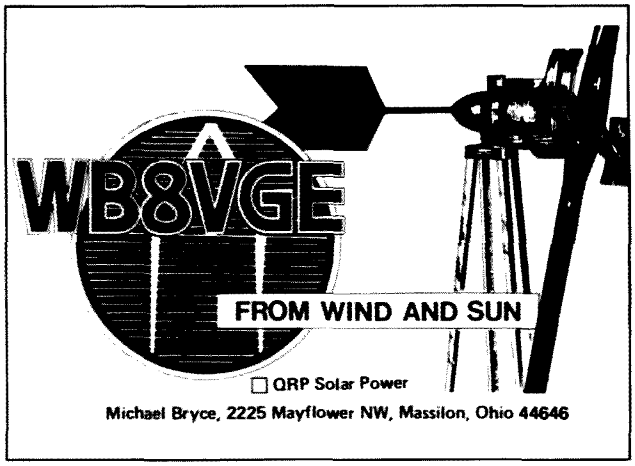

QSL OF THE MONTH

From high tech to soft tech is the theme of this month's winning QSL card. Ohio's Michael Bryce WB8VGE has taken advantage of the freebies given to us by Mother Nature and used them to power his station. The card depicts a solar panel and a wind generator, Michael's two sources of energy. So when you hear WB8VGE say he is just shooting the breeze, you better believe it.

If you think your QSL card is a winner, put it in an envelope with your choice of a book from *73's* Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be considered.

So, grumbling a lot, I started in again.

Now my goal is a billion. Oh, that's more of a side goal, since money has never been important for me. My real goal has been to provide education and entertainment for as many people as possible. But to do that I have to make money, so that goal has been inescapable.

A billion? Sure! And one thing is certain: To reach that goal, I'll help make several thousand millionaires along the way. The secret is simple: Figure out what is coming up next in technology, run quickly to the front of the parade, and then try to lead it.

For instance, I see the time not far ahead when education is going to be a marketable product. To get ready to take advantage of that concept, I'm now in the process of starting a college. This will escalate into an educational cable television network. The last step is interactive education on video disk which can be sold anywhere in the world. That's where most of my $60 million is going to be invested.

Since I feel that amateur radio is a key element in bootstrapping our country into technology, I'm going to be working hard to see that amateur radio gets into a strong growth pattern. Old-time hams who would prefer to see fewer hams and thus less interference on the bands are going to have a fight on their hands since I'm aiming for two million licensed hams by 1990.

Interference? Poo. With high-speed digital technology, we'll have far less interference than we do today. Indeed, I think we can develop some communications techniques which will be error-free and virtually instantaneous anywhere in the world.

One of the bonuses of success is that it is a lot easier to be heard. The incentive licensing debacle of 1963 kept me and *73* impoverished as the growth of amateur radio stopped for ten years. The disaster threw virtually every ham manufacturer out of business. If *73* had been stronger, I might have had the muscle to stop the debacle instead of just reducing its impact.

You've read about the FCC's Long-Range Planning Committee. The goal of this group is to help develop an emergency communications system for America which will be capable of surviving even an atomic attack. I think this can be done...and that amateur radio can do it. But I'm not talking about a handful of HTs and some surviving repeaters or 80-meter traffic nets using Morse code.

Several years ago, I pointed out in an editorial that a dependable emergency communications system would be a powerful deterrent to nuclear attack. Reagan has said the same thing recently, which sort of puts the ball in our court. Right?

Fred Hopengarten K1VR
RFD 1, 6 Willarch Road
Lincoln MA 01773

Bob Clarke N1RC
150 Stimson Street
West Roxbury MA 02132

Six Antennas from Three Wires

With these modified Beverage antennas, you double your directions without doubling your cost.

"Oh my, he's weak. Egads, what static. Oh well, let's turn the beam and see where he peaks up."

Sounds like a natural enough sequence, doesn't it? Well, at K1VR, we can do just that on *160* (and *80*, and *40*. . .) meters, and no antenna is higher than 15 feet. In fact, there is no "beam." Instead, we use three Beverage antennas, each reversible. Not bi-directional. . . reversible. This article will show you how we do it.

An Old Antenna

First described in a 1922 article by H. H. Beverage,[1] the Beverage is a receiving antenna described by one friend as an antenna that works poorly in general, but less poorly in one direction. Its principal advantages are:

- It increases your received signal-to-noise ratio (reduces QRN) for low-angle signals (i.e., DX!).
- It has a narrower beamwidth than typical 80-meter antennas. Belrose VE2CV has described the azimuthal beamwidth as 77 degrees.[2]
- It is much less susceptible to precipitation static, so that a snowstorm in February is less likely to shut down low-frequency operations.
- It is capable of excellent front-to-side performance to reject all that static coming from around the equator.
- It reduces the need for inserting attenuation to protect the solid-state front end of your receiver or transceiver.
- If you live in the Northeast, it will quiet down all that QRM generated by those very loud W3, W4, and W8 stations who insist that they have a right to the band, too. It is not unusual to see 20-25 dB front-to-back.

A Beverage is a single-wire antenna used in receiving only. It is end-fed, 1/2 to 4 wavelengths long, strung horizontally from 6 to 15 feet above ground. Many Beverages are fed at one end, left open-circuited at the other, far end, and are bi-directional in line with the wire (see Fig. 1). Adding a terminating resistor to the far end, as in Fig. 2, makes the Beverage unidirectional, but you can't switch directions. Some Beverage users use a dc relay and switch the terminating resistor in and out, but this still does not provide unidirectional performance in each direction.[4,5,6,7]

However, if you go one step further—feed both ends of a Beverage, select either feedline and terminate the other—you can indeed have two directions from a single wire. This is what we have done, not with just one wire, but three, for six directions!

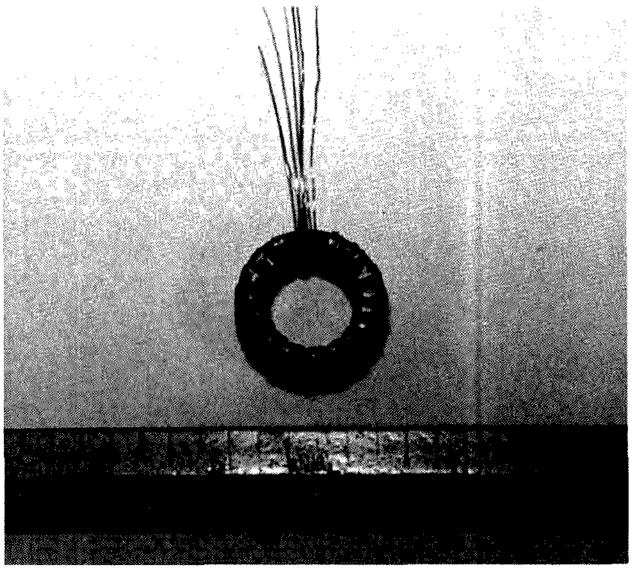

Photo A. View of toroidal matching transformer, showing method of winding.

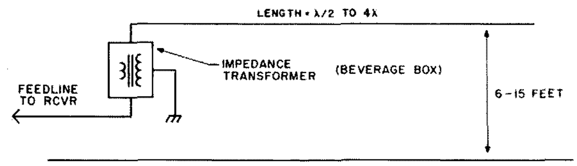

Fig. 1. A basic Beverage antenna. The directivity pattern is bi-directional along the axis of the horizontal wire. The Beverage Box contains a transformer which matches the impedance of the antenna to the impedance of the feedline.

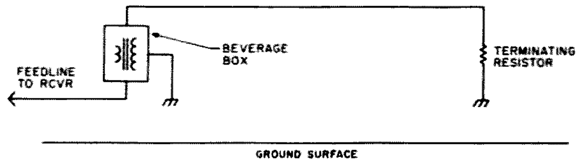

Fig. 2. A terminated Beverage is unidirectional toward the terminated end of the antenna. The resistor is a noninductive type, and experience suggests a value between 300 and 800 Ohms.

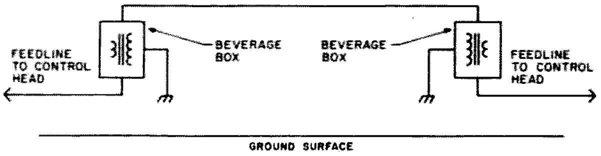

Fig. 3. The directivity pattern of the K1VR/N1RC Beverage is reversible. A control head at the operating position selects one of the two feedlines and routes it to the receiver while terminating the second feedline with a resistance. The antenna is directional toward the end with the terminated feedline. By using three such antennas and a rotary switch, six different directions can be selected.

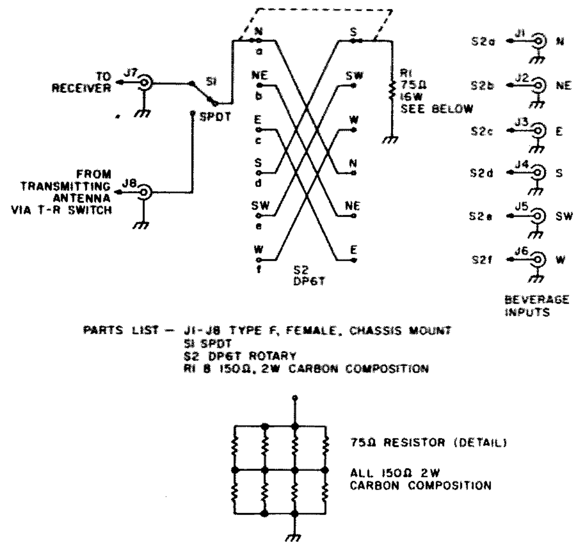

Fig. 4. Control-head schematic diagram.

A New Construction

The form of construction described in this article is desirable because few of us live on a piece of land large enough to stretch out a Beverage in each desired direction. But if you can have *one* wire, you can have *two* directions!

The system has the following components: a control head in the shack, three Beverages, six feedlines, and six "Beverage Boxes."

The control head has two switches: A Beverages/transmit antenna switch (to select the transmit antenna to listen on, if desired), and a rotary switch for selecting a favored direction.

Outdoors, we used three Beverages, which we strung between trees, but more or fewer can be used. Each end of each Beverage wire is connected through a Beverage Box to one of the feedlines. See Fig. 3. All feedlines end in the shack at the control head. Our Beverages range from 220 to 325 feet long, limited by the size of K1VR's yard.

It sounds simple because it is simple. Results: improved signal-to-noise, front-to-back, and front-to-side operation when compared with dipoles and delta loops. And you thought you couldn't rotate an 80-meter antenna!

The Control Head

In the original control head, the transmitting antenna was assigned position number 1 on the rotary switch. With a little experience, however, we soon learned that comparing reception on the Beverage to reception on the transmitting antenna was much easier with a separate toggle switch. In addition, the rotary switch had a nice even number of positions, with no empty space opposite the transmitting antenna.

The double-pole, six-throw (DP6T) rotary switch we used was the type that lets you select the number of positions desired by successively removing stops. We "crosswired" the switch as shown in Fig. 4, so that when one feedline is selected, the feedline coming from the opposite end of the same Beverage is connected to the 75-Ohm terminating resistor. Thus, if we select, say, the northeast end of Beverage A, then the southwest end of Beverage A is terminated.

Pay close attention to the wiring and labelling, or you will surely have to rewire several times, as we did, to make the switch go nicely around the compass, terminating the other end of the direction selected.

In locating the control head at the operating position, remember that while you may change bands only two or three times per hour at most, you will change directions for receiving repeatedly. So choose a location near the transceiver dial or antenna rotator, to be used by the hand you do *not* write with. The control head should also be plainly visible, so that you won't strain to hear someone only because you've forgotten to "point" the right antenna at him (or her!).

We used F connectors because they are cheap, readily available, take up much less back panel space than UHF connectors, and are much, much easier to install (a single 5/8" hole)! BNC connectors would also be appropriate. But note it is a good idea not to use a connector which may also be used in a transmitting application in your shack. Remember, Beverage antennas are for receiving only!

Finally, as we got around to attaching feedlines, it became apparent that as soon as they were identified, it was important to label them with Brady markers, tie-wrap tabs, or even masking tape to indicate direction. Without marking, eight identical RG-59 ends with F connectors quickly became confusing.

The jumper connecting the control head to the transceiver at K1VR was RG-59 with an F connector on one end and an RCA phono plug on the other. This was due to the need for RCA plugs in the Kenwood TS-520, 820, 830 series. Note that a small modification may be necessary to your transceiver to permit operation with a separate receiving antenna while maintaining the flexibility of switching back to the transmit antenna for receiving, if desired.

Feedline

Of course, the magic in the design of these antennas is that the feedlines are so inexpensive. With the advent of cable TV, so-called "drop cable" has become widely available at very attractive prices. This is the cable which is run from the telephone pole on the street to the home.

Drop cable comes in two sizes: RG-59 and RG-6. At 5 MHz, RG-59 has an attenuation of approximately .55 dB/100 feet; RG-6, which is more expensive, is approximately .45 dB/100 feet (source: Belden catalog). Therefore, since loss is inconsequential (the more feedline loss, the less attenuation you will have to insert to prevent front-end overload), choose the line on which you get the best deal. However, other considerations may contribute to your decision.

If you live near a strong local station or intend to operate in the multi-operator/multi-transmitter category in various contests, you may wish to consider the question of shielding. RG-59 is commonly available in 40% braid/100% foil or 60% braid/100% foil. The more ingress of signal that you expect, the more you should consider using 60% braid or even 95% braid. *In extremis*, these cables are also available with double shielding and double foil. Double-braided RG-6 is the cable of choice for direct burial installations.

In any ham station, the question of splicing wire often arises. A few words of advice are appropriate. If you have to put a cable in conduit to get out of your house and into the backyard, *never* put a splice inside the conduit. If you must splice outdoors, splicing and then putting the splice underground is bad business, as it is just too susceptible to water getting into the coax. Since this is a foam coax, the water will migrate without mercy. The coax is cheap; if you value your time at all, use unbroken runs of coax in conduit and underground!

Finally, when working with cable-TV coax, remember that the braid is generally going to be made of aluminum and will not solder. This dictates that all connectors must be either crimp-on BNC or crimp-on F. As for the crimping, it may be awkward, but be sure to borrow or buy the correct crimping tool. Merely using a pair of pliers will not do the kind of rf-tight crimp which will last.

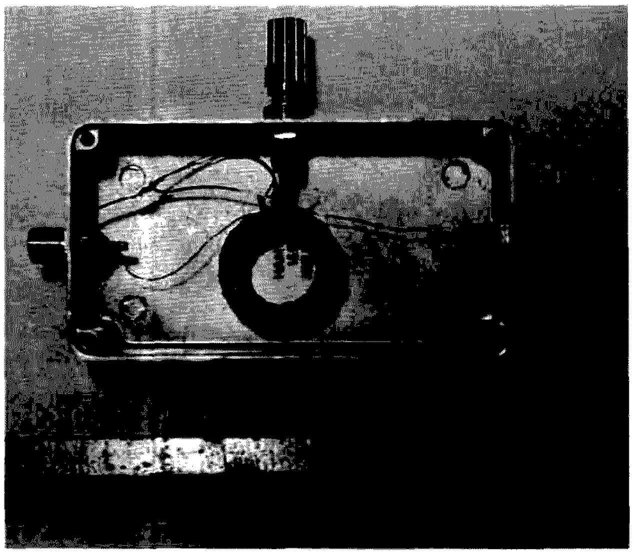

Photo B. Inside view of a Beverage Box.

Beverage Boxes (The Terminations)

The Beverage Box is the interface between one end of a Beverage antenna and its 75-Ohm transmission line. It should have minimum insertion loss, operate efficiently over a wide frequency range, and be weatherproof.

As a starting point, we knew that, according to the literature, Beverage impedances could range from 400 to 800 Ohms or so, but that we could reasonably expect an impedance in the 500–600-Ohm range.[10,11] Furthermore, we decided that rather than design a multiple-impedance matching transformer, a single 600-Ohm-to-75-Ohm design would be used. The thought of many treks into the woods to adjust taps aided in this decision!

The actual construction of the box was divided into smaller units of decision-making.

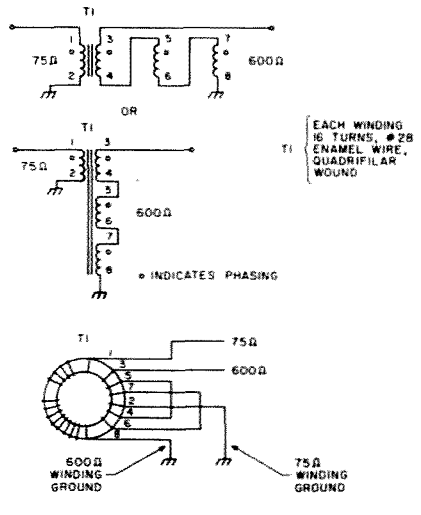

Fig. 5. Transformer winding details.

Connectors

F connectors were selected for the very same reasons we used them in the control head.

Also, watertight boots which go over F connectors are readily available. Filling them with silicone grease (not caulk) before tightening will make a very good setup. Remember to put the boot on before putting on the F connector. The authors have forgotten this rule more than once.

Binding Posts

We selected commonly-available posts and have very little to contribute to the discussion. However, it is a good idea to get the type with a hole through the post to ensure a good contact even after oxidation has begun. Also, note that some binding posts (the cheapest type) are not feedthrough types. That is, they are not insulated from the surface in which they are mounted. These should be avoided.

The Transformer

The transformer design meets the following criteria:

Impedance Ratio (Ohms)	600:75 (8:1)
Bandwidth	1.0 to 30 MHz
Insertion Loss	Negligible

The transformer was quadrifilar wound (Fig. 5), one winding serving as the 75-Ohm secondary, the other windings connected in series as the 600-Ohm primary. All windings were 16 turns, #28 enamel wire, closewound (Photo A), on an Indiana General 626-12-Q1 core (available from Permag Northeast Corp., 10 Fortune Drive, Billerica MA 01865; (617)-273-2890). Each winding had a self-impedance of 375 Ohms (5 × 75). The core of the transformer had a .75″ inner diameter, a 1.25″ outer diameter, and a .375″ width.

Note that the late Jim Lawson W2PV found that in the presence of very high rf levels—a local AM radio

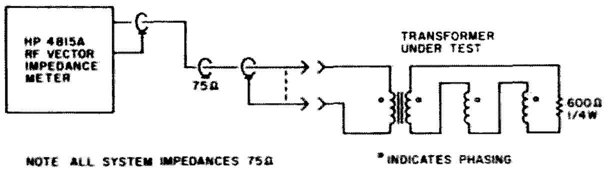

Fig. 6. Impedance-measurement test setup.

F(MHz)	Z (Ohms)	θ°
1.8	70	+6
2.0	70	+6
3.5	70	0
4.0	71	0
7.0	68	+2
7.3	67	+2
14.0	56	−2
14.35	54	−4
21.0	42	+8
21.5	42	+9
28.0	38	+30
28.5	37	+37

Table 1. Transformer vector-impedance measurements.

station—the toroid core saturated. He used L/C networks for transformers instead of toroids at his location.

Both a network analyzer and an rf-vector impedance meter (75-Ohm impedance) were used to verify transformer performances. Test setups are shown in Figs. 6 and 7; measurements are listed in Tables 1 and 2. Measurements made using the network analyzer are return loss as measured in decibels. "Return loss is the relation between the power returning down the line from a mismatched load to the power incident to that load." (Stephen F. Adam, "Microwave Theory and Applications," Prentice Hall, 1969.) It is related to vswr by the formula: $R1 = -20 \log_{10}(vswr - 1/vswr + 1)$. Equivalent vswr's are included in Table 2.

All measurements were made with the transformer terminated in a 600-Ohm load consisting of two 1200-Ohm, quarter-Watt, carbon composition resistors in parallel.

N1RC also tried a measurement setup which the average ham can do at home to get a rough indication of Beverage performance. Although the transformer is designed for a 600-Ohm-to-75-Ohm impedance transformation (an 8:1 ratio), it can also be used for 400-Ohm-to-50-Ohm applications. Bob made a 400-Ohm dummy load of 8–50-Ohm, 10-Watt wirewound resistors and connected it to the 600-Ohm side of the transformer. After connecting the 75-Ohm side to the "Antenna" connector of a vswr bridge and applying enough power to get a full-scale deflection, he measured the vswr (quickly!) on 160, 80, and 40 meters. It was 1.5, 2, and 3, respectively, and into a reactive load.

Winding Tips

Leave about three inches of wire free on each end of each winding. Tin each end for about 1/4"; remove the enamel by burning it off with a hot soldering iron. Wipe the tip of the iron frequently on a wet sponge to clean it. When all eight ends are tinned, identify each winding using a continuity tester or VOM. Separate out one winding as the 75-Ohm winding. Carefully solder the other three windings in series, removing excess wire (you don't need six inches), and re-tin ends before connecting the two end windings to the center windings. Pay careful attention to polarity (phasing).

Box Assembly

Each transformer is mounted in the Beverage Box on a platform built up of clear uncured RTV. When this cures, the toroid will be held securely in place. The ground ends of the windings are connected together to the ground binding post and a chassis ground. The 75-Ohm and 600-Ohm windings are connected to the F connector and input binding post, respectively. See Photo B. Be careful not to reverse these connections as we did in one box. If you need to identify windings, disconnect the ground ends from ground and from each other. The 600-Ohm winding will then show continuity from the "hot" end to the connections between its center winding and outer windings.

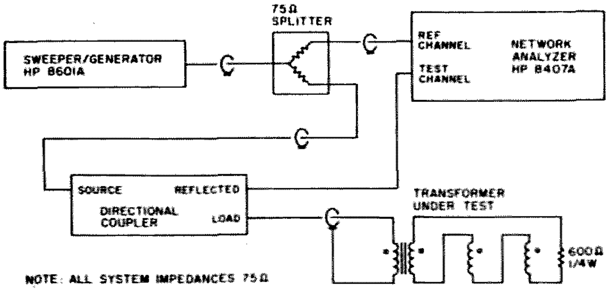

Fig. 7. Transformer return-loss test setup.

Another consideration is the location of the 600-Ohm binding post, the 75-Ohm binding post, and the F connector. We placed the 600-Ohm binding post and the F connector on opposite ends of the long axis of the Beverage Box with the ground binding post placed on the side. In this way, the box could be "hung" from a Beverage. The F connector and 75-Ohm feedline hang vertically from the bottom of the box with no right angle bends in the cable and a natural drip path for the water off the box.

The Box

We chose an aluminum Hammond 1590 B box (109 × 58 × 25 mm), equivalent to Bud box number CU 124, because it was reasonably priced—in the $6.00 area—and had an inner lip which protects the circuitry from the weather. All seams in the box and connectors were coated with clear nail polish to form an inexpensive and watertight seal. Photo C shows a completed box.

Grounding

This is a subject all its own. But it is probably worth a few words here. The Beverage antenna will be erected only 8-15 feet off the ground. Therefore, it is unlikely to receive a direct hit from lightning.

F(MHz)	Return Loss (dB)	Vswr
1	20	1.22
2	30	1.06
2.7*	45	1.01
3	35	1.04
4	30	1.06
5	28	1.08
6	25	1.12
7	22	1.17
8	20	1.22
9	19	1.25
10	18	1.28
11	17	1.34
12	16	1.38
13	16	1.38
14	16	1.38
15-30	> 10	< 1.9

*Resonance in transformer produced (out of ham band) measurement anomaly.

Table 2. Transformer return-loss measurements.

To a certain extent, the feedlines to the Beverage Boxes act as counterpoises, since the most convenient route from the shack to the Beverage Boxes furthest from the shack was almost always along the ground beneath the Beverages. All feedline braids were grounded at each end. However, this counterpoise effect caused by the feedlines is not a designed-in part of the Beverage system and cannot be depended upon to either improve or degrade system performance. It just must be accepted as one result of this design.

In the installation of this antenna, several four-foot cable-TV ground rods were

used. In addition, several six- and eight-foot ground rods were used. Six-foot-by-3/8-inch or eight-foot-by-5/8-inch ground rods seem to be the grounding system of choice. But the best strategy seems to be this: Erect something, and if you are unsatisfied with performance, go out and add more ground rods a few feet away or add radials to the existing ground rod.

Incidentally, since no #6 copper ground wire was available, we simply used two strands of #12 (approximately equivalent to one #9 wire) to ground the termination boxes.

Place the ground rod a few feet away from the tree and you will have a better chance of avoiding thick roots when you drive the rod(s) into the ground.

Note that a six-direction Beverage system uses seven ground rods; the last one is for ground back at the shack. But you have already installed a good ground for your station, haven't you?

Wire and Height

Beverages will work best, it seems, at heights from 6 to 15 feet. Above that, they begin to look like conventional longwires. We caution you to put the wire up at least 10 feet, however, because one Massachusetts ham is now the defendant in a lawsuit resulting from a trespasser on horseback who was toppled from her horse when she hit the Beverage wire.

At K1VR, due to constraints imposed by lot size, the Beverages were only between 220 and 325 feet long. Widely-circulated folklore suggests that two wavelengths, or 450 feet at 80 meters, is optimum. There is some experience, at W4BVV and W1ZA, to suggest that 1000-1200 feet is too long at 80 meters.

Almost any wire will do, but we recommend stranded and insulated, approximately #16 or #18 AWG. Finally, if you want the wire to be seen, because you cross an open field perhaps, make it white or yellow. On the other hand, if you live in a more suburban area and wish to hide it a bit, choose green, brown, or black insulation.

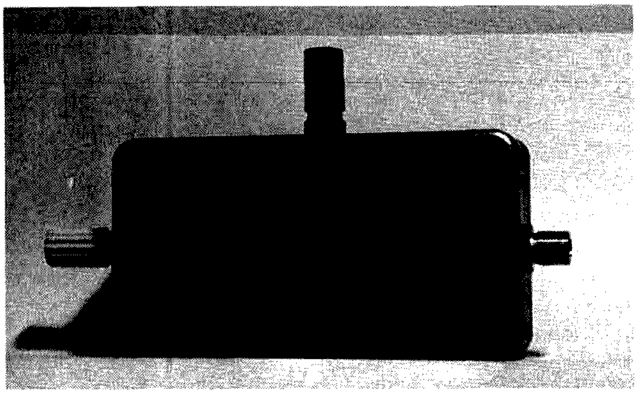

Photo C. Assembled and sealed Beverage Box. The system of three reversible Beverages at K1VR required six of these boxes.

The best mounting method yet discovered is to use standard electric fence wire standoff insulators made of plastic. They can be hammered into a tree in seconds.

Remember, when installing your wire, to keep it as far away as possible from towers and other metallic structures which may have the undesired effect of capacitive coupling. In the case where a 300-foot wire is supported in the middle by your tower, it is more likely to behave as if it were a 150-foot wire.

We chose stranded wire because, over such long runs, supported by trees, a solid wire would be flexed frequently, leading to stretching and breakage.

Conclusions

We set out to make a unidirectional receiving antenna for the low bands which would be very good for DX and reject signals from the side and back. For a modest amount of work, on a lot of modest size, we attained that goal.

Once we had the antennas up and working, we did notice something about their operation that deserved a bit of attention. Occasionally a signal seemed to peak on the wrong antenna. There are two reasons that this can occur. For one, a particular Beverage may not so much favor one direction as it nulls the interference coming from another. This gives the *appearance* of peaking a signal on the wrong antenna. In trying conditions, this means that some judicious switching is worthwhile. For another, Beverages are essentially low-angle antennas. As a result, a close (0-300 miles) station may actually be louder on the high-angle side lobe of a completely different direction Beverage than on the Beverage favoring that direction. At K1VR, this means that K2s often peak north or northeast. Locals, it seems, can peak almost anywhere.

Having established that we had a working antenna system and knowing full well that nothing good ever lasts, we decided to make records of baseline resistance measurements at the control head. There is variation due to feedline lengths, and maybe even grounding, but by measuring between the center conductor and ground at the output of the control head (removing the jumper that goes to the receiver), lines measured between 6 and 40 Ohms.

It is really neat to peak up the weak ones and reject the strong ones by changing directions so easily. If you've long bemoaned the noise and crud on 40, 80, and 160, try a Beverage and double your fun by feeding both ends!

Acknowledgments

Thanks to W1CF who erected the prototype version on Martha's Vineyard. And thanks to W1FC who took the first cut at designing the transformer. Both men work at M/A-COM, where we used some lab instruments for testing. Thanks also to N1BC for some helpful hints. K1VR thanks his company, Channel One, for offering a good deal on some RG-59 left over from satellite cable-TV installations.

We would be happy to respond to any inquiries accompanied by an SASE. ■

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8. Misek, *op. cit.*, page 6.
9. Belrose, "Technical Correspondence," *supra.*

Join the Packet-Radio Revolution — Part II

Warm up your soldering irons.
This part offers the nuts and bolts of building your own TNC.

Lyle Johnson WA7GXD
c/o Tucson Amateur Packet Radio
PO Box 22888
Tucson AZ 85734

"You mean I can send messages error-free, experiment with various protocols, use amateur satellites without an amateur satellite station...? Wow! But you indicated I'd probably need this TNC to do it. How can I get one? Or better yet, how can I make one?"

Last month, a general overview of packet radio was presented. This time, a detailed description of the Tucson Amateur Packet Radio (TAPR) Terminal Node Controller (TNC) will be presented. I will do this in detail to allow the experienced home-brew artist to construct one, and I will make general comments regarding packet hardware. A look at current and projected packet activities will be included, along with references to sources of further information.

As explained in Part 1, most packeteers utilize a TNC to connect their radio and terminal or computer together. The TNC contains a microprocessor, memory, I/O for the terminal (from now on, the word terminal will be used to include a personal computer), I/O for the radio (including the modem, or TU), a power supply, and miscellaneous circuitry.

There are at present two TNCs in common use. One is supplied as a bare board from the Vancouver Amateur Digital Communications Group (VADCG) and was the first system generally available. It has 4K bytes of RAM space and 4K bytes of EPROM space. The 8085 microprocessor is utilized, along with the 8273 HDLC controller. An external power supply and modem are required for operation. (Contact VADCG, whose address appears at the end of this article, for more information.)

The second unit is a TNC designed by TAPR (pronounced "tapper"), and it includes 24K bytes of EPROM, 6K bytes of RAM, a 6809 microprocessor, and a Western Digital 1933 HDLC controller. It supports both serial and parallel terminal I/O and includes an on-board modem (with radio interface circuitry) as well as an on-board regulated power supply. The primary emphasis of this article is on building a TAPR TNC.

Short History of TAPR

The TAPR TNC came into being after a group of six hams got together in late November, 1981, following a presentation on packet radio by KD2S at the local IEEE Computer Society. After reviewing the October, 1981, *QST* article on packet radio, the group decided to get further involved. Wanting to do extensive experimentation with various protocols and desiring that the TNC be self-contained (with on-board modem, radio interface, and power supply), an informal club was formed and the name Tucson Amateur Packet Radio adopted.

An initial TNC design using a 6502 microprocessor was completed in December of 1981, and by late winter, a dozen PC boards were fabricated. These were called alpha boards, and the twelve people who had ordered them hurriedly assembled them. The software and protocol groups meanwhile got very busy, but work (the bane of an amateur's existence) got in the way and things developed rather slowly. The original boards had 12K bytes of EPROM, 4K bytes of RAM—and some very troublesome IC sockets.

By May, 1982, a FORTH compiler was resident on the TNC and some fairly crude software to exercise the hardware and ship packets was written. This system was first shown publicly at the ARRL Southwestern Division Convention, June 4–6. By this time, TAPR was a nonprofit R & D corporation with over 100 members. Shortly after the convention, stations WA7GXD and KD2S established packet communications over a 35-mile path in Tucson using the alpha TNC.

Investigation into the radio response characteristics of the 2-meter gear available to TAPR that summer showed that the audio response on a system basis (that is, looking at a signal from a receiver's speaker that was transmitted by another radio with a pure signal at its microphone input) was terrible. If the modem was to work at the tar-

get rate of 1200 baud, some filtering was going to be needed.

At this time, KV7B and KV7D stepped forward and volunteered to design such a filter. After careful study and computer simulation (meaning building and testing it on paper as opposed to actually doing it), a design came forth which was quickly breadboarded. On the second pass, it worked! Several radios were tested with the new filter, and most worked perfectly.

About the same time, the software people requested more memory space and an improved microprocessor. The 6809 was selected, and memory space increased to 24K bytes of EPROM and 6K bytes of RAM. And, again at the same time, an experiment believed to be unique in the annals of amateur radio history was launched...

Beta Test

It was a fundamental belief amongst the original TAPRites that unless packet were made available to the general amateur community as a tested and proven mode of communications, it would become at best a curiosity—like SSTV—rather than a dominant mode whose advantages could be readily exploited—like VHF FM. Thus, it was determined to do an extensive, nationwide test of the TNC design, both establishing it technically and creating a widespread organization with packet experience and expertise. We felt that in this way thousands of amateurs would get exposed to the new mode, see demonstrations, etc., and the TNC could be tested in a variety of climates and by people with all sorts of backgrounds, many nontechnical.

TAPR announced its intentions via its newsletter, *Packet Status Register*, and the *AMRAD Newsletter* (published by Amateur Radio Research and Development). By the cutoff date, over 160 amateurs agreed to participate in the test. It was made clear that a true test was to be done evaluating protocols, hardware, etc., that problems could be expected, and that solutions would have to come from the field, not just the Tucson "core."

In October of 1982, AMSAT sponsored a conference to decide protocol issues so the forthcoming Phase IIIB satellite could be used for intergroup-linking experiments. It was apparent that a standardized protocol was needed, or else different groups would not be able to exchange information. A sort of Tower of Babel would result, with each group speaking its own language. The result of this conference was the adoption of a protocol called AX.25, sponsored by AMRAD, with a few changes.

At TAPR, a software effort was organized to get this new protocol on the beta boards, and the race was on between the PASCAL coders with AX.25 and the FORTH coders with the TAPR/DA (dynamic addressing) protocol. The AX.25 team won the first round, and the resultant TAPR/AMSAT AX.25 protocol was burned into the TNC's memory.

After a false start in which 119 TNCs had to be scrapped due to a manufacturing defect in the PC board (see "Black Thursday" in the December, 1982, issue of TAPR's *Packet Status Register*), the beta TNCs were distributed. In a matter of a few short weeks, beta sites were on the air with packet beginning a rigorous test of hardware, software, and protocol. As this is being written, the first results of the beta test are flowing in, and by the time you read this, it is expected that the bugs will largely be exterminated in the software and hardware design modifications for enhanced operation will have been implemented.

The TNC

The information presented here for constructing a TNC is based on the latest hardware modifications. Be sure to contact TAPR for any updates before you begin building your unit just to be safe (please include an SASE), but you may be assured that the design presented here has in fact been put on the air by over 160 other hams and that it works very well.

CURRENT PACKET ACTIVITIES

Packet radio development is currently expanding in many directions:

On HF, transcontinental contacts have been made as well as short-distance ones, on 10 meters. AMRAD is sponsoring the design of a Packet Adaptive Modem (PAM) especially for HF use. It will work from 75 to 1200 baud using FSK techniques. The idea is that stations will establish contact at 75 baud and then step up the rate until the bit-error rate (BER) becomes too high (meaning too many retries). The units then will step down in rate and continue until either (a) the error rate degrades, meaning another step downward, or (b) the error rate becomes too good, meaning another step upward.

Another set of experiments has been conducted by W9JD using a scheme of forward error-correction (FEC). This means that redundant bits are sent for each character, slowing down the data rate for a given baud rate but allowing the receiving station to miss some bits and still get error-free copy! This sort of system no doubt will be further developed in the future.

On VHF, W3IWI and others have exchanged packets using OSCAR 8 Mode J! This is a precursor for the AMICON network to be established since the successful launch of Phase IIIB. TAPR is starting to design high-speed linking hardware for the Terracon application.

One of the most original experiments now being implemented is a device called PACSAT. This is an AMSAT-sponsored satellite that will fly in low Earth orbit (LEO) much as the present OSCAR series. However, this bird will have up to 4 megabytes of memory and will allow amateurs to send messages to other amateurs anywhere else on Earth. PACSAT will store the message until the receiving amateur logs in, at which time it will send the message to him. This store-and-forward system will allow non-real-time communications on a global scale. PACSAT is slated to fly in the 1985/6 time frame.

Back on the ground, several sites have put up computer bulletin boards on packet. The list includes San Francisco, St. Louis, Tucson, Washington DC, and many other cities.

A major breakthrough in packet communications occurred during October, 1982, when AMSAT sponsored a protocol meeting in conjunction with their annual meeting in Washington DC. Locked in a room until an agreement was reached, representatives from most active US packet groups met and adopted a "level two" protocol. This means that nearly every packet group will be running a common protocol, enabling us to "talk" to each other now that Phase IIIB is up! While seemingly perfectly obvious, such an accord will help prevent a Tower of Babel, allowing experimentation with access and modulation techniques for this satellite. Of course, each group can run whatever protocol they like locally, but most are now running the AX.25 protocol adopted at the Washington meeting.

As you can see, there is no lack of things being done with packet now, nor will there be in the foreseeable future. In fact, it is my opinion that the next year or so will see the beginning of traffic handling and emergency-communications-oriented amateurs reaping the benefits of packet-radio techniques.

The TNC design is broken into the areas of microcomputer terminal I/O, radio I/O and modem, and power supply. These will be discussed in some detail, and it is recommended that the builder thoroughly read this section before construction commences. The TAPR TNC incorporates some very new technology, some of it believed to be unique in the Amateur Radio Service.

NOVRAM (a trademark of Xicor) is a form of memory (nonvolatile) that doesn't forget when power is removed yet is easily updated by the operator. It is used to store such information as station callsign, terminal I/O characteristics (baud rate, parity, and stop bit options, etc.), radio channel information, and so forth.

A CMOS switched capacitor filter is used to smooth the radio system audio response to allow for a 1200-baud transfer rate. This filter is crystal-controlled, and its parameters are set by a network of 1% resistors so that it is economical (about $6 total) as well as reproducible (there are no adjustments nor critical capacitors).

"Byte-wide" memory is used, so the user can optionally mix the ratio of RAM and EPROM, and the address map for the microcomputer is burned into a TTL PROM, so it can be changed by those who so desire.

Other unique features include a 14-second "watchdog" timer to prevent a malfunctioning unit from tying up a channel, on-board self-calibration routines for setting the modem frequencies, and capability to select the HDLC baud rate under software control.

The Microcomputer

The TNC digital logic is implemented via a programmable microcomputer. This allows changes to be made in the logic (such as protocol definition) without modifying the board and greatly simplifies the device. To implement a TNC in discrete logic (such as TTL or CMOS ICs) would be an incredibly complex task and probably would render packet an unusable mode.

The design of the microcomputer portion of the TNC is very conventional. A crystal-controlled clock oscillator is implemented using two sections of a hex inverter, U1. The frequency chosen, 3.6864 MHz, enables the various baud-rate generators on the board to operate exactly at the standard baud rates in general use. A frequency divider follows the clock oscillator to provide a 1.8432-MHz signal for the 6551 UART (see User I/O, below) as well as a 115.6-kHz signal needed by the switched capacitor filter in the modem, described below.

A reset circuit is provided using two sections of a hex Schmitt trigger/inverter to provide a time delay after power-up. A switch is provided to allow the operator to manually reset the system as well.

The microprocessor is a 6809, selected for its architecture. It is efficiently able to run block-structured code such as that generated

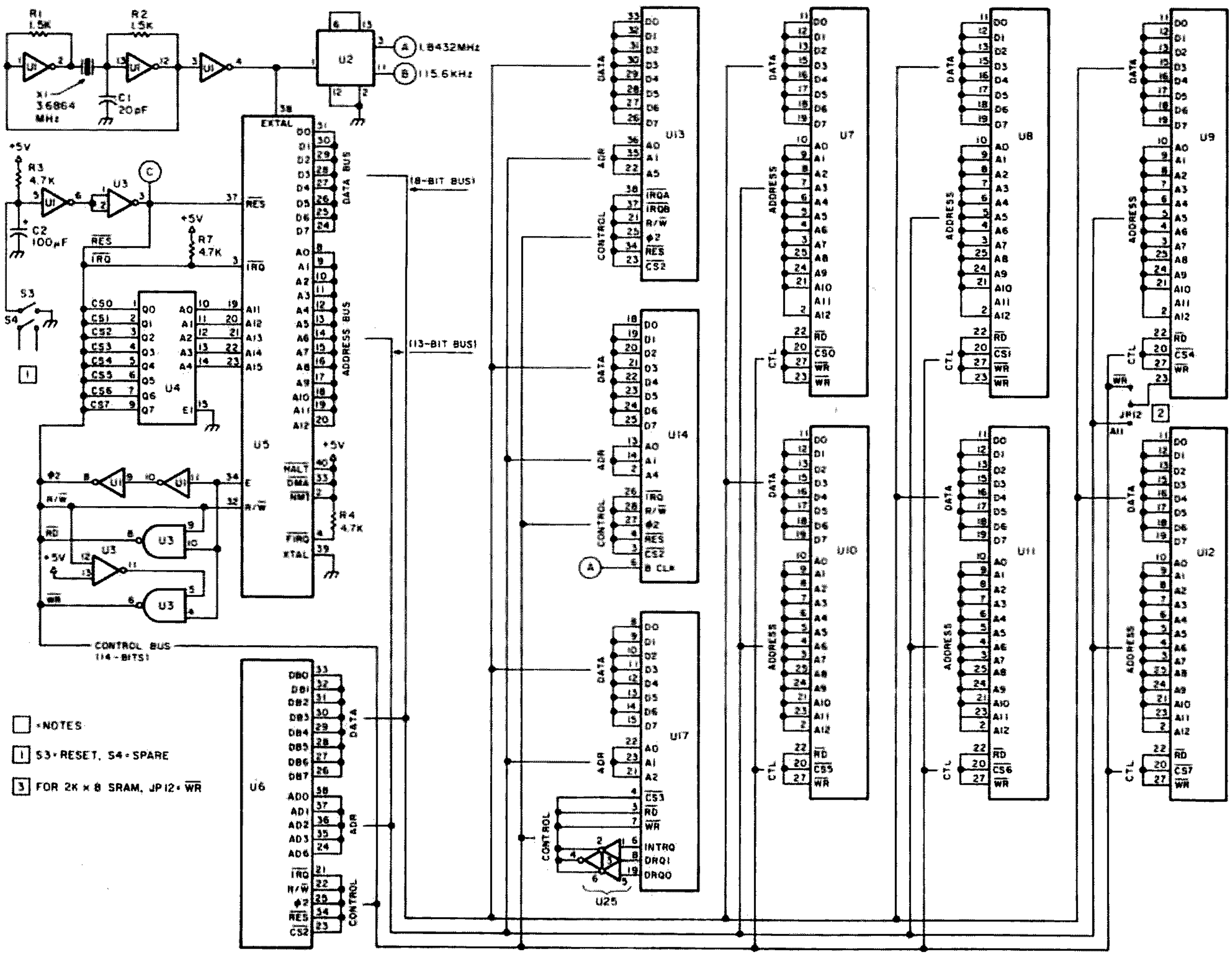

Fig. 1. System circuitry.

by PASCAL and FORTH compilers. Some additional circuitry is provided on the control bus to provide compatibility with the memory and HDLC controller. This is implemented using TTL for clock buffering and generating separate !RD and !WR signals. (Note that a leading ! means negative true logic in this discussion.)

The memory bank consists of six JEDEC-standard "Byte-wide" sockets. Each 28-pin site can accommodate RAM, ROM, EPROM, or EEPROM. The beta configuration calls for the low-order sockets, U7-U9, each to contain a 2K-byte static RAM chip (such as the AMD 9128, Toshiba 2016 or TI 4016) for a total of 6K bytes. The other three sockets contain 2764 EPROMs at 8K bytes each for a total of 24K bytes. This is more memory than many of the current crop of low-end "home" computers!

For maximum flexibility and to allow using higher-density memories (such as 8K-byte static RAMs, and 16K- or 32K-byte EPROMs), the address map is burned into a 32 × 8 bipolar PROM. This address decoder allows for any memory mix with a resolution of 2K bytes. Thus, a full 64K-byte address space can be accommodated with no changes other than burning a new address decoder PROM (at a cost of about $1.00)—and buying more memory, of course!

In order to allow the operator to store his station callsign only once (as opposed to storing it every time he turns the TNC on), as well as to allow flexibility in saving various serial port parameters (baud rate, stop bits, parity) and radio timing characteristics (key-up delay, hang time, etc.), a form of nonvolatile memory (NOVRAM) is incorporated into the TNC. 256 bits of this memory are provided. The interface is through a parallel I/O port (U6), simplifying the hardware design as well as protecting the NOVRAM from any glitches that might alter its contents in an unexpected manner.

This memory requires no batteries or other power to retain data for at least 10 years. It can be rewritten 10,000 times, or once a day for nearly 30 years! (Usually, it will be written to once or twice during initial setup, then only when the operator desires a "permanent" update, maybe once a month.)

The HDLC chip used is a Western Digital 1933B-00, selected for the fact that it contains a digital phase-locked loop (DPLL), used to recover clock information from the incoming NRZI data stream, and because it is the least expensive chip available which has this feature. Unfortunately, it wasn't designed just to hang on a 6809 bus, so a little TTL glue is needed to attach it.

Apart from the separate !RD and !WR lines, also needed for the memory system, the three interrupt outputs from the device are inverted and buffered by open-collector inverter sections of U25. Note that the data bus on this chip is in-

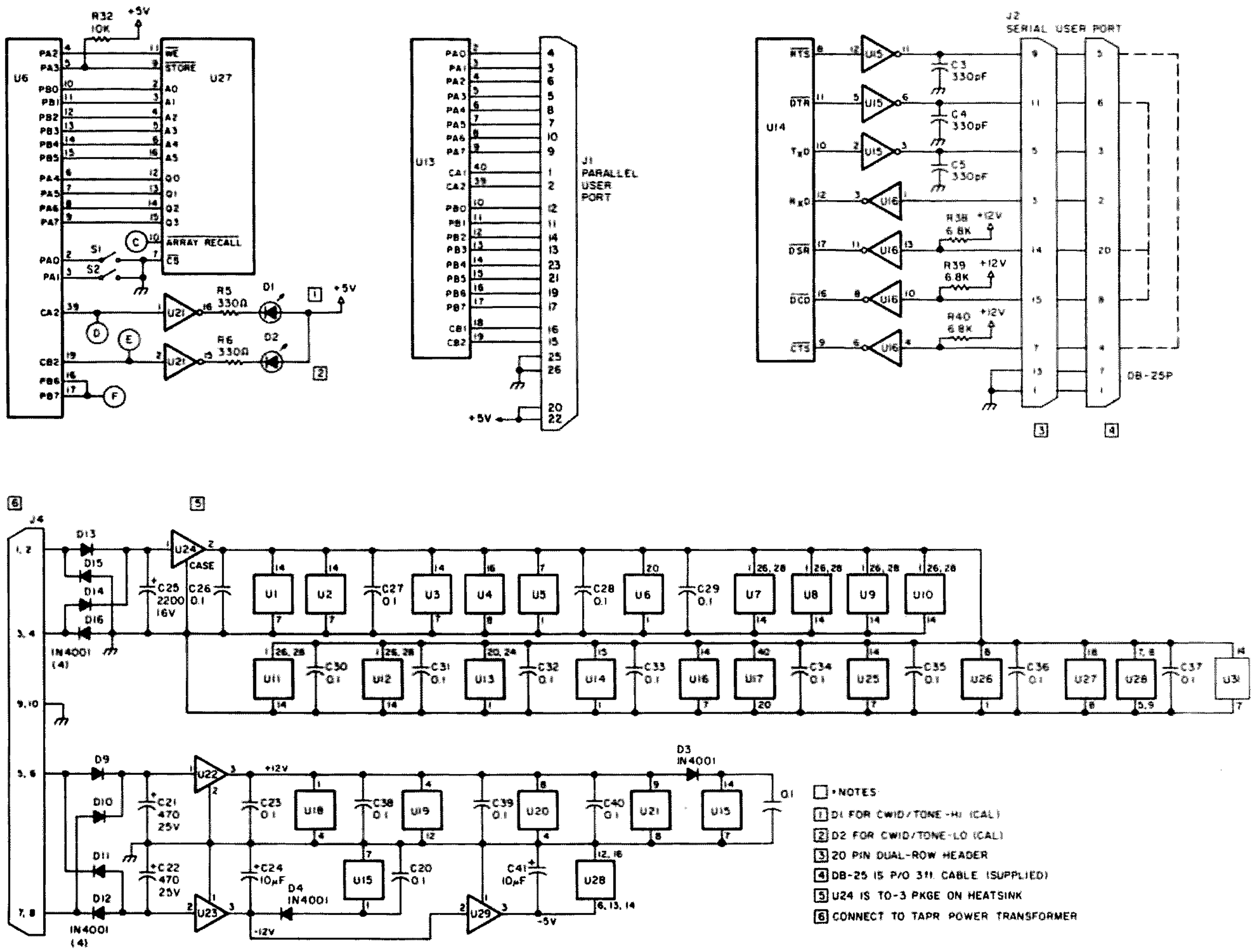

Fig. 2. I/O and power circuitry.

verted, so all data read from the chip must be complemented by the microprocessor before it is used, and likewise all data written to the HDLC controller must be complemented prior to writing.

The reset signal for the HDLC chip is provided by U6, which also provides the 32× baud-rate clock from one of its 16-bit programmable timers. The other 16-bit timer contained within the 6522 is used for maintaining several software clocks. These control such things as the CW ID interval, CW-character dot times, and so forth.

Terminal I/O

The operator interface consists of both a serial RS-232C port and a TTL-level dual 8-bit parallel port.

The most commonly used interface is the serial port. It supports the RS-232C voltage, current, impedance, and pinout specification, and the port looks like data communications equipment (DCE). This simply means that a standard terminal will attach to the port and work! If you choose to use a personal computer, it must look like data terminal equipment (DTE)—a terminal emulator. If your computer looks like DCE, a null-MODEM cable may be used.

The serial port is driven by a type 6551 UART (universal asynchronous receiver-transmitter), which is a 6809-family I/O device. It contains an internal, software-controlled baud-rate generator and can operate at all standard baud rates from 50 to 19,200 baud. Further, it supports 5- to 8-bit data widths, odd/even/mark/space/no parity options, and 1, 1½, or 2 stop bits.

The TTL levels from the 6551 are buffered and inverted by a 1488 driver (output) and a 1489 buffer (input). The output lines are loaded with 330-pF capacitors to ensure that the maximum slew rate of the RS-232C spec is not exceeded, while the 1488 driver is isolated from the power supply by a pair of diodes (D3 and D4) to protect the TNC from faults that may occur on the RS-232 interface. The connector on the PC board is designed to interface with a standard IDC connector and cable, the other end of which may contain a DB-25 crimp-on connector. The DB-25 will then have the correct pinout to attach to a terminal (DTE).

The parallel port uses no standard pinout, as no real standard exists for a bidirectional port of this type. It is included for completeness. An optional accessory for this port that turns the TNC into an EPROM programmer (for software bootstrapping) is available from TAPR.

Radio I/O and Modem

The TNC provides an audio signal for the microphone input of the radio transmitter, a "contact clo-

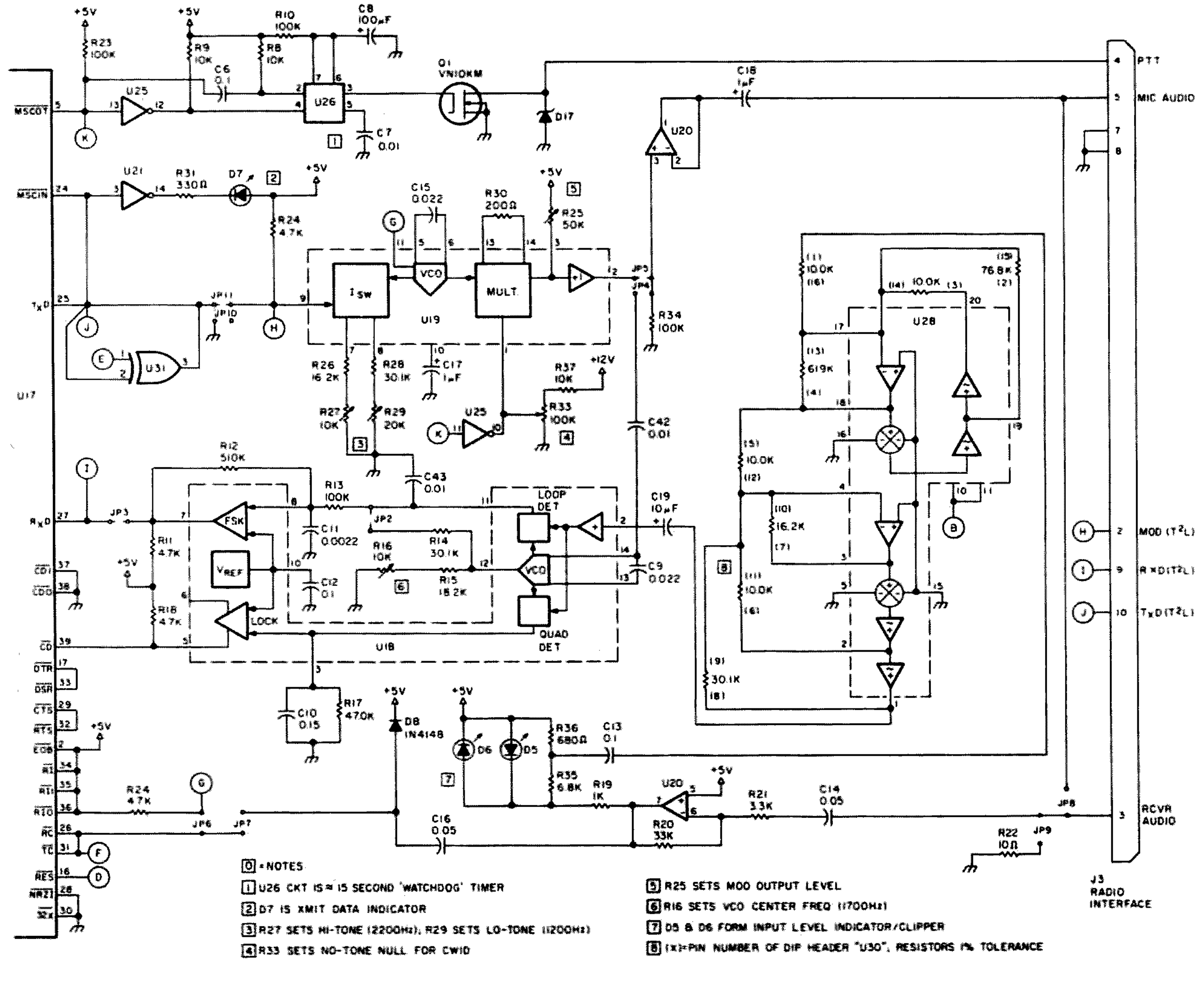

Fig. 3. Modem circuitry.

sure" to provide PTT actuation, and accepts audio signals from the speaker/headphone jack for reception.

The PTT actuation is accomplished via a VFET transistor, protected by a zener diode. When the TNC commands a transmit condition, the !MISCOT pin of the HDLC controller goes towards ground, activating the 555 timer. The output of the 555 biases the VFET on, providing an "on" resistance on the order of a few Ohms. This impedance is low enough to key every radio tested to date. When the transmission is completed, the !MISCOT line goes high, turning off the 555 and hence the VFET. Any voltage spike generated by the radio is suppressed by the zener, thus protecting the VFET and the TNC.

In the event that a glitch of some sort occurs (brownout?) during the absence of the station operator, the 555 timer acts to protect the channel independent of the microcomputer. The component values shown provide an approximately 14-second-duration maximum keydown time. This time may be increased and will need to be if the user plans to send long files at lower baud rates (such as might be required on HF frequencies).

The modulator is a phase-coherent FSK circuit using the popular XR2206 chip. This results in a low-distortion sine-wave output along with a simple, easily adjusted circuit. The output is buffered via an op-amp section before being passed to the radio I/O connector.

The output amplitude level is adjustable from a few millivolts to a few volts peak-to-peak and is typically set for 75 mV p-p. A null adjustment is provided and the tone keyed on and off for CW ID purposes. A square-wave output is also provided for connection to the 6522 PB6 input. This enables the software to configure a frequency counter for calibrating the modem to within a very few Hertz of the target frequencies.

The tone pair most commonly used is 1200 Hz and 2200 Hz for compatibility with amateurs using surplus Bell 202-style modems.

The receive side is somewhat more involved. The desired bandpass characteristic for using the Bell 202 tones is not met very well by unmodified amateur or commercial FM communications equipment. While a demodulator can be made to work by limiting and careful adjustment, it has been shown that the XR2211 PLL demodulator used in the TAPR TNC yields a performance improvement on the order of 3 dB when preceded by the switched capacitor filter shown in the schematic diagram.

The incoming signal is buffered by an op-amp section and then passed to a limiter/indicator using a pair of LEDs. The LEDs provide operator feedback for setting the volume of the receiver. The best adjustment is when the LEDs are just extinguished with an incoming signal.

A resistive divider then couples the signal to the MF10 switched capacitor filter. A second-order high-pass filter followed by a second-order low-pass filter then corrects the radio system bandpass characteristic. The filtered signal is then passed to the XR2211 PLL demodulator, where data carrier detection and data recovery are accomplished.

The MF10 filter has the advantage of not requiring any critical capacitors (nor any caps, apart from bypassing), relying instead on 1% resistors (cheap) and a crystal-controlled clock signal (already needed for the microprocessor). The result is an easily replicated filter characteristic with no adjustments!

The XR2211 circuit is very standard and reliable. The only changes made in the circuit recommended by the manufacturer are in the area of the data carrier detect filter capacitor. It was increased in size to help eliminate chatter and provide greater resistance to false indications due to noise.

Connections are provided to the demodulator to allow calibration by the same on-board frequency counter that is used to set up the XR2206 modulator. The result is an easily calibrated circuit that requires no special equipment.

If you desire, provision has been made for connecting an external modem for further experimentation and development.

FOR FURTHER INFORMATION

To find out more about packet radio, TNC boards, manuals, and parts kits, you may contact Tucson Amateur Packet Radio at PO Box 22888, Tucson AZ 85734.

There may be a TAPR beta site in your area. If so, talking on one of the local repeaters may lead you to someone with a packet station on the air. Numerous local groups are springing up, and many FM/repeater groups are beginning to incorporate packet operations into their systems.

Subscribing to *73* will provide you with other articles on packet radio, and other amateur magazines will also be carrying more and more information on this new mode.

Additionally, the following organizations have regular newsletters with packet information: TAPR, AMRAD, PO Drawer 6148, McLean VA 22106, and SLAPR, 1309 Gloucester Dr., Edwardsville IL 62025. Please include an SASE when writing to any of the above groups for information.

Packet promises to revolutionize amateur communications in the 80s much as did SSB in the 50s and FM in the 70s.

Power Supply

The TNC power supply uses full-wave rectifiers and series-pass regulators for stiff, low-impedance power sources. The design is very conventional and uses the 78/79XX series regulators for their excellent regulation, thermal overload protection, low cost, and wide availability. +12 V is supplied to the modem and RS-232 circuitry, while −12 V is used only for the RS-232 interface and −5 V is used only for the switched capacitor filter in the modem section. +5 V is handled by the more substantial LM309K, which may be mounted on or off board and supplies every subsystem on the TNC. Extensive bypassing is used (don't cheat and leave any out!), and no problems have been noted with crosstalk on the +5-volt bus.

Construction

With the foregoing as background, you are now ready to tackle the actual construction of the TNC. Please be warned, however, that the TAPR TNC is a complex piece of equipment, and construction by the faint-hearted or inexperienced is not advised.

While a wire-wrap job should yield a perfectly suitable unit, construction will be much easier if you elect to use a PC board. TAPR has blank boards available for a nominal price, and I suggest you write TAPR at the address given elsewhere in this article for details on price and availability. TAPR also has parts kits available, and you may want to take advantage of this service as well.

If you decide to obtain the parts yourself, consult the parts list for a detailed breakdown of the necessary items. It is OK to substitute many of the items (such as IC bypass capacitors) but be

Parts List

Part	Part Number	Description
Integrated Circuits—TTL		
U3	74LS00	Quad 2-input NAND gate, DIP, plastic
U25	7406	Hex Inv., OC, DIP, plastic
U1	74LS14	Hex Schmitt trigger, DIP, plastic
U2	74LS393	Dual 4-bit counter, DIP, plastic
U4	82S123	32 by 8 PROM, programmed, plastic
U31	74LS86	Quad 2-input exclusive OR gate, DIP, plastic
—NMOS		
U17	WD1933B-XX	HDLC controller, plastic
U7, 8, 9	2016/4016	2K by 8 static RAM, 450-nSec, plastic
U27	XD2210	64 by 4 NOVRAM (Xicor)
U10, 11, 12	2764	8K by 8 EPROM, 450-nSec
U13	6520/6821	PIA, 1 MHz, plastic
U6	6522	VIA, 1 MHz (Synertek/Rockwell/Commodore)
U14	6551	ACIA, 1 MHz, plastic (Synertek/Rockwell)
U5	MC6809P	8-bit uP w/clock, plastic
—LINEAR		
U28	MF10CN	Dual filter (National Semi), plastic
U24	LM309K	TO-3, +5-volt regulator
U26	NE555V	Timer, 8-pin mini-DIP, plastic
U15	MC1488P	RS-232 driver, plastic
U16	MC1489AP	RS-232 receiver, plastic
U21	XR2203/ULN2003	7 Darlington driver, plastic
U19	XR2206CP	FSK Mod, plastic
U18	XR2211CP	FSK Demod, plastic
U20	CA3240E	Dual hi-impedance op amp, 8-pin mini-DIP
U22	MC7812CT	TO-220, +12-volt regulator
U33	MC7912CT	TO-220, −12-volt regulator
U29	MC79L05	TO-92, −5-volt regulator

Resistors

5%, 1/4-Watt carbon film or composition

R22	10 Ohm
R30	200 Ohm
R5, 6, 31	330 Ohm
R36	680 Ohm
R19	1.0k Ohm
R1, R2	1.5k Ohm
R21	3.3k Ohm
R3, 4, 7, 11, 18, 24	4.7k Ohm
R35	6.8k Ohm
R8, 9, 32, 37	10k Ohm
R20	33k Ohm
R10, 13, 34, 23	100k Ohm
R17	470k Ohm
R12	510k Ohm
R38, 39, 40	6.8k Ohm

1%, 1/8-Watt precision (must be stable)

U30	10.0k Ohm
R26, U30	16.2k Ohm
R15	18.2k Ohm

Psrt	Part Number	Description	
R14, R28, U30			30.1k Ohm
U30			61.9k Ohm
U30			76.8k Ohm
Trimpots			
R16, R27	3299W-10k	10k Ohm	(Bourns P/N)
R29	3299W-20k	20k Ohm	(Bourns P/N)
R25	3299W-50k	50k Ohm	(Bourns P/N)
R33	3299W-100k	100k Ohm	(Bourns P/N)

Capacitors

Disc ceramic, 16 volt or greater, 0.25" center-to-center lead spacing

C1	20 pF
C3-5	330 pF
C26-40, C20, 6, 12, 13, 23	0.1 μF
C11	0.0022 μF
C9, 15	0.022 μF or 0.027 μF COG
C7	0.01 μF
C14, 16	0.047 μF or 0.05 μF
C10	0.15 μF

Electrolytic, radial-lead (higher voltages may be substituted)

C17, C18	1.0 μF/16 volt	(0.1" lead spacing)
C19, 24, 41	10 μF/16 volt	(0.1" lead spacing)
C2, 8	100 μF/16 volt	(0.15" lead spacing)
C21, C22	470 μF/25 volt	(0.2" lead spacing)
C25	2200 μF/16 volt	(0.3" lead spacing)

Miscellaneous

Diodes

D1, 2, 5, 6, 7	SR503D	Red LED (NEC)
D3, 4, 9-16	1N4001	Silicon diode, 100 PIV
D8	1N4148	Silicon diode, switching
D17		33-volt zener diode, 10%, 400 mW or 1 Watt

Sockets, DIP, side-wipe contacts, for .062" PC board

8 pin
14 pin
16 pin
18 pin
20 pin
28 pin
40 pin

IDC connector, dual-row, 0.100" centers, nonpolarized, w/strain-relief

J3, J4	10-pin connector
J2	20-pin connector
J1	26-pin connector

Other

U30		16-pin DIP header
S1-S4	CTS204	4-pole DIP switch
X1	NDK	3.6864-MHz crystal
	15-38-1024	Shunt (molex®)
	22-03-2021	02-square pin strip (molex)
	22-03-2031	03-square pin strip (molex)
	22-03-2041	04-square pin strip (molex)
J3, 4	22-03-2051	05-square pin strip (molex)
J2	22-03-2101	10-square pin strip (molex)
J1	22-03-2131	13-square pin strip (molex)
Q1	VN10KM	V MOSFET

certain to use temperature-stable components in the modem area and for the switched capacitor filter. Saving a few nickels here can lead to grief later on!

The software is available on a set of EPROMs. Source listings may be available, but they are bulky. Furthermore, unless you have a native-code PASCAL compiler for the 6809, the source code probably won't do you much good.

The TNC manual, available from TAPR, contains many details on operation, command structure, etc., that are simply too lengthy to print here, so obtaining this item is an absolute must.

Once you have all the parts, sort them out and organize them so you won't be fishing around for a particular resistor at midnight . . . anything you do to relieve tensions and frustrations as the building phase progresses usually pays off in reduced troubleshooting time after power-up.

The first construction step is to inspect carefully the PC board for shorts or opens. Use a magnifying glass, especially around the address decoder, the data/address lines on the top of the board in the memory array, and at the RS-232 buffer area. It is always possible that a board could get out that has an undetected flaw, and these are the high-density areas that are most likely to be troublesome.

The next step is to mount the IC sockets. Just tack-solder them in at the four corners, one at a time. (Use ONLY a low-wattage, temperature-controlled soldering iron with 60/40 or 63/37 rosin-cored solder.) When the socket is properly seated on the board, solder all remaining pins before going on to the next socket. You are less likely to miss a pin if you do it in this manner. Take your time, as it is much easier to be extra careful now than track down the cold or unsoldered pin later.

Next come the resistors. Be sure to double-check all values before soldering any of them in place. Follow these with the capacitors, paying special attention to polarity on the electrolytics.

Then solder in place the diodes, rectifiers, and voltage regulators. Don't mix up the 7812 and 7912 regulators—they can look the same at 2:00 am!

Finally, the crystal and connectors get installed. Be especially careful that you don't cause any solder bridges across the connector pins, as this can be disastrous!

Inspect the board for cold or otherwise poorly made connections. Be sure no lead clippings have lodged under the IC sockets and that no bridges occur between connections or foils.

If the board passes the visual inspection, set it aside. Wire up your power-supply transformer and radio interface cable, using connectors to match your radio. (You probably will find the appropriate connection information in the Radio Interface Appendix in the TNC manual; otherwise you will have to figure it out.) Incidentally, if your radio isn't mentioned in the interface section, please send a note to TAPR with the pertinent information (after you get it on the air and verify it, please!) for inclusion in future manual releases.

Now wire up your terminal/computer interface. If you are using an RS-232 terminal, you will find that an insulation displacement connector (IDC) at the TNC and terminal ends will work just fine, matching pin 1 of the TNC to pin 1 of the terminal connector.

Firing It Up

The first step in testing the unit is to power it up with no ICs in their sockets (you didn't use sockets . . . ?). Connect the transformer to the TNC and apply power. Using a voltmeter, verify that +12, +5, Gnd, −5, and −12 volts are all where they belong and within tolerance. *Be sure they are right* before proceeding with the next step.

Remove power from the TNC. Now ground yourself, the TNC, and the ICs. *Carefully* install the ICs in the sockets. If you mess up, use proper tools to remove the chip, and try again. Don't use a tool for removing the HDLC controller that doesn't allow for the hump in the middle of this chip or you will wind up with a pair of half-HDLC chips, neither of which will work . . .

A final inspection is in order now. It is advisable to have someone else inspect your work. Often someone not close to the project can spot something that you may consistently have overlooked. If all appears OK, you are ready for the smoke test!

Place DIP switch 1 in the closed position. Set your terminal at 300 baud, no parity, 8 data bits (same as 7 bits and space parity). Connect the terminal to the TNC and hit the return key (some terminals "stick" and the return key loosens them up). Apply power to the TNC. You should see the signon message appear. If you don't, or if you smell something like a burning TNC, remove power in a hurry!

Assuming all is working properly, you may now go through the calibration procedures as outlined in the TNC manual. If all is not well, consult the troubleshooting hints section of the manual for help.

You are now ready to join the ever-increasing ranks of amateur operators pioneering this new mode. Good luck! ■

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Seventeen hundred meters! This is the band of frequencies that gives you a chance to experience the world of long wavelengths. It can't fail to touch the imagination of the experimenter. Little attention has been paid to this FCC Part 15 band between 160 and 190 kHz even though it has existed for many years. Granted, there are strong limitations on antenna size and transmitter power as well as the fact that this isn't a true ham band. But it represents an opportunity for a first-hand view of the realm of low-frequency communications. With true ham resourcefulness and imagination some surprising things happen here.

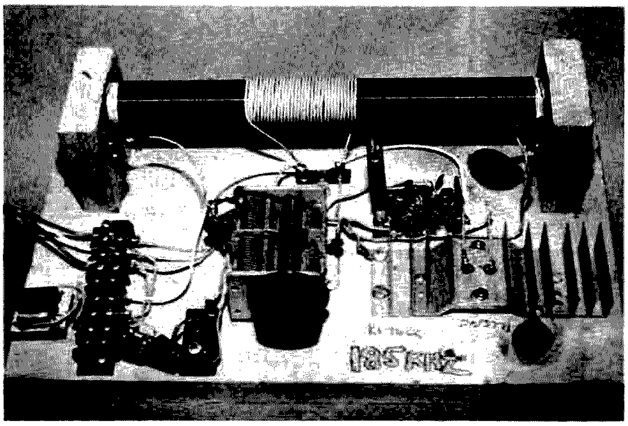

Photo A. The completed transmitter.

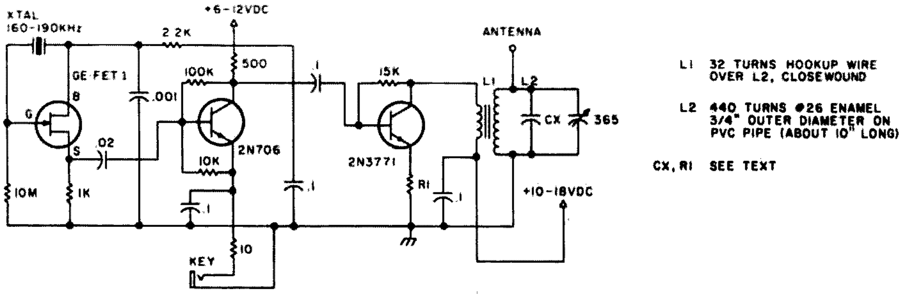

Fig. 1. 160-190-kHz CW transmitter.

The Rules

For those unfamiliar with Part 15, it deals with unlicensed radio transmitters that are permitted to operate under certain conditions. You may recall that toy CB walkie-talkies are legal . . . somehow. That somehow is Part 15. These regulations include a host of other services, such as industrial, scientific, and medical applications of radio. 1700 meters is specifically spelled out as an experimental band here and is free from some of the more restrictive rules concerning Part 15 in general. Anyone is permitted to operate an unlicensed 1-Watt transmitter using any mode for any purpose as long as the antenna is less than fifty feet in length. (Alternately, the power limitation can be calculated as not exceeding 15 microvolts per meter measured at 300 meters.)

So What Can I Expect?

Believe it or not, a CW or sideband signal into a good antenna can be heard for a hundred miles or more, even with these restrictions. While there are reports of ranges in excess of five hundred miles, the average station should be easily heard twenty to forty miles away. Today there is a small but growing number of amateurs—true radio pioneers—actually using this band for communications. Unfortunately, little information about it has been available to the average ham.

This article will be limited to the transmitting aspect of 1700 meters except to say that any number of commercial receivers available today will work well on this band when used with a good

antenna. An antenna that performs well for transmitting will work well for receiving. However, don't be deceived into thinking that just any long wire will work at these frequencies. It is likely you'll spend more time tuning up a 1700-meter antenna than anything you've ever assembled at higher frequencies. There will be more on antennas later.

The Transmitter

Building a transmitter at these low frequencies will come as quite a shock, especially if you've spent much time building UHF or microwave circuits. The tuning coils are monstrously large, lead lengths can be measured in feet, and audio transistors work great as rf power amplifiers.

This transmitter, as shown in Photo A, was a real breadboard design; it was built on an 8- × 14-inch piece of pine. This was done because of the inductive effects on the tank coil that would be caused by a metal enclosure. While this type of construction is not necessary, I recommend it for your first transmitter since it makes tuning up much easier.

The CW transmitter shown in Fig. 1 uses a GE FET-1 as a crystal oscillator feeding a 2N706 power amplifier. A 2N3771 is used as a final amplifier, although any NPN power transistor like the HEP247 or the SK3036 should work fine. Notice the lack of any tuned circuits until the final amplifier. When dealing with large coils, I've tried to keep their number to a minimum. The final tank coil, L2, is 440 turns of #26 enamel wire wound on a ¾-inch-outer-diameter piece of PVC plastic water pipe. The coupling link, L1, is 32 turns of single-conductor insulated hookup wire wound about the center of L2. An AM broadcast radio variable capacitor of 365 pF is paralleled with a 350-pF capacitor, Cx. This may have to be varied with individual transmitters, but this value is a good starting place for tuning 160-190 kHz. R1 in the emitter lead of the final amplifier is varied to produce the 1-Watt input required by Part 15. With 18 volts on the collector, I've found 15 Ohms is about right, but here again individual adjustments may be necessary.

There are several places to key the transmitter. The easiest is to simply key the emitter of the 2N706. If the transmitter is located a long distance from the operating site, a keying circuit like the one shown in Fig. 2 will control the transmitter by keying in 10 V dc. The current requirement is practically nil, so a long run of wire is possible.

Photo A shows the final transistor with a large heat sink. At one Watt, the final stays cold without the heat sink, but I've used this transmitter for experiments under Part 15 at higher inputs; that is why it is shown. A small IC ID generator can be seen attached to the terminal strip for use as a beacon.

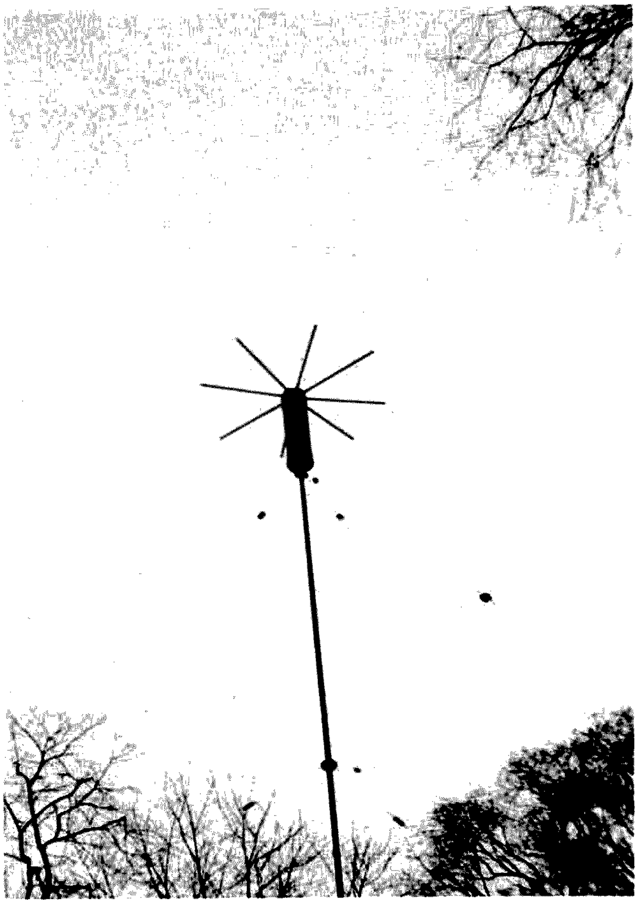

Photo B. The top-hat vertical for 160-190 kHz.

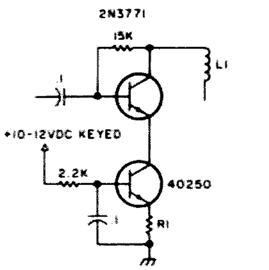

Fig. 2. Alternate circuit for transmitter keying from a remote location.

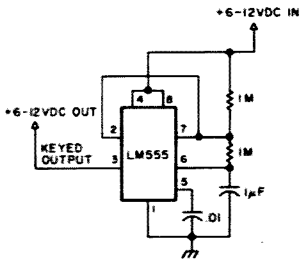

Fig. 3. LM555 timer used as a beacon keyer.

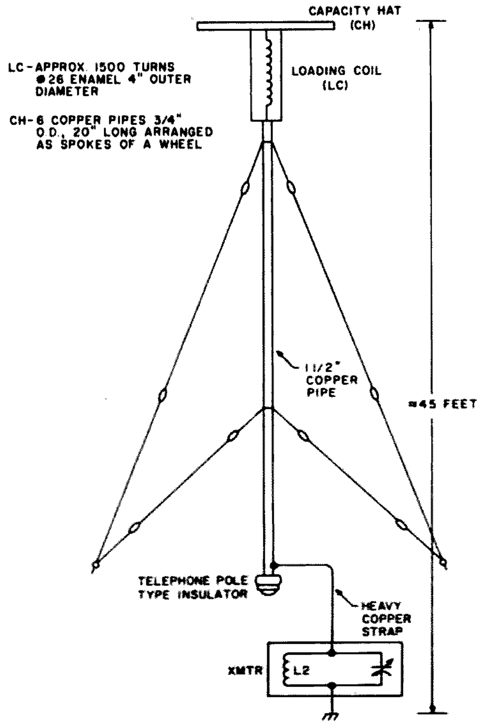

Fig. 4. One type of antenna used by the author.

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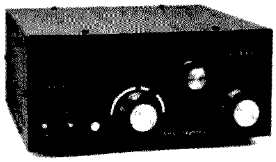

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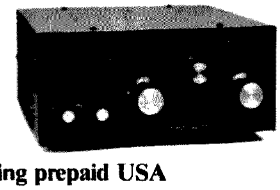

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A simple LM555 timer (shown in Fig. 3) will key either the 2N706 driver directly or the circuit in Fig. 2, in a recognizable on/off pattern. This will allow you to distinguish your signal from others on the band, while doing remote measurements for antenna adjustments and so on.

Tune-up is simple. First listen on a receiver to make sure the oscillator is oscillating. Then tune C1 to resonance. A good indication is a glowing neon bulb placed across L2. With the high turn ratio between L1 and L2, the transmitter becomes a miniature Tesla coil capable of several hundred rf volts. Be careful that the tank circuit is dipped for 160-190 kHz and not harmonic. Using the values given for L1 and C1/Cx, this should be unlikely.

An Antenna

Antennas for 160-190 kHz are an entirely different subject. Since you are limited to fifty feet in length, each antenna will be an individual unlike any other. It will be necessary to experiment to get the best combination of values to achieve maximum radiation. These values will depend on local conditions such as soil conductivity, proximity to metallic structures; the list is endless. Here are a few guidelines to follow. Stay strictly with vertical polarization since losses from horizontal antennas are severe given the limitations of fifty feet. Use a high-quality base insulator because you'll be dealing with high rf voltages even at 1 Watt. Also use the best grounding system you can construct. Lastly, listen with a receiver at a considerable distance from the antenna and adjust the combinations of loading coils, grounds, etc., to produce the best S-meter readings. Be prepared to do a lot of experimenting (and learning), but eventually your efforts will be rewarded as you're able to add more and more miles to your communications range.

Fig. 4 is an antenna I've used and one which others can be patterned after. L2 of the transmitter is grounded on one side and the other is fed by a heavy copper strap to the base of a large diameter copper pipe. At the top of this guyed mast is a capacity hat and a loading coil. The coil is made of #26 enamel wire close-wound on a 4-inch-diameter piece of PVC pipe. The number of turns is somewhere in the neighborhood of 1500, and as I said, there are some monstrously big coils at these frequencies.

The transmitter is located directly over an old 60-foot-deep well with a 4-inch iron casing. This and numerous radials make up the ground system. This transmitter and antenna radiate a signal that can be consistently heard over twenty-five miles, which isn't bad when you consider the limitations of using a very short antenna with wavelengths approaching a mile.

During the last WARC, 160-190 kHz was proposed as a ham band. Perhaps if interest grows it will find its way among our frequencies. Right now it is still a great place to explore. ■

Parts List

Crystal

160–190 kHz	$12.50	from Jan Crystals, 2400 Crystal Drive, PO Box 06017, Ft. Myers FL 33906. (Suggested frequency range of 180–190 kHz since this is where most serious operation is done.)

Transistors

1 GE FET-1	$2.00	SK3112 also suitable.
1 2N3771	$4.50	SK3036, HEP247, or other power NPN transistors are suitable.
1 2N706	$1.00	2N2369A, SK3122 are suitable.
optional		
1 40250	$4.00	SK3026 also suitable. Used for optional remote control of transmitter.

Resistors

1 10 Ohm	All resistors are ¼ Watt, 10%. Cost: approximately 20¢ each.
1 500 Ohm	
1 1k	
2 2.2k	(only one required if optional remote control is omitted)
1 10k	
1 15k	
1 100k	
1 10 megohm	

Capacitors

1 .001 Ceramic	Capacitors from grab-bag-type assortments available from Radio Shack.
1 .02 Ceramic	
4 .1 Ceramic	$2.00

Random combination of silver micas to total 350 pF.
Micas available from the same above sources, if purchased separately at 25¢ each.

1 350 pF variable	$1.00 from a local hamfest. Also, old BC AM radios.

Miscellaneous

1 2-watt resistor for emitter of power amplifier transmitter, to be experimentally calculated, to limit input to 1 Watt. (A safe bet is 25 Ohms for a 15-volt supply.) 25¢

1 2-foot section of PVC pipe for coil form. See text. A scrap item.

1 10- × 14-inch piece of ¾-inch pine breadboard, another scrap item.

MICROLOG

AIR-1

SPECIFICATIONS

INPUTS: Receiver audio, in & out phono jacks for easy speaker connections. Hand key input allows code practice that reads your sending and drives the transmitter keying outputs.

OUTPUTS TO TRANSCEIVER: Positive and negative switching for CW & FSK keying, solid state or tube type transmitters, AFSK tones at microphone compatible levels, T/R(PTT) transmitter control.

PRINTER OUTPUT: Uses standard VIC printer for "Hard-Copy" of both receive and transmit data regardless of on-the-air mode. Also has hi voltage transistor switch on board for driving current-loop type printers.

DISC & TAPE INTERFACE: Uses standard VIC DISC & DATASET for recording off the air and making long "brag tapes." Another handy feature is the ability to save and re-load your "here-is" memories easily. Since this function is also compatible with your VIC disc drive, it's especially nice for quick start-up.

VARIABLE MEMORY UTILIZATION: A unique Microlog feature allows you to select the size of your text buffer and 8 "HERE-IS" messages from the available computer RAM. It automatically takes into account any memory expansion cartridges you've added. The unexpanded VIC has about 3000 characters for you to allocate. You could for example choose eight 300 character messages and a 600 character text buffer. If you don't tell it otherwise, the system will default to eight 100 character "HERE-IS" memories and a 2200 character text buffer. The expanded VIC will have different default memory sizes, depending on the amount of added memory. The programmable "HERE-IS" memories can be loaded or inserted into the text buffer for transmission at any time.

TEXT BUFFER: Allows you to type ahead while receiving. Text entered into the buffer is visible above the split-screen line for correction before sending.

AUTO-START: Inhibits the display of non-RTTY data.

TUNING INDICATORS: On screen visual tuning aid and audio (pitch) reference tone for RTTY and CW. (Audio is heard thru your tv or monitor's sound channel, just like any other VIC generated audio.)

W R U (Who Are You?): Automatically responds with your call sign when a user programmable sequence up to 15 characters is received.

SEL-CALS: Two 15 character user programmable sequences. Receipt of selcal #1 enables the printer, disc or tape. Receipt of #2 disables these outputs for unattended message store (mailbox).

FULL SPEED OPERATION: Transmit and receive Morse — 5 to 199 WPM, Baudot — 60, 66, 75, 100, 132 WPM, ASCII — 100 & 300 baud.

MORSE SPEED TRACKING: Automatic and speed lock modes, keyboard selectable.

VIDEO DISPLAY: Color keyed display makes optimum use of the computer's color capability. Uses standard VIC format of 23 lines of 22 characters.

SPLIT-SCREEN: Displays text buffer input above and receive/real-time transmit text below the split line.

TOP LINE DISPLAY: Constant display of Time, Mode, Speed/Code in use, and status indicators.

TEST MESSAGES: Quick brown fox and RYRY's in Baudot, U*U* in ASCII, and VVV in Morse.

SPECIAL SYNC-LOCK MODE: Allows improved ASCII operation and "Paced Output" in Baudot RTTY.

T/R(PTT): Fully automatic control of your XMTR via the Push-to Talk line in both RTTY and Morse.

UN-SHIFT on SPACE: Automatically shifts back to "LETTERS" upon receipt or transmission of a Baudot space. Keyboard command on/off.

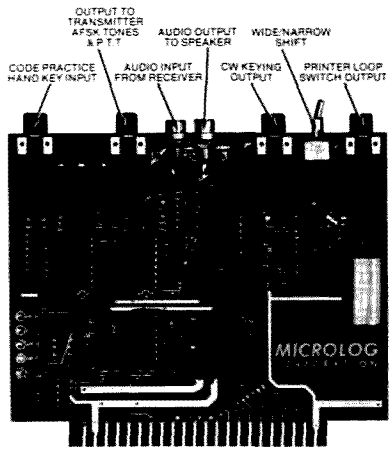
SYNC: Transmits "Blank Fill" in RTTY and BT in Morse when the text buffer is empty and unit is in transmit. Keyboard command on/off.

OUTPUT MODES: CHAR — outputs each character as typed. WORD — outputs full word when spacebar is typed. LINE — outputs full line when carriage return is typed. BUFFER — outputs full buffer, on command.

REAL-TIME CLOCK: Uses the VIC's internal clock for constant on screen display of time which can be inserted into text buffer on keyboard command.

WORD WRAP AROUND: Prevents splitting words at the end of a line. Works in receive as well as transmit.

MORSE TONE DETECTOR: Single tone, 800 Hz center frequency, with effective bandwidth of 300 Hz. Pitch reference regenerated audio tone for easy tuning.



RTTY DEMODULATOR: True dual tone computer enhanced demodulator circuit on standard 2125/2295 Hz tone pair compatible with HF RTTY and VHF FM operation. Switch selected wide and narrow shift.

CODE PRACTICE: Random five character code group generator sends at any speed you set via the keyboard. Hand key input for sending practice and manual morse transmission.

CW ID & NORMAL ID: Two independent 16 character memories for either 2 calls or one normal and one with auto-CW ID for RTTY.

MECHANICAL: Printed circuit board is G-10 epoxy, double sided with plated thru holes. Board is solder masked and silk-screened with parts locations for easy troubleshooting. Size is 5¾" wide by 4½" deep by ¾" high. Fits directly into VIC expansion port and is compatible with popular expander boards in use.

NO EXTERNAL POWER REQUIRED: Unit is completely powered by host computer, eliminating the need for outboard power supply. (Entire system; VIC, Microlog AIR-1, & video monitor can easily run from 12 VDC power for remote or emergency battery operation.)

CONNECTIONS: All inputs/outputs are convenient ¼" 3 circuit phone or RCA phono types. Mating plugs are all provided.

Note: VIC, VIC-20 and DATASET are trademarks of Commodore Electronics, Ltd.

MICROLOG ✓51

INNOVATORS IN DIGITAL COMMUNICATION

The Phantom Antenna of Possum Hollow

The boys needed a good antenna fast—before winter set in. Thurman's mysterious story was the solution.

W. Brandon Randolph W8VFT
895 Clifton Road
Xenia OH 45385

The Saturday night meeting of the Possum Hollow Radio Club had to be the high point on the monthly social calendar. The only other activities that rivaled club meeting were Wednesday Night Prayer Meeting and kicking Little King Ale bottles along Route 68. Possum Hollow was one of those unique places where time appears to stand still.

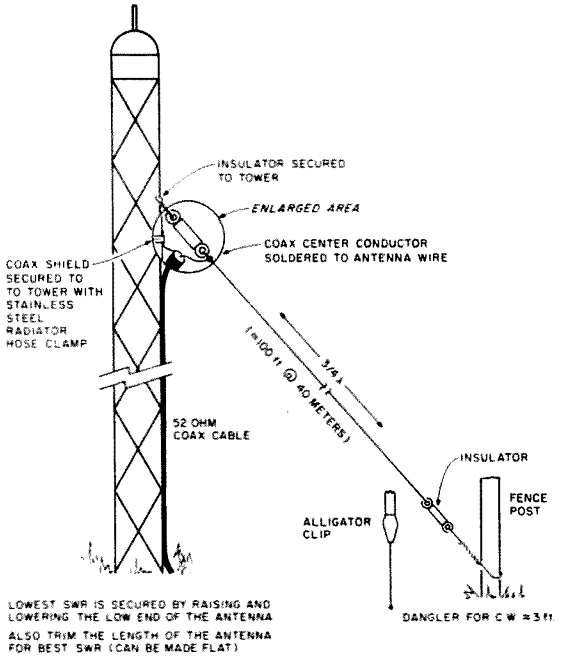


Fig. 1. The 3/4-wavelength Extended Sloper Antenna. The length of the dangler will be the difference in length of the measurements calculated for the phone band and those for the CW band.

The lack of something exciting to do, in this out-back community, might explain the club's popularity.

Because the club shared the old Possum Hollow schoolhouse with the local Grange, the furniture was arranged as if for a fraternal lodge meeting. The wisdom of the founding fathers had preserved the one-room school intact, up to and including the large, ornate potbelly stove in the corner.

Since this was an agricultural community, the summer meetings were dispensed with and the fall harvest signaled the resumption of the monthly get-togethers. By this time of year, a small fire in the stove was much appreciated by everyone.

Thurman, the club treasurer, had made sure that his desk was near the stove. Since he was the technical expert of the club, his desk was the favorite gathering place.

The last bang of the president's gavel signaled the end of the business meeting and the time to break into little groups, like women at an old-fashioned quilting party. The technically-minded quickly grabbed folding chairs and slid in close to Thurman's desk. This part of the meeting was the lifeblood of the club and the part of the meeting that attracted the majority.

This particular meeting was held on a nippy fall evening and the fire felt good. The snapping, crackling sounds added to the festivity and good fellowship. Before the last sound of the president's gavel had died away, the usual gang was crowded around Thurman's large wooden desk.

"Thurman, got any good ideas for a 40-meter DX antenna that I could string up before bad weather? Something not too expensive or elaborate."

Thurman looked up from the records he was working on and grinned.

"Not looking for much, are you, Ernest T.?"

"Well . . . guess that is a big order, but I figured if anyone could help me, it'd be you, Thurman."

Thurman closed the record book he had been working on, smiled, and placed his pencil behind his ear. Leaning back in his swivel chair, he turned slightly.

"Ernest T., you're in luck. I just finished a new antenna this summer and from the reports I've been getting from Europe, I'd say it's going to be a honey."

"What do you call it, Thurman?"

"Oh . . . I call it an Extended Sloper."

"What the heck is an Extended Sloper?"

Thurman's eyes twinkled as he tapped his pipe in the ashtray on his desk. He knew that he had Ernest T. on the hook. Thurman loved to spin a yarn, and this new twist on an old antenna would give him plenty of mileage. He lit his pipe and continued.

"Remember that quarter-wave sloper I had on my tower a while back?"

"Sure do," replied Ernest T.

"Well, I reasoned that if I lengthened it to 3/4 wave and aimed it toward Europe, it should have a little more gain and some added directivity." Thurman tilted his head back and blew a thick, undulating smoke ring—and waited.

"Well . . . did it work?"

"Sure did—and it loads up fine. Takes a little playing with for the exact length and height at the low end, but it's worth it and I'm getting excellent reports." With this statement several chairs slid in closer.

"How about a diagram, Thurman?" chimed in several voices in unison.

"OK, fellows, no problem. Its design is exactly the same as any other sloper with the exception of its length. Calculate the length for a quarter wave and then multiply by three."

"That's all there is to it?" asked Ernest T.

"That's all."

Otis had been leaning back in his chair with first one foot and then the other propped against the ornate trim on the potbelly stove. He now leaned forward and looked intently at Thurman. A look of disbelief was written across his face.

"You mean to tell us that you can load that odd length of wire?"

"I certainly can . . . and by adjusting the height at the low end and trimming the length, I can get the swr perfect. The best thing about the antenna is that I cut a 'dangler' piece of wire with an alligator clip attached, and I'm able to operate both phone and CW with perfect swr on both."

"What band you got it on, Thurman?" asked Forrest.

Thurman glanced around at all the inquiring faces and smiled. He withdrew his pipe from his mouth and slowly answered as if he was thinking of something.

"Well sir, it's on 40 meters. Look here, fellows—I'll draw you a diagram. It's very simple." He drew them a diagram and everyone scooted closer to watch. After he had finished putting in the figures, each observer made a rough sketch for himself.

"See, I told you it was easy. Just like a quarter wave, but extended. That's why I called it an Extended Sloper."

"Come and get it . . . Come and get it!" called Ramsey, the club refreshment coordinator. He was motioning for everyone to come to the table where the coffee pot and doughnuts were waiting. Tonight, fresh cider was on the table, and the thought of cider and doughnuts relegated the copies of Thurman's antenna diagram to shirt pockets.

Thurman chuckled to himself as he tidied up his desk and walked to the refreshment table. "Bet I'll be pruning some antennas next week," he thought to himself. ■

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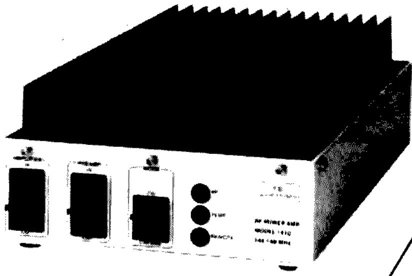

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Your Enemy, Feedline Loss

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Martin K. Salabes K3CSV
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If the performance of your antenna system seems to be deteriorating, the problem, or at least part of the problem, may lie in the coax connecting the transmitter with the antenna. Coax is subject to deterioration, especially if moisture can enter through the connectors or if there is a rupture in the vinyl sheath. Fortunately, there is a simple and fairly accurate way of measuring coax loss, using only an ordinary swr bridge.

When the frequency of a signal fed to an antenna is much lower than the resonant frequency of the antenna, the swr *at the antenna* will be infinity, or approaching infinity. In other words, all of the energy fed to the antenna will be reflected back. However, if the swr is measured at the transmitter end of the coax, the swr will be somewhat lower than infinity because not all of the forward energy reaches the antenna due to the loss in the coax, and not all of the reflected energy returns to the swr bridge for the same reason.

Most swr bridges actually indicate rectified rf voltage, although they are calibrated in swr. These voltages are relative, of course, and can be read on a linear scale. (If your swr bridge does not have a linear scale of some kind, one can easily be improvised.) So, all that is necessary to determine coax loss in dB is to read the forward and reflected relative voltages on an swr-bridge linear scale (while using a signal frequency much lower than the resonant frequency of the antenna) and plug these voltages into the standard equation for dB in terms of voltage: $dB = 20 \log_{10} V_1/V_2$, where V_1 = forward voltage and V_2 = reflected voltage.

As a voltage ratio is required for this equation, only relative voltages are needed, not actual voltages. Of course, the loss obtained this way is "round-trip" loss and is twice the loss experienced in normal use. One caution: As the transmitter is working into a very high swr, use as little output as possible and for as short a time as possible.

For example, suppose we feed a small 40-meter signal into a 10/15/20-meter beam. Adjust the swr bridge to read full scale forward (10 on the linear scale). Switching now to reflected, it reads 8 on the linear scale. Round-trip loss is therefore: $dB = 20 \log_{10} 10/8 = 20 \log_{10} 1.25 = 20 \times .097 = 1.94$ dB = a coax loss of .97 dB one way. Whether this is high or not will depend, of course, on how long the coax is. Check with the manufacturer's specifications for that particular type of coax.

If you are fortunate enough to possess or have access to a bidirectional wattmeter, the measurement is even simpler. As before, feed a signal into the antenna that is much lower in frequency than the resonant frequency of the antenna and measure forward and reflected power. Now just plug these values into the equation for dB in terms of power: $dB = 10 \log_{10} P_1/P_2$, where P_1 = forward power and P_2 = reflected power. As before, the loss obtained will be round-trip loss; one-way loss will be half as much.

One symptom of coax loss is an improving swr of your antenna system. As the coax deteriorates, less forward energy reaches the antenna and less reflected energy returns to the swr bridge, giving a false indication of an improved swr. If this is happening but your rig's performance is not what it used to be, check the coax loss. If it is much higher than the manufacturer's spec says it should be, just replacing the coax might make a world of difference. ■

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Flush high cost down the drain and build these cheap antennas. The gain is free.

Occasionally an antenna is wanted which is compact, cheap, and easy to make. Being inventive and a bit short of cash, I came upon this solution to fill the requirement for a couple of antennas I needed.

The following material was purchased at the local hardware store for the sum total of four bucks including tax; certainly, if purchased in a specialty store, you might save another buck:

- 5 feet of PVC water pipe, 1/2-inch i.d.
- 3 feet of copper tubing, 1/4-inch i.d., type L
- 2 PVC caps to fit PVC pipe

RG-58 coax, approximately six feet of it, was salvaged from the junk box. BNC or PL-259 type connectors, as required, also came from the junk box. These materials are enough to make a 2-meter and a 3/4-meter antenna.

Construction of the 3/4-meter antenna is as follows. Cut a length of approximately 20 to 24 inches of RG-58 coax. Strip the outer insulation for about eight inches. Remove most of the shield, leaving a section about 3/4 to 1 inch long. Do not remove the insulation from the center conductor. It will provide for support of the radiator.

Cut a piece of copper tubing about 7½ inches long; using either a tubing cutter or hacksaw, deburr ends. Using steel wool, clean one end of the tubing. Neatly tin the cleaned end.

Carefully slide the tubing over the coax and fan the piece of shield over the tubing. Measure where the tubing ends and wrap a few layers of tape around the coax to protect it from the sharp edge of the tubing. Slide the tubing back over the coax. Fan the shield back over the tubing as evenly as possible and carefully solder the shield to the copper tube. Use a large iron or a soldering gun, working quickly to prevent the center insulation from melting. If you find it difficult to solder the fanned shield, it can be tied down with a very thin strand of copper wire. That worked really well for me.

When the tubing has cooled, check with an ohmmeter for short circuits between the center conductor and the copper tubing. If all is OK, proceed to the next step.

Cut off 18 inches of the PVC pipe and slide the antenna into the pipe.

Mount a connector at the free end—either a BNC or PL-259; check again for short circuits.

Check swr with the antenna assembled; the PVC pipe will affect the swr somewhat. Prune as required. Trim the radiator only—don't try to shorten the copper tube.

When the swr is acceptable (less than 1.5 to 1), final-assemble the antenna inside the PVC tubing (a few turns of tape at the lower portion of the tubing will help hold it in place). Glue one of the caps on the top of the pipe and a grommet at the bottom end to keep the feedline centered.

The 2-meter antenna is made exactly the same way except for the dimensions. The copper tubing is cut to 18.5 inches. A 4-foot or longer piece of coax is stripped 19 inches. And the PVC pipe is cut to 41 inches.

Build and test the same way as the 3/4-meter antenna. To provide better support inside the tubing, wrap three bands of tape around the tubing to provide a tight fit inside the PVC pipe. I supported the center conductor inside one VHF antenna with a handy 1/2-inch-o.d. faucet washer; this kept the antenna nice and quiet, too.

These antennas are, obviously, 1/2-wave centerfed dipoles; they were very popular some years ago. They have fallen out of favor to the newer high-gain (3-dB), base-loaded, $40.00 antennas that are now flooding the market. These coaxial antennas perform somewhere between 1/4-wave and 3-dB-gain antennas in terms of gain; not bad for 2 bucks each!

The final tuning procedure should be done in a clear area with as little metal around as possible. Prune the antenna 1/8″ or less at a time, especially the 3/4-me-

ter version. However, if you over-trim, it's easy enough to solder a piece of wire back on the radiator to lengthen it. When completed, the antenna can be sealed at both ends with RTV compound for total weather protection.

Use the best quality coax possible and it will not present any problems either during soldering or at any other stage of the construction. It also will last longer if the antenna is mounted on a tower and is exposed to all kinds of weather.

The antenna can be mounted in a variety of ways using easily-available clamps and brackets. Since these antennas are very unobtrusive, they also can be mounted either inside the ham shack or out of sight in a kitchen corner.

For those who have more ready cash and room, a somewhat better antenna could be made using RG-8/U coax and correspondingly larger diameter (1/2"-i.d.) copper tubing and (1"-i.d.) PVC piping. The other dimensions should stay the same.

This same principle also works well for a marine band VHF antenna, either as the main antenna or an emergency antenna. It can be tied to almost any unobstructed non-metallic (sailors take note) part of a boat—or even hand-held if necessary. The dimensions for this antenna should be: 40 inches of PVC pipe, 18 inches of copper tubing, and 48 inches of coax.

Construction and tuning are the same as for the 3/4-meter and 2-meter antennas. Provide a loop of nylon line at the top so that it can be hoisted and suspended by it. When using the antenna, seal the coax connectors with a plastic bag and tape to keep water and dampness out. ■

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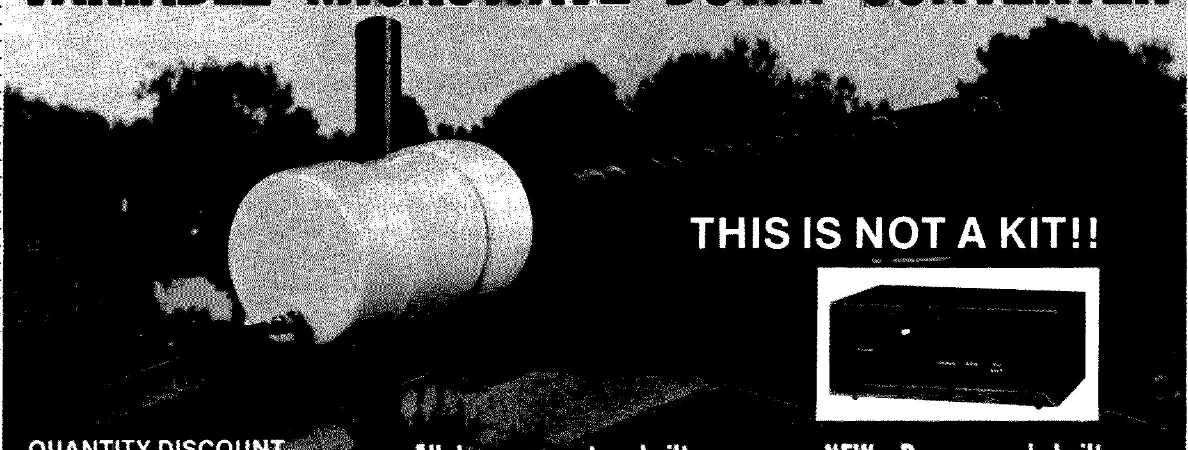

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A 10-MHz Antenna for $10

If you're still not on 30 meters, the Hanging Helix may be your last chance.

Guy Slaughter K9AZG
753 W. Elizabeth Drive
Crown Point IN 46307

The old-fashioned delta loop, when fitted with a newfangled "Hanging Helix," makes a cheap but superb antenna for the recently opened 30-meter band.

You've never heard of a "Hanging Helix"? Me neither. It's just a name I coined for a gadget I made to perform multiple-duty assignments on a 10-MHz antenna, or one for any other band.

A full-wave loop, whether in quad or delta form, presents a feedpoint impedance of around 100 Ohms at normal heights above ground, depending somewhat on the nature of surrounding objects. And it is a balanced antenna whose radiation pattern and, hence, efficiency suffer when fed with an unbalanced feedline.

It is necessary when mating a full-wave loop with a 50-Ohm feedline, therefore, to contrive both an impedance-transforming system and some sort of a balanced-to-unbalanced conversion device.

The Hanging Helix performs both these functions, plus two mechanical chores as well. It is a quarter wavelength of 75-Ohm RG-59/U coaxial cable wound into a coil on a homemade form that also serves as the antenna's feedpoint insulator and as the anchor for the feedline. Thus, it converts the antenna's 100-Ohm-plus feedpoint impedance to the 50 Ohms of RG-8 mini-coax and acts as a choke-type balun preventing antenna currents from appearing on the shield of the feedline to alter the antenna's radiation pattern.

This multi-purpose gadget is easy to make from commonly available materials. In use, it converts a full wavelength of wire hanging from two trees—or two anythings—into an efficient and rewarding antenna.

When the new 10-MHz band was suddenly opened last October, it caught some of us with our pants down—or at least without anything up in the air cut to resonance on that frequency. A lot of eager beavers fired up 40-meter wires through their tuners and some of the guys even loaded up their tribanders in their hurry to try out the new megacycles.

I was prepared, sort of. I had a quarter-wave vertical up, arranged to work as a ground-plane antenna against the chain-link fence that is the ground system for my 160-meter and 80-meter inverted Ls. So, when the go-ahead came, I got in there and went, working out well enough to bag a few Europeans and even a VK3.

But I had troubles in the

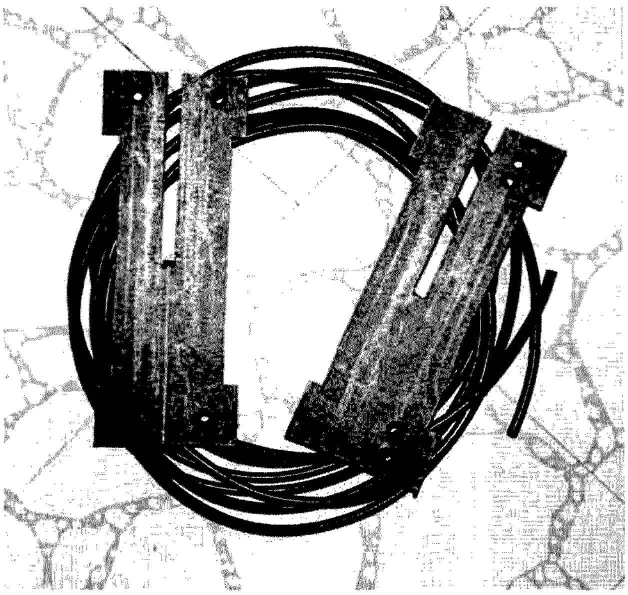


Photo A. Components of the Hanging Helix after sawing and drilling of the coil-form pieces from "waterproof" Masonite and their spraying with polyurethane to make them truly moisture repellent.

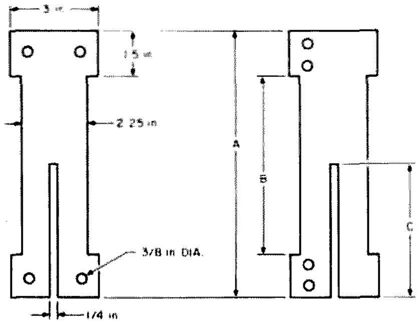


Fig 1. The Hanging Helix coil forms are identical except for the locations of the 3/8" holes. For 10 MHz, A, B, and C are 9", 6", and 4½" respectively; for 7 MHz, they are 13", 10", and 6½".

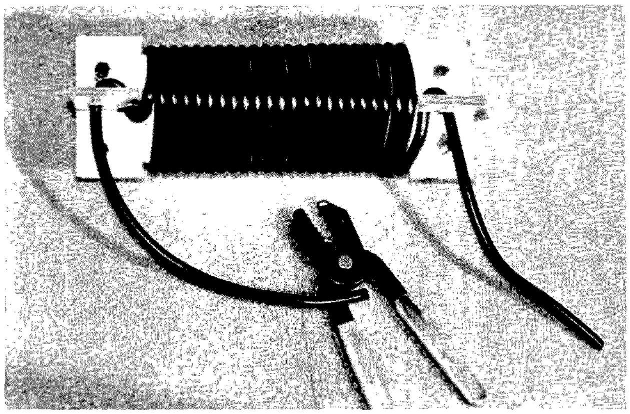


Photo B. The Hanging Helix after the quarter-wave matching transformer of RG-59/U has been wound onto the form.

form of NOISE. I can't speak for other QTHs, but mine is polluted with vertically-polarized man-made QRN that seemingly rises and falls on schedule. The rise, of course, always coincides with band openings that bring in skip signals to gladden the hearts of DXers. And the falls, naturally, always come when the only signals on the band are from just beyond the backyard.

That's the problem with vertical antennas, ground-plane or plain plane: They are noisy. And my new 30-meter GP was among the noisiest I have ever used. I don't know whether all line-leakage rf peaks around that frequency or whether it's a quirk peculiar to the man-made QRN in my neighborhood, but I do know that a delta loop, fed from the bottom and thus horizontally polarized, doesn't hear all that noise. Thus, it is unbelievable to switch to my Hanging Helix loop from the ground plane on even a relatively quiet day and hear signals come up out of the mud. And on a noisy day, the loop makes the difference between operating and deciding to watch the boob tube instead.

If you want to hear those signals-minus-mud in your own shack, you can duplicate my Hanging Helix delta loop easily and cheaply.

I used hardware-store number 14 house-wiring wire, the kind that comes with red, white, or black insulation for about 7 cents a foot, cut to the formula of 1005 divided by the frequency of interest. In my case, using 10.125 MHz as the new band's center frequency, the wire length came out to 99 feet, 3 inches.

Two insulators, threaded onto the wire and twisted into place at 33 feet, 1 inch and at 66 feet, 2 inches from the starting end, formed the base of the triangle that was to become my delta loop. Suspending it base up by those insulators from trees or whatever, high enough so the inverted triangle's apex cleared the ground, converted the tangle of wire into an embryonic antenna.

For the Hanging Helix that, together with the feedline, completes such an antenna, you will need two pieces of insulating material, each 9 inches long, 3 inches wide, and 1/4 inch thick. I used "waterproof" Masonite because I have scads of it left over from the era when I "finished" my basement. So-called "waterproof" plywood would do as well, I think, and Plexiglas™—the kind the stores stock for window-pane replacement—would probably be even better.

Each of the two pieces has a 3/8-inch strip 6 inches long cut off its two 9-inch edges, leaving a 1½-inch "T" at each end (see Fig. 1). Saw a 1/4-inch slot up the middle of each piece to the halfway point. Drill 3/8-inch holes near the four corners of one piece and a pair of same-size holes 3/4 of an inch apart vertically near the top and bottom of one side of the other piece. Now slide the slots together so that the two pieces become a single X-shaped coil form. Spray or brush the assembly with polyurethane or a similar waterproofing compound, applying it liberally to the sawed edges and the edges of the drilled holes to keep moisture out.

Cut the quarter-wave impedance-matching transformer, using the formula 234 divided by the frequency of interest times the velocity factor of the particular brand of RG-59/U you will use. I used a center frequency of 10.125 MHz for my 30-meter Hanging Helix which, using Radio Shack's published velocity factor of .75 for its foam coax, figured out to 17 feet, 4 inches.

Weave one end into the top hole of one of the coil form's vertical-hole pairs and out the hole just below it. Leave about 3 inches of cable sticking out for later connections. Close-wind the coax onto the form keeping it tight, the way you wound that very first coil when you were making your very first receiver or whatever. An easy way is to clamp the far end of the cable in a vise or the hinge crack of a door and walk towards it as you turn the form.

You will find that the cable and the coil-form space on which you are winding it will come out even if you stick to the dimensions given and are making it for the 30-meter band. If it's for 40 meters, scale the coil-form pieces up to 13 inches with 10 inches of winding room to accommodate the greater length of cable required by a quarter-wave transformer for that band.

Finish the device by weaving the end of the winding

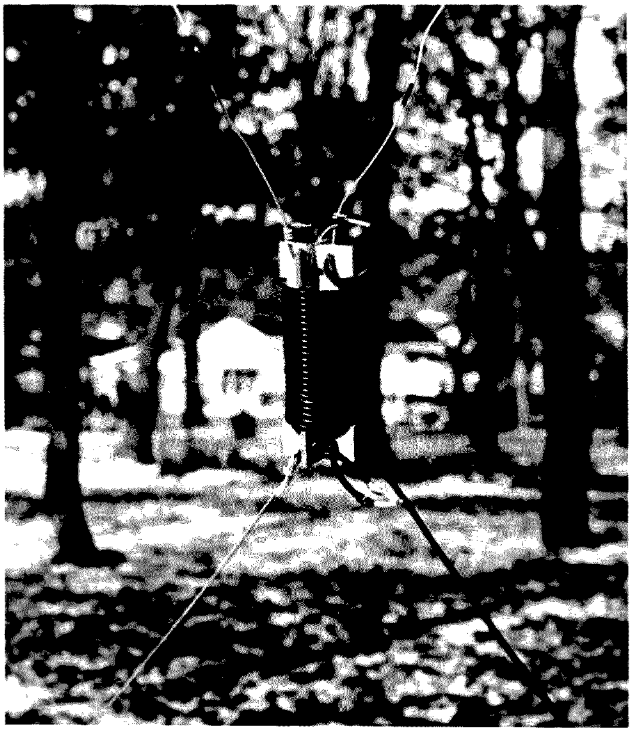


Photo C. The Helix hanging from the delta loop, the antenna wires and feedline attached but not yet taped.

into the hole of the vertical pair farthest from the top of the form and then through the top hole, pulling it tight to anchor it. Remove about two inches of the insulating jacket from each end of the coax, comb out the shield braid, twist it into a stranded wire, and remove about 3/4 inch of insulation from the center conductor.

Now take the whole works outside, feed the apex-end wires of the embryonic delta loop into the corner holes at one end of the form, twist each wire around itself to anchor it, strip back about 3/4 inch of insulation from each, and solder one wire to the center conductor of the coax and the other to its shield.

Push one end of your 50-Ohm feedline into one of the corner holes at the bottom end of the Hanging Helix, then through the other hole, and pull it tight to anchor it, leaving enough loose end to make your connections. Solder its center conductor to the center conductor of the coiled cable, solder the shield braids together, tape to prevent moisture entry, and your Hanging Helix delta loop is ready to pump rf into and out of the atmosphere.

Like any other antenna, this one follows the old "the higher the better" rule of thumb. But even with the feedpoint barely clearing the ground, you'll get out. Mine is about 10 feet up, and I prevent excessive wind sway by tying a light nylon anchor line between the coil form and a brick lying on the ground beneath it.

My in-line swr meter reads a flat 1 to 1 across the 30-meter band and well above and below it. My noisy reception is gone. My signals get out and I work what I hear. The Hanging Helix went up about two weeks after the new band was opened to us and has been in use for about six weeks as of this writing. In that time, my TS-830S, running barefoot, has racked up 18 countries for me despite sparse operating hours. I need only Asia for WAC on 10 MHz, and I'm told the band is full of workable Js in the early-morning hours. I wouldn't know, though, because I'm a devout sleepyhead.

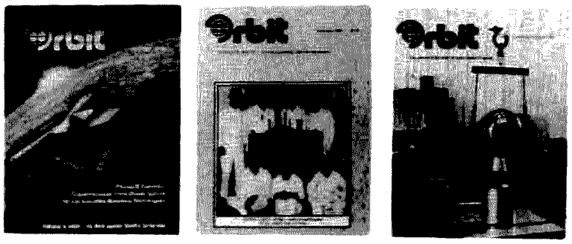
That's all I can tell you except to warn you against locating two such antennas side by side or overlapping each other. I learned the hard way that adjacent 30-meter and 40-meter loops interact so that pruning one detunes the other. If they are hung concentrically, however, the 30-meter loop within the 40-meter loop with the wires spaced reasonably equidistantly around the perimeters, such interaction is minimized or eliminated. If you use this arrangement, you'll find that running the 30-meter Hanging Helix feedline down past the 40-meter Hanging Helix and taping it to the 40-meter feedline won't affect tuning or degrade the performance of either antenna.

That's the story, except for an apology for its title, which isn't quite accurate. In the first place, the new band isn't exactly centered on 10 MHz, and it has an FCC-ordered hole in it—a frequency "window" that is taboo to American hams. And, in the second place, I paid $7 for the antenna wire at my local hardware store, $2.80 at Radio Shack for the RG-59/U matching cable, and had the feedline, the Masonite, and a can of polyurethane on hand. But I also paid sales taxes of 28 cents for the wire and 11 cents for the coax.

I hope you'll forgive me for my untruthfulness, however, because such strict accuracy as "Build a 10.1-to-10.09- and 10.015-to-10.15-MHz Antenna for $10.19" would make a rotten title. ■

Photo D. The author tying on light nylon anchor line before hauling the delta loop skyward. At K9AZC, the Helix hangs about 10 feet off the ground, with excessive wind sway prevented by the "anchor," a brick lying on the ground beneath the antenna.

Orbit



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Guy Slaughter K9AZC
753 W. Elizabeth Drive
Crown Point IN 46307

Slaughter's Sway-Bar Forest

Are trees an antenna hindrance? Or are they the means to the best antenna collection you ever had? It just depends on your outlook.

Antenna farms are nice, but not many of us have the space, the time, the money, or the inclination to be antenna farmers. Antenna orchards, on the other hand, are within the reach of every ham with a chunk of property under his control on which God has made some trees.

I am an antenna orchardist, and I find it rewarding.

I have wire antennas for 160, for 80, and for 40 meters strung up in my trees. They don't have the gain nor the directivity of my triband yagi, which is atop a conventional tower like everybody else's, but they do get out, they do allow me to copy my contacts, and they give me what most of us call all-band capability.

My lot is full of 50-foot, 60-foot, and even 70-foot oak, maple, and locust trees that in times past I begrudged yard space because three seasons of the year they make my tribander look into heavy masses of foliage in three directions. Now, however, I am happy with the trees, because some of them serve as towers for my wire antennas as well as giving shade for the lawn and sanctuary for squirrels and birds.

I have a length of nylon rope strung between two of them that are around 100 feet apart. From it hang the vertical portion of an inverted L cut for 1,840 kHz (the horizontal section of which runs along the support rope), another inverted L pruned for 3,750 kHz, a quarter-wave vertical wire cut for 7,050 kHz, and a delta loop (the resonant frequency of which centers on 7,150 kHz).

The suspension rope and, therefore, the top ends of all except the 40-meter vertical are about 60 feet up. The bottom ends of the vertical and the Ls are fed against a ground system that consists of the top pipe of a five-foot-high chain-link fence. The

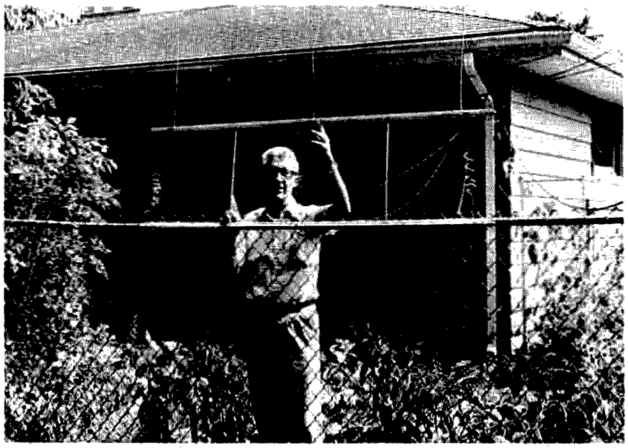


Photo A. Because trees bow and curtsy in the wind, and because vertical wires suspended from them thus dance up and down, some sort of flexible bottom-end tie-down is needed if an antenna orchard is to survive heavy gusts. I devised a "sway bar" system to beat the wind. Here, I'm checking its position. It's a five-foot fiberglass fence post tied with two screen-door springs to another such post strapped to the top pipe of a chain-link fence. The springs stretch and contract in the wind, maintaining tension on the vertical wires. The spiral pigtails wound into the antenna elements allow them to flex as the sway bar moves up and down.

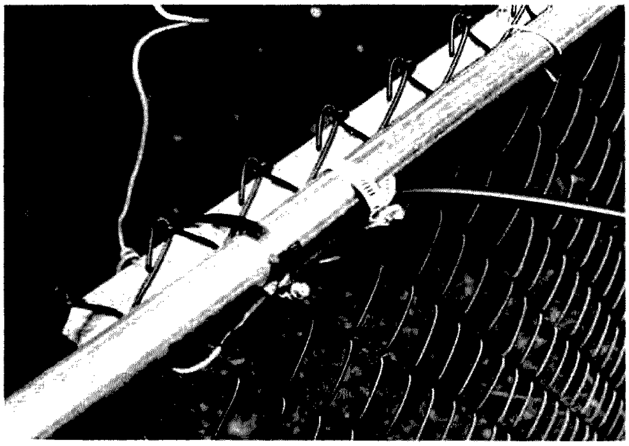


Photo B. Each of the antennas in my orchard is fed with a separate coax feedline. One of them is shown here. The left-hand hose clamp fastens both the fiberglass fence-post insulator to the top pipe of the chain-link fence that is my ground system and the coax braid to the grounding pipe. The right-hand clamp provides strain relief to eliminate pull on the grounding connection and the joint between the feedline and the antenna element. The first half-turn of the pigtail coil wound in the element between the insulator and the sway bar is visible at the upper left.

delta-loop feedpoint dangles about 12 feet above ground, connected to a homemade triangular insulator fashioned from Plexiglas™ that supports a commercial balun salvaged from a now-forgotten earlier antenna. A length of polypropylene rope tied to a brick resting on the ground keeps it from swinging in the wind.

The top of the 40-meter vertical wire ends in an insulator to which is tied a length of polypropylene line just long enough to suspend the antenna's bottom end at the grounding pipe.

I have a fiberglass electric fence post, one of those triangular jobs five feet long, clamped to the top pipe of my chain-link fence as a long insulator for all three of the vertical-wire antennas, and a second such post suspended about 18 inches above it as a "sway bar." Trees do sway in the wind, you know, bowing and curtsying to the breezes and even genuflecting to heavy gusts. The sway bar eliminates problems of too much wire tension when the wind lifts the treetops and too little when it sags them. It is tied to the insulator post with a pair of light screen-door springs. Thus, it can be pulled away from it, under tension, when the wind blows the treetops up, and can resume its original position, retrieving the slack, when the wind blows them down.

The sway bar is drilled with three holes for each of the three vertical wires it carries. Each wire is woven through the trio of holes to fasten it to the sway bar in a fixed position that can be adjusted up or down and locked in place by pulling the wire taut.

Each of the vertical wires is allowed about 18 inches of extra slack between the sway bar and the insulating post. The excess is wound into pigtail coils that lengthen and shorten as the wind moves the sway bar up and down. The vertical movement and flexing is thus confined to these flexible pigtails, and there is, therefore, no wind stress on the feedline connection to the antenna wires and no flexing of the solder joints.

The jackets on the separate 50-Ohm coax feedlines for the verticals are cut back about two inches, an inch or so of braid is uncombed and folded back over the uncombed section, and that portion of each feedline is squeeze-grounded to the top pipe of the chain-link fence with a hose clamp. A second clamp provides strain relief for each. The antenna wires are soldered to the center conductors of their respective feedlines and the joints are insulated with heat-shrink tubing.

I match the delta loop's impedance of about 100 Ohms with a quarter wavelength of 72-Ohm RG-59 between the 1-to-1 50-Ohm balun and the feedline.

All of the feedlines, together with the coax from my tribander, go into my garage where I have a remotely controlled five-antenna coax switch, wall-mounted, whose selector control is at my operating desk in the basement shack. A single run of RG-8/U connects my TS-830S and/or my Yaesu linear to any of the antennas at the turn of the selector-switch control knob.

None of the antennas in my orchard is either exotic or sophisticated, obviously. But all of them work well.

The delta loop is cut to frequency using the formula 1005/frequency in megahertz. It is a 140.5-foot length of #14 house-wiring wire, insulated with neoprene and formed into an approximately equilateral triangle a bit over 46 feet on a side, fed at the open bottom. That makes it horizontally polarized. Running roughly north and south, it displays little directivity and seems to work equally well into Europe, South America, Alaska, and Hawaii.

The 40-meter vertical is seldom used since the delta loop consistently provides better signal reports and better reception. But it's there for comparison purposes, and if I ever need it—for whatever reason.

The 80-meter inverted L, likewise, is seldom used, simply because I don't often get on either 75 or 80.

But the 160-meter inverted L is frequently pressed into service and, working against the chain-link-fence ground system, gets out remarkably well. It, like the 80-meter inverted L and the 40-meter vertical, also is #14 neoprene-insulated house-wiring wire. All three are cut from the quarter-wave formula, 234/frequency in megahertz. The 160-meter wire is 127 feet long, the 80-meter wire is 62.4 feet long, and the 40-meter wire is 33.2 feet in length.

Getting them up into the trees was no problem at all. Using a slingshot borrowed from the junior op, I used an old spark plug as a projectile, tying to it monofilament fishing line feeding from the reel of a spinning rod laid on the grass beside me.

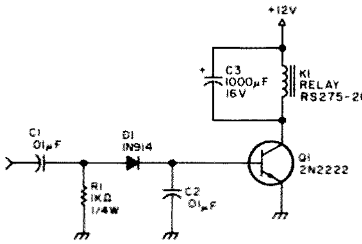
It took a few tries to get the spark plug over the selected branches, but pulling a light line into the treetops with the fishing line was simple enough, and then hauling the heavier nylon rope up as a permanent suspension line was child's play. It is long enough so that I can lower the center section all the way to the ground, tie antennas to it, and haul it—and them—up to the sky.

That's the story of my antenna orchard. If you can afford a full-scale antenna farm, go to it and happy acres, friend. But if you can't and have a few trees around, you might try orcharding. I think you'd like it. ■

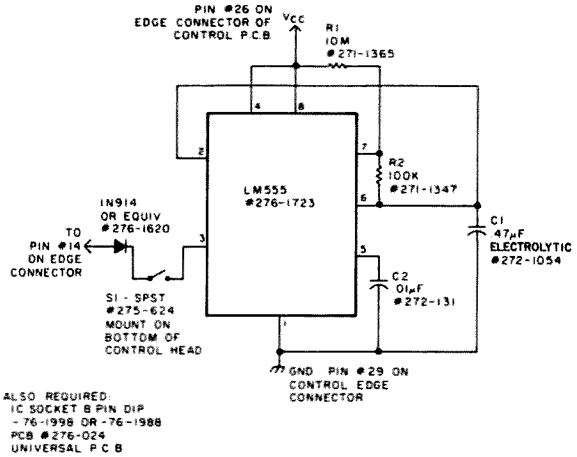
CIRCUITS

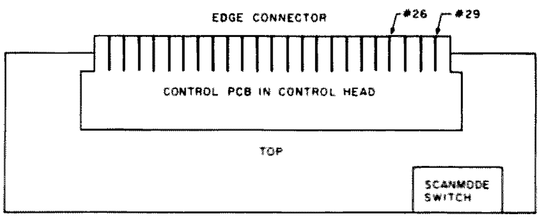
Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73 Magazine, Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*

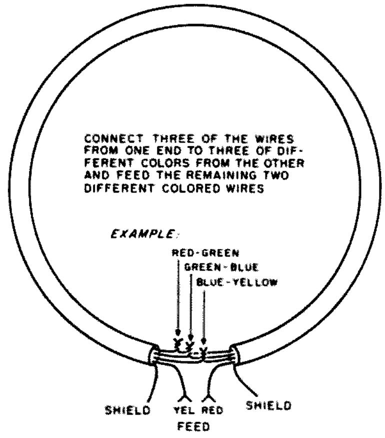


RF-ACTUATED RELAY: Here's a simple circuit to add automatic antenna switching to your home-brew power amplifier. This relay will key with less than 150 mW of drive on 2 meters.—Don Bohm WB0FLG, Sauk Rapids MN.





SCANNING RESUME FOR THE AZDEN PCS-2000: When scanning, the Azden 2000 will lock on a busy channel until the carrier drops, unless this modification is added. The 555 is wired as an astable, with three connections to the control-head PC-board edge connector: pin 14, the SQC line running from the discriminator section to the scanning control logic section; pin 26, which provides 13.8 V to the circuit; and pin 29, which is the ground. The time duration is determined by the resistance and capacitance values; the values given will allow the Azden to resume scanning after five seconds. By wiring the circuit on an 8-pin DIP socket, you will be able to mount it in the control head of the radio.—Kurt R. Fritsch WA3TOY, Glen Burnie MD.



SIMPLIFIED LOOP WINDING: A recent article described the construction and use of shielded loops for receiving under noisy conditions, but the author deplored the difficulty of sliding multiple turns through a shield. The easy way is to use shielded telephone cable. One standard form of cable has four wires coded yellow, red, green, and black, surrounded by an aluminum foil shield with a bare wire running under it. Just form the loop to whatever size is required, connect three of the wires from one end to three of a different color from the other end, and feed the two remaining wires.—William Bruce Cameron WA4UZM, Temple Terrace FL.

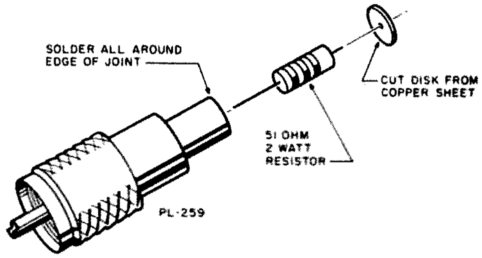


Fig. 1.

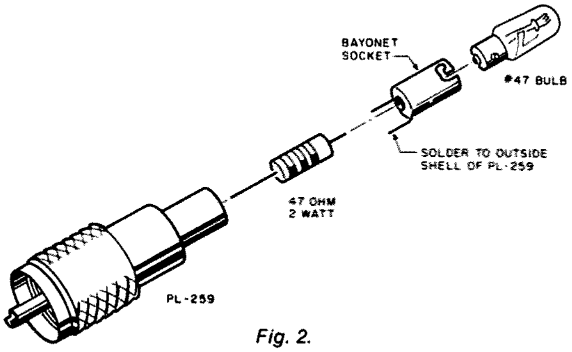


Fig. 2.

TWO VHF DUMMY LOADS: Fig. 1 shows a simple dummy load useful for frequencies at least as high as 220 MHz. It is a well-shielded load and can handle up to 5 W intermittently. To make the dummy load, insert a 51-Ohm, 2-W carbon resistor into a PL-259 connector. Solder one end of the resistor to the center conductor, making sure that the body of the resistor is completely inside the barrel of the connector and that only the resistor's lead sticks out past the body of the PL-259. Cut a disk out of copper or brass sheet (shim stock works well—even a penny can be used), drill a hole in the center, and slip it over the resistor lead, fitting it snugly against the end of the connector. Solder all around the edge of the disk and the lead in the center. File off the excess disk material. Fig. 2 shows a modified version that will give a visual indication of relative rf power as well as provide a 50-Ohm load. The dummy will handle up to 5 W intermittently and will indicate output as low as ¼ W.—Craig Crichton K7UKW, The Dalles OR.

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The Phase-Shift Oscillator Goes Hollywood

This circuit can be the star of your audio designs. All it needs is a tweak here and a taper there.

Curtis C. Goodson
Av. Francisco Glicerio 467
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13100 Campinas, Sao Paulo
Brazil

The phase-shift oscillator is noted for good stability and a clean sine wave. It also uses a very simple circuit. Hence, many hams attempt to use it when an audio oscillator is needed, only to discover that "it won't oscillate." The beta of the transistor is most often blamed for the difficulty. Although it is true that a rather high beta is needed to overcome the loss in the phase-shift network, with today's transistors a high beta is easy to find and still "the shiftless thing won't oscillate."

Most often the phase-shift network is taken from tube circuitry without being adapted to transistors. In the tube circuit, the network is fed from the high impedance plate and terminated in the even higher impedance of the tube's grid. When a bipolar transistor is substituted, the network is fed from a fairly high impedance but feeds into the low impedance of the base. Therefore, a high-to-low impedance transformation should be included in the network design. Tapering the values of the network components will do it. Make R_{out} about ⅓ of R_{mid} and R_{mid} about ⅓ of R_{in}. (See Fig. 1.) Then, to keep the phase shift at 180°, make the RC products of each section the same: $R_{out} \times C_{out}$ equal to $R_{mid} \times C_{mid}$ and to $R_{in} \times C_{in}$.

In the circuit in Fig. 1, the collector load resistor of 33k Ohms serves as R_{in}, so R_{mid} is about ⅓ of that, or 10k Ohms, and R_{out} is ⅓ of R_{mid}, or 3.3k Ohms. To keep the RC products equal, C_{mid} is $3 \times C_{in}$ and C_{out} is $3 \times C_{mid}$. The approximate frequency of oscillation is found by the formula: $f = 1/11RC$. For the values in the example, the frequency will be about 600 Hz.

The resistor from collector to base biases the transistor and should be chosen for best waveform and output. A value from one to one and a half megohms will be about right. The output is taken from the collector, but be careful not to load down the high impedance of the network.

If those "computer surplus" transistors just do not have enough gain, use a pair of them in a Darlington connection, as shown in Fig. 2. You'll probably have so much gain that it won't be necessary to taper the network values.

Minor frequency adjustments can be made by altering just one or two of the resistors or condensers. The 500k-Ohm potentiometer is adjusted for best waveform. A double-pole switch can be inserted at x-x to select networks for different frequencies, but the pot may need readjusting each time. Since transistors are so cheap, why not build a separate oscillator for each frequency? No transistors are specified since almost anything will work. ■

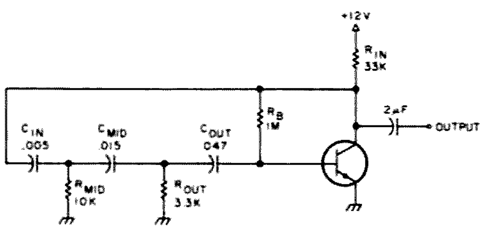

Fig. 1.

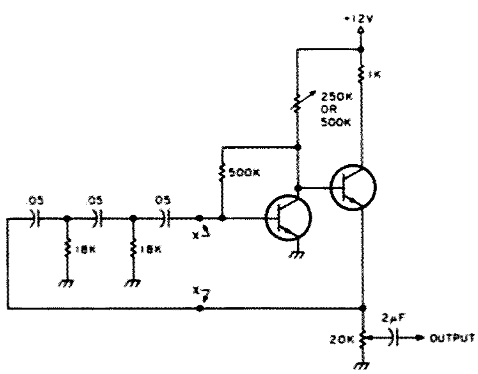

Fig. 2.

Build the Harmonic Zapper

When the TV starts sounding like Donald Duck, you need this 20-meter trap.

John Labaj W2YW
12 Park Place
Elsmere NY 12054

When I got back on the air after a long layoff, I ran into some really severe interference problems. I interfered with every working television channel on all television sets in the house. My signals rode in on the Hammond organ, jammed the telephones, and made most of the lights in the house flicker.

Over the years I cleared the lights, organ, and telephone lines of all interference and reduced the TVI to where I could operate with full power on forty meters with just a faint trace of interference on channel six. It was too slight to be objectionable. The other channels were perfectly clear.

However, when I tried to operate on twenty or higher, channel six would be wiped out. Being of a lower order, the amateur harmonics from the higher bands were stronger. No attempt at a cure seemed to have any effect. Low-pass filters were useless. They absorbed power and heated up or broke down. Reluctantly, I came to the conclusion that maybe I had reached the limit as to how much TVI I could eliminate. As a result, most of my operating was on forty.

One rainy Sunday when QRN made forty meters just about a total loss, I decided to make another attempt to lessen the TVI problem. Although I had tried an open-ended quarter-wave stub across the line, I decided that perhaps a combination of a shorted stub and an open stub would be more effective. The shorted stub, in series with the feedline, would represent a parallel tuned circuit and thus be a high impedance at the harmonic frequency. The open stub, across the line at the output end, would act as a coil and capacitor in series and would be a very low impedance at the harmonic frequency. They would have no effect on the operating frequency.

In very short order I had the trap made up. I installed it in the feedline and tuned the rig up on twenty meters. I set the keyboard up for automatic keying and went around the house checking channel six and other channels for TVI. Not a trace. In fact, reception was so clean that I went back to the shack to see if the transmitter was being keyed. It was.

I tried the other bands. Still no interference. I ran the transmitter for about fifteen minutes to give the trap a smoke test. The trap remained cold. Furthermore, the trap had made no noticeable change in the line current, the loading, or the tuning.

As a final test, I loaded up the amplifier (four 572Bs) heavy, raised the grid bias voltage to 250 volts, and increased the drive to 250 mA of grid current to really squirt out a lot of harmonic power. Still not a trace of TVI. The trap really was a killer.

Let me tell you how I built the harmonic killer. Bear in mind that this idea will work on other channels. You can even hook these traps up in tandem in case you have more than one trouble spot.

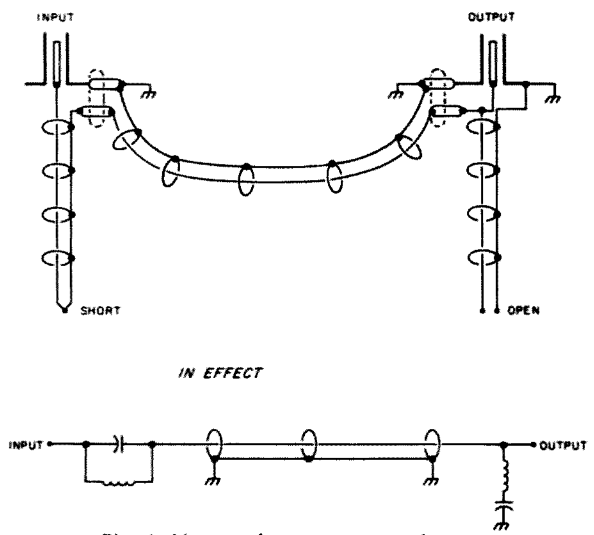

Fig. 1. Harmonic trap connections.

To cut the stubs to the right length, I used the familiar formula $L = (246 \times V)/F$, or $L = 246V/F$, where L is in feet, V is the velocity factor or the coaxial cable, and F is the frequency in megahertz.

Since I operate mostly in the low end of the bands, I selected 84.15 MHz as the target frequency. However, I later found out that the trap is effective over a broad range of frequencies. Using 84.15 gave me a stub length of 1.929 feet (about 23 and an eighth inches).

Here is a list of materials I used. Since it was a Sunday, I made do with what I could find around the shack. Also, I wasted no time or money running to the parts store. I do not consider this the ultimate in trap construction. Your ideas may be better, but this trap is easy to build and it works.

- Two 6-inch tomato cans. These are seven inches high and are free from your favorite restaurant or their rubbish pile. (I use them for storing parts.)
- Two SO-239 female coaxial cable fittings.
- Two tiepoints with one ground lug and one insulated lug.
- One plastic bottle or plastic container used for detergents or sour cream about 3 or 4 inches in diameter and about 6 inches high.
- Enough RG-8/U to make up the two stubs plus about 9 inches to connect the two SO-239 fittings together.
- A few nuts and bolts to put the pieces together.
- Some lacing twine or heavy string.
- Some fingernail polish—or something similar.

Using tin snips, cut one can down so that it is only about an inch and a half high. The other can requires no work. On the cut-down can, make some vertical cuts with the snips so that later on you can bend in the side and nest this can into the other can.

Mark a diameter on the bottom side of the can. Five-eighths in from each edge punch two five-eighths-inch holes to take the SO-239 fittings. Use an upside-down SO-239 fitting as a template and mark and drill two mounting holes for each fitting.

Take the tiepoints and enlarge the holes in the lugs and also the hole in the foot (ground lug) by putting the tip of your needle-nose pliers in the holes and turning.

While mounting the SO-239 connectors, bolt a tiepoint (using the same bolt) at each connector.

Lay a piece of coax along the edge between the two SO-239 connectors so that you can judge how to cut and prepare the ends. When you have the short coax cut and prepared, connect the inner conductor to the insulated lug of a tiepoint using the lower hole. You may have to file the wires a little to fit in the hole. Connect the shield which you twisted into a pigtail to the grounded lug. Solder both. The SO-239 connector at this side will be the input end and will go to the output of the transmitter.

At the other end of the short piece of coax, run the inner conductor (which you made about an inch longer) through the lower hole of the insulated lug and continue until you push the end into the solder hole of the SO-239 connector. Solder both. Solder the shield to the ground lug using the lower hole.

Prepare the plastic container by drilling several mounting holes in the bottom. Place them far enough away from the side so you can reach the bolts and nuts. Also drill a row of closely-spaced holes at all four quadrants of the container. These will be used to tie the coax to the form.

Center the plastic container between the two SO-239 connectors and mark the location of the two holes so that you can drill the bottom of the can and mount the plastic container.

To make the stubs, remove about an inch of the outer jacket from an end of coax. Unravel the shielding and twist it into a pigtail. Cut off about half an inch of insulation from the inner conductor. Since this is going to be the input of the trap, the high impedance side, shape the inner conductor and file to fit into the inner contact of the SO-239 fitting. The shielding braid is going to be part of a hot circuit, so it will connect to the insulated lug—the one where you already have connected the inner lead of the short coax. Solder both.

Inspect the connections to make sure there are no loose strands to short things out. Stretch the coax out and measure from where the shielding is formed into a pigtail along the coax for the proper distance plus a quarter of an inch for making the short between the shield and the inner conductor. Cut the coax. Strip off about a half inch of jacket, push the shielding back, and remove a quarter inch of insulation from the inner lead. Clean the wires, pull the shielding forward, twist it around the inner lead, and solder.

For the open-ended stub, the one in shunt with the line, prepare the ends as before. Connect the inner conductor to the insulated lug which already is connected to the center contact of the fitting. Connect the shielding which you formed into a pigtail to the grounded lug. Again measure off the right length, but do not allow a quarter inch for shorting the conductors together since this end will be open. Check the cut end to make sure there is good clearance between the shield and the inner conductor. Paint the end with fingernail polish.

To wind the stubs on the form, start with the stub that has the shield grounded since it will not be sensitive to capacity effect. Wind the stub around the form, lacing and tying it as you go along. Use a folded piece of #18 wire for a needle. If you cannot get your hands into the form, use long-nose pliers to thread the needle through the holes. Space the turns about two inches apart. When you have the one stub tied down, do the same with the other stub, winding and tying it between the other turns. The two stubs should be about an inch apart. Check all work.

Paint the joints, the nuts, and the knots with fingernail polish.

Nest the can on which the trap is assembled into the other can, pushing down as far and as evenly as it will go. You can either spot-solder the two cans together or use some tape to hold the assembly tight.

One last comment: After I got through admiring the trap, I fastened it to the tree holding up the dipole. I used a plastic pail for an umbrella.■

Parts List

5½'	Belden #8237 RG-8/U coaxial cable	$1.93
2	Amphenol-type SO-239 connectors	.80
6	8/32 half-inch plated bolts and nuts	.72
6	Washers—four lock-type, two flat	.12
2	Six-inch-diameter tin cans, 7" high*	N/C
1	Plastic container 3-4 inches in diameter and 6" high**	N/C
6'	Lacing or other sturdy twine or carpet thread.	N/C
	Elmer's Glue or fingernail polish. Small amount of solder.	N/C
	Total	$3.57

* Three-pound coffee can; restaurant-size tomato or mushroom cans are free from most restaurants for the asking.

** Soft drink, shampoo, instant tea, marshmallow whip, and many other items come in suitable bottles or containers.

Richard Silberstein WØYBF
3915 Pleasant Ridge Rd.
Boulder CO 80301

The Anti-Gravity Antenna-Erection System

Now you can put your wire antennas as high as you want—maybe.

Joyce Kilmer once wrote:
I think that I shall never see
A poem as lovely as a tree.
But trees mean different things to different people. Personally, I can never visit a tropic island and see a home surrounded by tall coconut palms without mentally projecting an antenna farm onto those trees.

Early History

In 1948, when I moved into a house in Washington, DC, surrounded by trees, I was faced with the problem of erecting wire antennas without ever having acquired climbing skills. By 1950, I had begun to study how to use a bow and arrow to accomplish this, and by 1952, I was the author of a published article outlining problems and procedures.[1]

In seeking ways of getting a rope up over a tree limb, I immediately rejected any method which employed a pistol or other firearm as unsuitable for most civilian purposes. A group of techniques concerned with a slug, fishing sinker, rock, or ball attached to a line, thrown by means of a hand pitch, sling shot, or casting rod, were rejected after some early experimentation with a small rock on the end of a line. A problem would develop if the object came down over a limb with only a little line to spare and wrapped itself around this limb. On one occasion, it became evident that such an object, suspended over a sidewalk, constituted a real hazard; it was removed with the help of the Fire Department using a hook and ladder.

The choice narrowed down to a bow and arrow—the arrow, of course, being blunt-nosed. The idea was to fire a light line over a

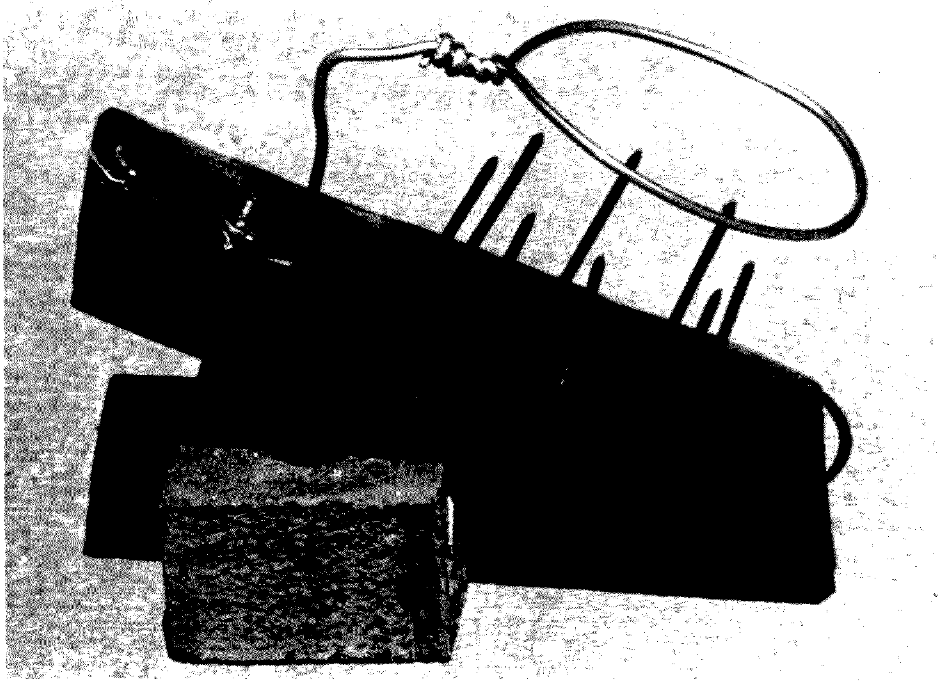

Photo A. Early open-end reel design, using nails and a guide ring.

branch, use it to pull a heavier line, and then follow with a rope. Those days, to ensure the least drag on the arrow, I used what was then known as Size A nylon thread as the initial line, followed by a string known to the trade as carpenters' chalk line. The chalk line was used to haul a 9.5 mm (3/8") rope. Since these lines, when pulled, tended to catch in small crevices and crotches, it was necessary that the junction between one line and the next be wrapped in a conical fashion with smooth waterproof tape, as shown in Fig. 1.

Fig. 1. Tapered line joint.

The arrow itself had to be just heavy enough to come down by its own weight, dragging the line after it. In those instances where the shot was terminated with the arrow suspended out of reach, a slight jiggling of the other end of the line sometimes was needed to make the arrow slide again. The arrow I finally chose was a straight section of 8 mm (5/16") wooden dowel, 66 cm (26") long. Tail fins made of tape were essential to keep the arrow from tumbling, three being used. I notched the tail end of the arrow to fit the bowstring. I made a notch near the tail; its purpose was to clinch the end of the line, which was knotted.

One of the most difficult maneuvers I ran into in the early days was that of getting the arrow to drop over a desired branch in a grove of trees. Sometimes the arrow would come down and drag the line over a branch of a tree farther away than the one intended. It was frequently possible, with care, to withdraw the line slowly, while jiggling at the same time, in such a manner that the arrow came back over the unwanted branch and fell again, pulling the line over the correct branch. Fig. 2 illustrates the case.

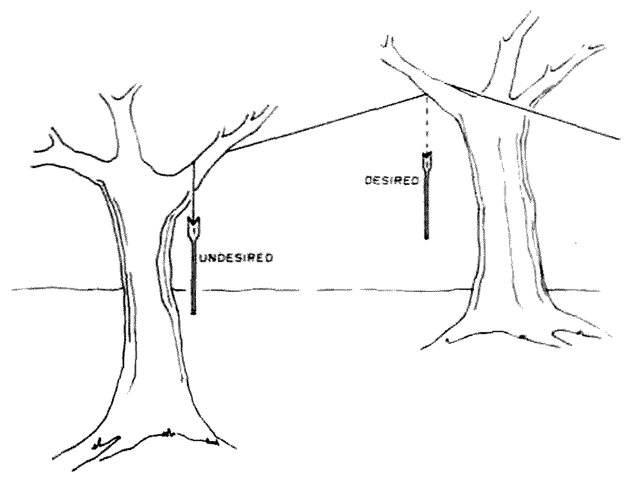

Fig. 2. Arrow falls in wrong tree.

Storing and launching the line required a special technique. Whether I was pitching a rock tied to a line or firing an arrow, letting the line lie in random fashion on the ground resulted in snagging on irregularities, blades of grass, and trash. My initial solution was suggested to me by an unknown Air Force enlisted man who happened to be browsing in the same sporting-goods store where I bought my first bow.

My first line-launcher system had eight large nails laid out in a circle, protruding through a small board so as to form a crude open-face reel. (Remember, this was before the time of spinning reels.) In making a shot, I set the reel on the ground and aimed it like an artillery piece, propping up the little board with a stone. In retrieving the line, I wound it back on the reel by hand, taking care not to gash my hand on the ends of the nails. Problems with occasional snagging of the line on those nail ends led me to devise a wire guard ring held to the board by means of a vertical section and a wing nut. Before retrieving the line, I would release the guard ring, which would then float on the line, sometimes getting tangled.

I was not the first to use the bow-and-arrow technique, apparently. Many years ago someone informed me that he had seen an earlier article in *CQ* magazine.

Later Developments

In later years, I decided to sacrifice some of the range available with a light nylon thread as the line so as to have a line strong enough to haul the final antenna rope, thus eliminating the need for an intermediate hauling line. I began using woven-nylon casting line of 20-pound test strength. Also, for Field Day operations, I found nylon parachute cord satisfactory for wire antennas supported by trees. I kept the same arrow specifications but found that two tail fins still provided stability. For suitcase portability, I made some shorter arrows.

One big improvement was my replacement for the open-face line launcher described above. For my new design, I fastened the top of a peanut-butter jar to a small board and then screwed the inverted jar into its lid. The outside of the jar became the open-face reel. Initially, I used a guard ring as before. Finally I resorted to an eyelet suspended above the jar on a dowel stick mounted far enough away from the jar so as not to interfere with rewinding, so that nothing would have to be removed for retrieval of the line.

I call this line launcher, illustrated in Fig. 3, the PBJL (peanut-butter-jar launcher) and advise prospective builders to eat the peanut butter before assembling the device.

For portable operation, I found it desirable for everything to be short enough to fit into a standard suitcase. I had previously designed a vertical whip antenna using a fiberglass mast in 61-cm (2-foot) sections, each section being socketed to the next by means of drilled wooden dowel segments cemented to the sections. By plugging two of these mast sections together, I have a 122-cm (4-foot) archery bow. A nylon string of the right length fastened at each end to eyelets on wooden caps drilled for the fiberglass rod diameter provides me with an instant portable bow ready for use. Fig. 4 shows the components.

I found that the mast for an all-terrain vehicle safety-warning pennant is an excellent low-cost source of fiberglass stock. The type purchased was The Detector, Columbia Products Co. (subsidiary of Shakespeare Co.), PO Box 4470, Columbia SC 29240.

Noticing the improvements in fishing reels over the years, I thought it would be interesting to see what a spinning reel would do for storing and releasing the line, i.e., as a launcher. I had been reluctant to make any tests, fearing that a monofilament line would be too springy in contrast to a woven casting line. Finally, however, a note in *QST*[2] indicated that Larry W3MSN was having success with a

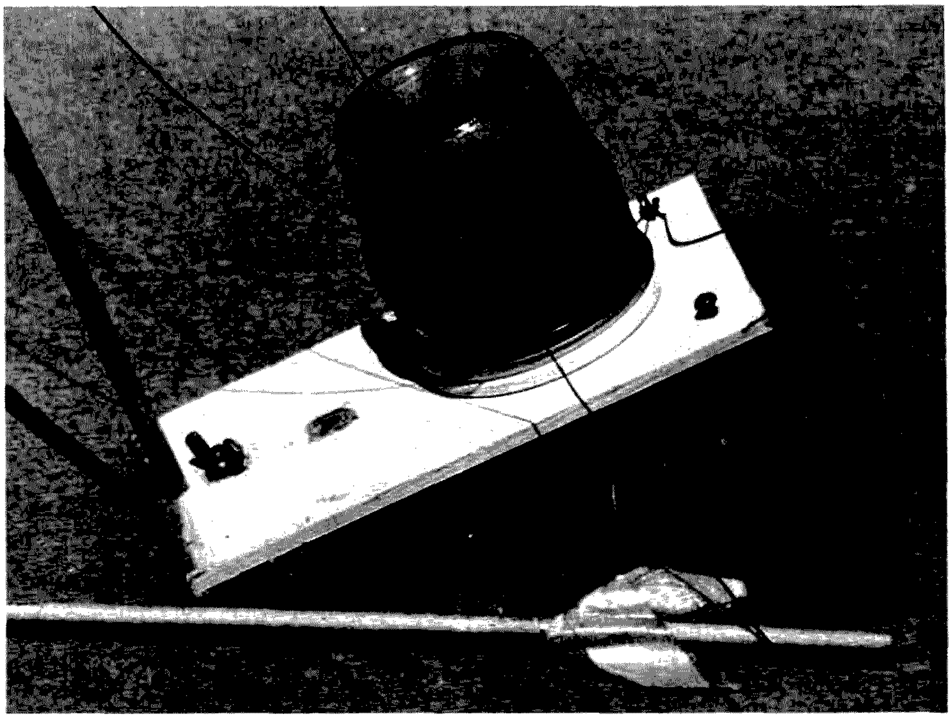

Photo B. Close-up of PBJL line launcher.

closed-face spinning reel, Zebco 202 (erroneously reported as Zebra 202). In looking over the merchandise at a local sporting-goods store, I noted that the Zebco 202 was their least expensive reel, so there was every reason to buy one.

I tried the Zebco mounted on a piece of PVC pipe inserted in a small flagpole bracket and aimed in the desired direction. I used the 8-pound monofilament line which came with the reel. The range was rather good, but, as apparently is true with all spinning reels, the line began to bind on the edge of the spool after a certain amount had come off.

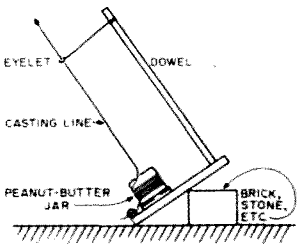

Fig. 3. PBJL launcher.

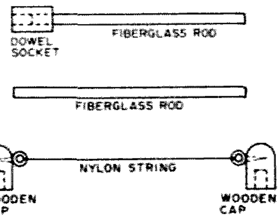

Fig. 4. Portable bow components.

There was a more serious problem, however. For low-angle shots, results were good. Shooting at high angles, however, the falling arrow permitted the line to fall without tension, a situation which apparently does not occur in casting. The monofilament line tangled hopelessly as it approached the ground. Limp, woven-nylon casting line would have been vastly better in this regard. However, I now began to realize that a spool with straight sides actually requires a springy line for the line to be able to hurdle these straight sides in coming off a spinning reel.

Then I made a compensating discovery. It is possible to purchase monofilament lines with different degrees of springiness. The kind with the trade name Trilene is sold in three grades of stiffness. I bought a roll of 8-pound Trilene XL, the least stiff. I followed the advice of a salesman—who said that only the top 3.2 mm (1/8 inch) or so of line would come off a spool without binding—and filled most of the reel with old woven casting line, depositing the monofilament line above this. Success was instant.

Since I was still interested in a line heavy enough for senior citizens' eyes to see and heavy enough to haul up a strong rope, I did not give up on the idea of a 20-pound line. So my next purchase was a roll of XL in the 20-pound strength. This was too heavy to use in the small Zebco 202, so I bought an Olympic ES-2 skirted-spool, open-face spinning reel. This reel is capable of handling heavier lines, and the side of the spool against which the departing line rubs is tapered so as to lessen the binding mentioned above.

I mounted the reel on PVC tubing inserted in a flagpole bracket, as with the previous reel. With an open-face reel, however, it was necessary to guide the line by means of an eyelet mounted above the reel on the tubing as in the case of a casting rod.

To my disappointment, using the 20-pound XL line with the Olympic reel resulted in a tangled mess on the lawn, in which a cherry tree, the neighbor's dog, and I were temporarily imprisoned. Evidently, even the XL grade was too springy in the 20-pound size.

But I had "one more string to my bow," so to speak. Considering my previous successes with the very limp 20-pound woven-nylon casting line, the next and last step was to try this line with the Olympic reel. Success was achieved, but the results were not as good as with the PBJL launcher.

Conclusions

Results of tests are summarized roughly as follows:

1) The Zebco 202 wound with 8-pound Trilene XL monofilament line gave about 5% greater range than my PBJL with 20-pound woven-nylon casting line.

2) The Olympic ES-2 with the 20-pound woven line was about 15% worse than the PBJL with similar line.

Greatest range and some reliability came with the Zebco 202 closed-face reel filled with old line and then wound with 8-pound Trilene XL. However, the 8-pound line is hard for many people to see and might still be more springy than desired, besides not being as strong as might be desired for hauling a rope over a branch. It appears that the PBJL with 20-pound woven line was the better

choice. However, the Zebco 202 combination is the most portable, whereas the Olympic ES-2 combination is less fragile in transportation than the PBJL and affords faster line retrieval.

As to approximate heights possible, the following was achieved:

1) 28-pound bow and light nylon thread (in 1951): 27 m (90 ft.).

2) 30-pound bow with PBJL and 20-pound woven casting line: 20 m (65 ft.).

3) Portable bow described in the text with PBJL and 20-pound woven line: 9-12 m (30-40 ft.).

Elsewhere, in Oregon, K7MKG has been using a modern compound bow. Jack stated in a QSO that he reaches heights in excess of 30 m (100 ft.) with monofilament line which he says should not be in excess of 10 pounds in rating, agreeing with my observations noted earlier in the text.

In a subsequent letter, Jack wrote: "I might add that I am using a large saltwater open-face reel, a Shakespeare No. 2090. I attach it to a short piece of 1/2" pipe with a hose clamp. I then stick the pipe in the ground with the reel aimed at the treetop. I have little trouble with 8-pound Stren. The large reel is probably an advantage."

Relative to reliability, a follow-up by mail on results obtained by W3MSN[2] revealed that Larry did sometimes experience problems of debris remaining in trees, which illustrates the need for blunt-nosed arrows. Although in five successive Field Day operations ending in 1979, the Boulder Amateur Radio Club archers scored only one loss of an arrow (in an irrigation ditch) and did not decorate any trees with fishing line, still my own occasional bad experiences indicate that skill and caution are needed, even to the extent of having bystanders keep a safe distance in the event that the line from the launcher snags on one end of the bow.

Here it becomes appropriate to quote Henry Wadsworth Longfellow. In "The Arrow and the Song," he wrote:

I shot an arrow into the air.
It fell to earth I knew not where. . .

In today's bedroom communities and even among the Rocky Mountain evergreens of Boulder's public park on Mt. Flagstaff, where Field Days are sometimes held, Longfellow would be considered irresponsible.

Later in the poem, Longfellow told about finding the arrow "long, long afterward in an oak." Luckily, for irresponsible-but-sensitive Longfellow, the recipient was only an oak tree. Another case for blunt-nosed arrows—unless you're out deer hunting—in season, of course.

While wishing you all good luck with your archery, let me once again turn to Joyce Kilmer's poem quoted in the beginning. He described:

A tree that may in summer wear
A nest of robins in her hair.

When we utilize antenna archery, let's not replace that "nest of robins" with a "mess of rope ends," remembering that Kilmer also wrote:

Only God can make a tree. ■

References

1. Richard Silberstein W3JQB, "Some Simple Ways of Erecting Temporary and Semi-Permanent Antennas," *QST*, March, 1952.
2. Larry Briggs W3MSN, "Shooting a Fishing Line over a Tree," "Hints & Kinks," *QST*, April, 1980.

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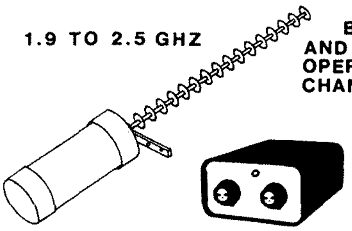

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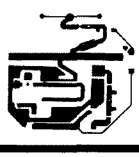

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Your Own Beam-Bruiser

Muscle your beam around from anywhere with this local control box. It's perfect for serious tower work.

For those of you who do more than a casual amount of work on your tower and/or beam, control of the beam heading from the tower could be an advantage. Such was the case at my QTH, and it prompted the local-control unit described here for my HAM IV Rotator System (see Fig. 1). Modifications to existing equipment are made in the HAM IV control unit and should not require drilling any holes if you are careful and use your imagination. Access to the individual wires in the rotator-control cable at the base of the tower also will be necessary.

The local-control unit will duplicate all the functions of the remote-control unit except for power control and meter indication. Safety is designed into the circuit so that, when under local control, the remote-control unit has no effect on the rotator. This prevents someone in the shack from inadvertently moving the beam while you are working on it. The local-control unit may be housed in a weatherproof box or stored in a protected location.

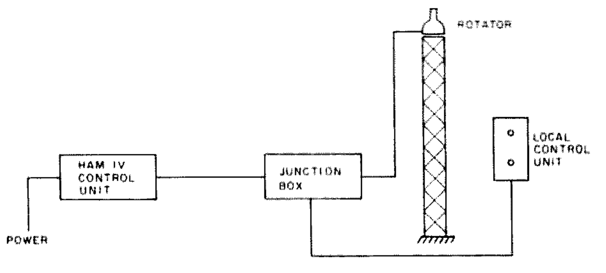

Fig. 1. Beam rotator system showing added local-control unit. Rotator unit on tower requires no modification, nor does cable run up tower.

Modification of Remote-Control Unit

Fig. 2 shows the schematic of the modified HAM IV control unit. The contacts of relay K1 added to the chassis carry 120 V ac at about 1 Ampere and must be accordingly rated. I used a small surplus unit and wired its DPDT contacts in a double-break configuration. Coil voltage should be rated at 12-24 V dc and less than 100 mA. Appropriate series resistance can be used with a lower voltage coil, but should be avoided because of the higher actuation currents.

To simplify matters, the following procedure is suggested and may save you from chasing wiring around the chassis to determine where connections are most easily made. However, I would suggest that you double-check your wiring to make sure that production variations don't exist between my unit and yours.

- Before starting, pull the power plug! Line voltage is present on several exposed points inside the unit.
- Remove the top and bottom covers by loosening the eight screws in the sides of the unit.
- Mount the relay to the chassis. There are several unused holes in the chassis that could be used, or you can bend up an aluminum bracket.
- Unsolder the heavy transformer-secondary wire from terminal 1 of the terminal strip on the rear apron and connect it to the grounding lug on the chassis just below the terminal strip.
- Disconnect both ends of the short jumper between terminal 1 and ground and discard the jumper.
- Connect a wire from the cathode (banded end) of diode CR1 on the PC board behind the meter to one coil terminal of the relay.
- Connect the other coil terminal to terminal 1 on the rear-apron terminal strip.
- Connect the normally-open relay contacts across the terminals of BRAKE RELEASE microswitch S3. This is the center switch in the three-switch stack near the front panel. Use #18 AWG wire.
- Check all connections, dress the added wires to prevent interference or chafing later, and replace the top and bottom cover sections.

This completes the remote-control-unit modifications.

Construction of Local-Control Unit

Fig. 3 shows details of the local-control unit. If the unit

is to be stored in an unprotected location, a weatherproof enclosure should be used to house the components. Otherwise, a standard minibox can be used. Construction is straightforward, the only precaution being in the selection of the DIRECTION (S2) and SAFETY (S3) switches. These carry the motor current, which is about 2.5 A ac, and should be rated accordingly. BRAKE switch S1 has only to carry the brake-control relay current. Rotary switches for S2 and S3 are not recommended, as they will probably not carry the load.

The indicator lamp shown in Fig. 3 is optional but is recommended to remind you that you have the brake released (energized). The ac voltage across the brake line (terminals 1 and 2 of the rotator) is about 30 V ac. By using the diode in series with the lamp, the voltage is effectively halved to the lamp, thereby reducing the power-rating requirements of the series resistor. Measure the voltage between X and Y on your unit and insert the appropriate resistor. Calculate its value using Ohm's Law and the rated current/voltage specs of the lamp you are using.

One more wire will be needed in the cable out to the junction box at the base of the tower to allow actuation of the brake-control relay in the remote-control unit. If you have spares in the existing cable, fine. If not, lay a length of ordinary zip-cord, field-telephone wire, or even a single strand of #20 AWG along the existing cable run to the junction box near the tower base. The cable run up the tower to the rotator is left as is.

Close inspection of the circuit might suggest that perhaps the extra wire isn't needed after all. By moving the power-transformer secondary from terminal 1 of the control unit to the chassis (where it was electrically connected anyway), we freed up terminal 1 so it could be used to energize the relay from the local-control unit. If our station is prudently wired, then everything will be grounded. Further, if the tower is grounded to the same point as the station ground, then theoretically we could use this ground line as the return circuit for the motor and brake in the rotator, and use terminal 1 on the remote-control unit for relay control—we wouldn't have to add anything to the control cable. *Don't do this!* That ground line is there for safety reasons and must not be used as a current-carrying conductor. Use the circuit shown here and you will retain grounding protection.

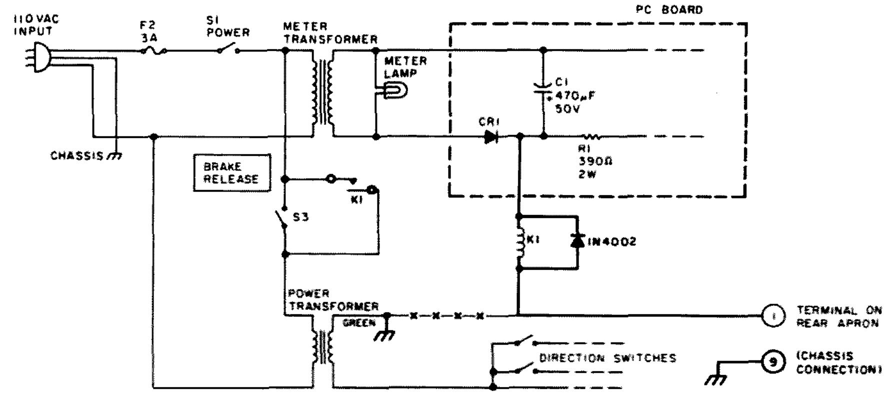

Fig. 2. HAM IV control-unit modification. Heavy lines show circuit changes and added parts. See text for relay information.

Junction-Box Details

I would strongly recommend the use of some sort of junction box (see Fig. 4) to make the connections between the local and remote unit and the rotator. Cut the control cable only after careful examination of junction-box placement and cable run. Locate the box out of the weather if possible. If not, use a weatherproof enclosure. A simple, albeit not elegant, method is to drive a length of 1 × 4 board in the ground to attach the terminal strip and hang a plastic trash can upside down on the board. There would be room inside for the terminal strip and the local-control unit.

Final Checkout and Operation

Do the following step-by-step checkout procedure to make sure that all connections are correct.

1. Set the local-control-unit switches to the following positions: SAFETY (S3)—Remote, DIRECTION (S2)—Stop, and BRAKE (S1)—Set.

2. Plug in the HAM IV remote-control unit and turn the power switch on. The light in the meter should illuminate and neither the brake nor the motor in the rotator should be energized.

3. Operate the unit and verify normal operation, checking all functions. If there is any difference between the "before" and "after" operation, shut down the unit immediately and check your wiring.

4. Now, leave the power switch on, go out to the tower, and set the SAFETY switch to the Local position. Nothing should happen. This switch disconnects the motor-control lines from the HAM IV control unit to prevent inadvertent operation while you are working on the beam.

5. Move the BRAKE switch to Release. You should hear the brake sole-

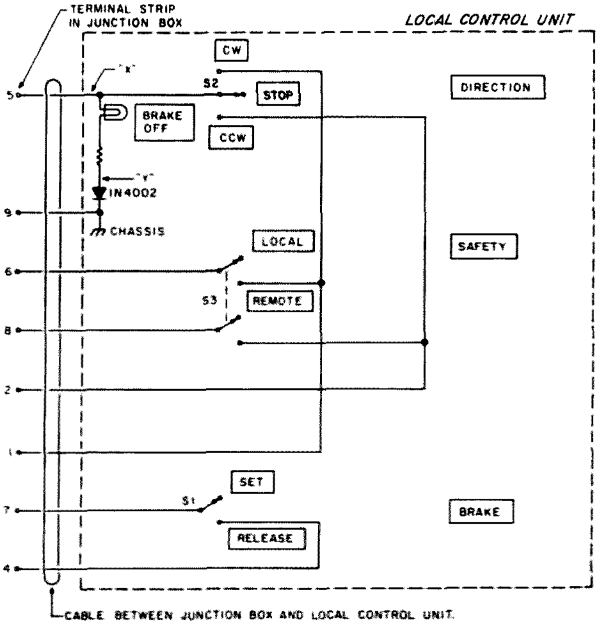

Fig. 3. Local-control unit schematic. See text for explanation of X and Y. See Fig. 4 for conductor sizes in local cable.

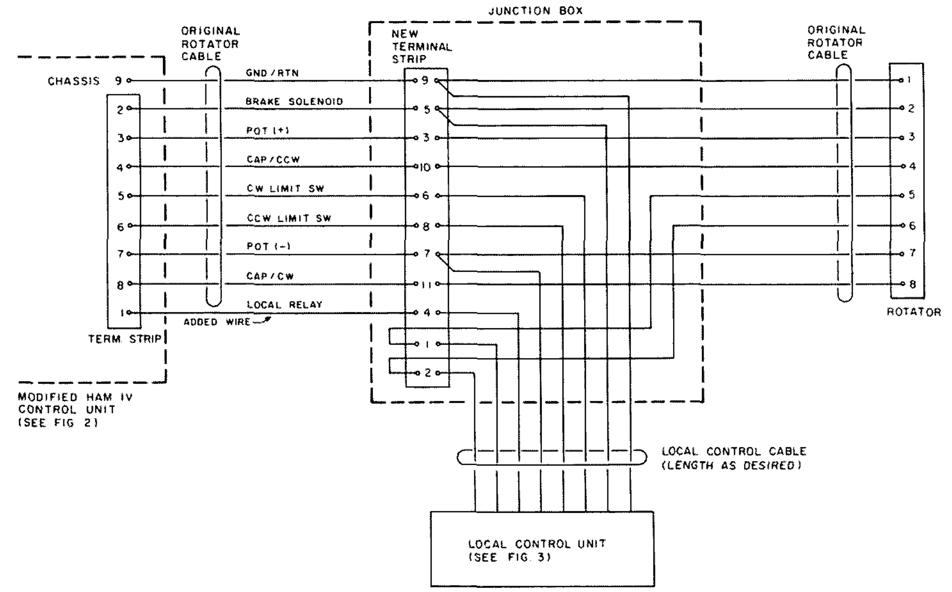

Fig. 4. Junction box and overall cabling. If added local-control cable plus existing cable lengths total less than 125 feet, use #22 wire in local cable. Use #20 for up to 200 feet total, #18 for up to 300 feet total.

noid pull in at the rotator and the light on the local-control unit should illuminate.

6. Move the BRAKE switch to Set. The brake should set and the light should go out.

7. Operate the DIRECTION switch. Nothing should happen.

8. Move the BRAKE switch to Release and operate the DIRECTION switch both CW and CCW. The beam should move accordingly. Be very careful as you approach the travel limits—you no longer can see the meter on the remote-control unit. "Jog" the DIRECTION switch when you think you are getting close to a limit to prevent mechanical damage to the beam, rotator, and/or tower.

9. When you are through with the local-control unit, reset the switches to the positions given in step 1, above.

Conclusion

While this convenience may not be desirable to everyone with the HAM IV system, it sure can save you some steps in that special situation. Most antenna rotators operate in a manner similar to the HAM IV, so that the principles shown here can be applied directly to other systems. Remember to check all your connections carefully before energizing for the first time, and be particularly prudent with your ground connections. Grounding systems are for life and equipment protection. Don't cheat! ■

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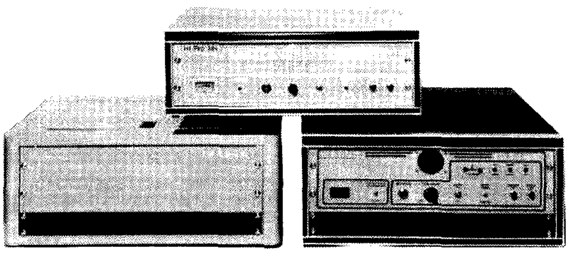

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Thomas Roth
11619 Johnson Drive
Shawnee KS 66203

Put Together the Shawnee Logic Probe

It's better than a tomahawk when you're on the warpath against glitches.

Well, here it is. Another logic-probe project. It's not the simplest, most exotic, or highest-frequency probe you've seen, but it works for me.

This probe indicates a high or low at 70% and 30% of V+ (a CMOS specification, but close enough to TTL switching levels to keep you out of trouble). The circuit in Fig. 1 is very straightforward. One section of the voltage comparator (LM393) senses V in over 70% of supply and the second section senses V in under 30%. These two sections direct-drive the appropriate LEDs. You need to be careful of LED current as the LM393 is rated at only 6-mA sink min/16-mA typical. I've had no trouble with the values shown with supplies of 5-12 V dc. The pulse detector is a CMOS one-shot (MC14538) triggered on the rising edge of the LM393 outputs through 1N4148 diodes. With the RC values shown, it has reliably triggered at greater than 30 kHz on both sine and square waves.

Construction should pose no problem. I've built two sizes of probes so far, one in a Continental Specialist logic-probe case and one in a cigar tube. The resistors are all 5%, ¼ Watt except as noted on the schematic. If you're eyeing a cigar tube, you probably will want to find some miniature capacitors. You may want to add a small electrolytic capacitor across the supply leads (1-2 uF), although I've built it both ways with no apparent operating problems. You may substitute a 2N2222 or similar NPN transistor for the MPSA13.

Operation is very simple. You just clip the supply leads to the circuit under test and probe away. The probe's input impedance is greater than 1 megohm, so you shouldn't load down most circuits. If a test point is between 30% and 70% supply, you will get no LED indication. Any logic changes should give you a pulse indication.

Some things you may want to do to your probe are:

1) Give it a pulse memory; tying the Q output to the set input, a resistive pull-up on the reset input, and SPST switch to GRD for reset should work.

2) If you're really worried about overvoltage, you can put a 15-18-volt zener across the supply line.

3) If you need to know the polarity of the detected edge, you can wire in the second half of the 4538, eliminate the diodes, and connect the two inputs to the LM393 outputs, adding a second resistor/transistor/LED.

I hope you find this as useful as I have and get it working the first time around. ■

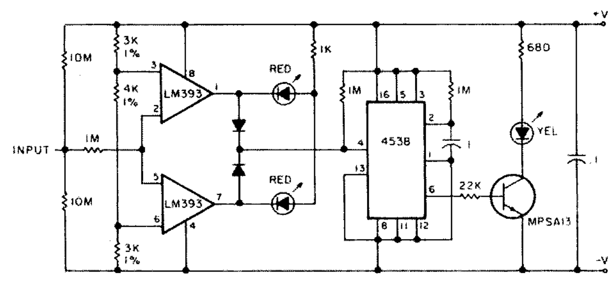
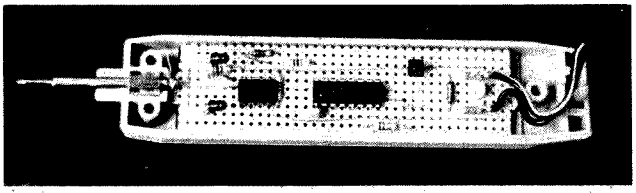


Fig. 1. Schematic. Resistors in Ohms, capacitors in uF. Diodes—1N4148, 1N4154, etc.



The logic probe.

Parts List

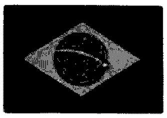
Qty	Item	Cost
2	1N4148 (1N914, 1N4148, etc.)	$.20
2	T1 LED (red)	2.00
1	T1 LED (yellow)	1.00
1	LM393 dual comparator	1.50
1	MC14538 dual one-shot	1.20
1	MPSA13 NPN transistor	.60
2	0.1 uF capacitor	.75
1	1.0 to 10.0 uF electrolytic (alum./tant.)(opt.)	.50
2	3k 1% resistor (hand-picked 5%)	.50
1	4k 1% resistor (hand-picked 5%)	.25
3	1 megohm 5% resistor	.30
2	10 megohm 5% resistor	.20
1	1k 5% resistor	.10
1	680 5%	.10
	Misc. hardware, PC board, case, etc.	10.00
		$19.20

Notes: (1) Resistors 1/4 W (1% may be 1/8 W). (2) MC14538 may be replaced by MC14528. It is pin-for-pin compatible but the RC values will be different (see 14528 data sheet). (3) T1 3/4 LEDs may be substituted if they meet the current tolerances of the LM393. (4) LM393 may be replaced by a quad comparator (LM139/239/339, LM2909, LM3302).

73 INTERNATIONAL

Each month, 73 brings you amateur radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: **Amateur Radio's Technical Journal**, *Pine Street, Peterborough NH 03458, USA, Attn: Avery L. Jenkins WB8JLG.*



BRAZIL

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20270 Rio de Janeiro, RJ, Brazil

BRAZILIAN TIIC-1 TRANSCEIVER

Manufactured by the Intraco Co., this all-solid-state, 100-W-output, Brazilian transceiver is the most up-to-date electronic jewel offered to Brazilian amateur-radio operators.

It works on all bands from 10 to 80 meters, including the new 12-, 17-, and 30-meter bands. It also comes with a 12-V-dc power supply and a 110/120-V-ac unit and has a peak power consumption of 250 W. The TIIC-1 can be used as a base or mobile station.

The frequency range is as follows: 3.5-4.0 MHz; 7.0-7.5 MHz; 10.1-10.15 MHz; 14.0-14.5 MHz; 18.068-18.168 MHz; 21.0-21.5 MHz; 24.89-24.99 MHz; and 28.0-29.7 MHz.

Transmitter carrier suppression is better than 40 dB and unwanted sideband suppression is better than 50 dB, while harmonics and signal attenuation is better than 40 dB. Intermodulation distortion is 25 dB down and frequency stability is ±500 Hz after 30 minutes. The output impedance is 50 Ohms.

The receiver's image rejection is better than 60 dB, and i-f rejection is rated at 50 dB. Selectivity is 2.7 kHz for 6 dB and 5.6 kHz for 60 dB. Audio output power is 3 W with less than 10 percent distortion.

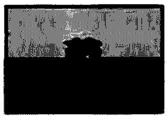
The TIIC-1 is a very nice and distinct rig—a sure bet for love at first sight. Its dimensions are 32 cm × 11 cm × 34 cm deep, and it weighs 8 kg. If it is used mobile, the rig has only a 16-A peak transmitting current.

This rig is almost 100 percent Brazilian—only 5 percent of it is imported—and it is being exported to Colombia and Chile, and possibly to Argentina, Peru, and Ecuador. It costs only $590 US for both the power supply and the transceiver.

Intraco is also introducing an external vfo and wattmeter. These products join the lineup of Brazilian ham gear which includes the RT-1 antenna rotor with a speed of 8 degrees per second.

Considering the Brazilian government's goal of 100,000 amateur-radio operators in the near future, the TIIC-1 and Intraco will be a big help to this program. The 100-W output matches the limits for beginning hams and many older hams will be interested in it as well.

For more information, contact Mr. Jean Weiner, Trade Director, Telecomunicacoes Intraco Ind. Com. Ltda., rua Costa Aguiar 1279, 04204, Sao Paulo, SP, Brazil.



ECUADOR

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PO Box 511
Guayaquil, Ecuador

The Guayaquil Radio Club is the oldest club in Ecuador. It was founded on May 9, 1923, by Ignacio Wolf, who was also its first president.

Our anniversary meeting was held last May, with a party and a nice session, the same day as the founding of the club. In this session, diplomas were given to members who have been radio amateurs for more than 30 years. The club also received congratulations in special speeches by civil-defense officials, government officials, and Boy Scout leaders, praising our assistance in emergencies (of which we have had too many).

With this short article, we begin a series that will let you know all of the emergencies that we are handling every month or so. But first I will talk about our meeting place.

It is a beautiful building, three stories tall. The first floor is for administration purposes and in here we have an office with two-meter equipment and a secretary. The office of the club president is also on this floor.

The second floor is where the general assembly hall is located. Although we have many members, this place is large enough to accommodate all of the people who come to our annual meetings.

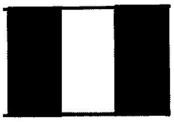
The third floor is where the action is. We have a radio shack with more than ten pieces of equipment so we can transmit on different bands at the same time.

There is a room for storage, temperature and humidity controlled, in which we keep all of the radio equipment and accessories that we need. We have 25 TR-2500s, 7 HF rigs, 6 TR-7850s, antennas for the different bands, batteries, scanners, power supplies, etc.

On this floor is also the room where the weekly meetings of the members of the Directory are held.

We have three towers. Two of them have nothing but Telrex monobanders for each HF band. The other tower is the tallest (105 feet high) and supports all of the VHF antennas. In the two-meter band we have the capability of transmitting in simplex, without the help of repeaters, for 200 kilometers. This range varies somewhat with the weather and other factors.

Since we are members of the IARU, we will give information related to it, too. There was a meeting recently in Cali-Colombia, where HC2NW represented the 2730 members in our country. If you plan to come to Ecuador, please let us know so that we can make your stay more comfortable through the hospitality of amateur radio.



FRANCE

Claude Guae F1DGY
11 Rue Emile Labiche
28100 Dreux, France

Each year since 1976, club station F1KJC has organized a hamfest at the end of June. This club belongs to a French color CRT factory (Philips-RTC) located in Dreux.

Dreux is a small town of 40,000 inhabitants located 50 miles southwest of Paris, on the borderline of Normandie and Ile de-France. There are few hams in this town, so the majority of the participants come from the surrounding countryside.

As far as weather is concerned, June is generally sunny—important for a picnic.

Mobile operators are guided to the picnic area on 145.525 MHz. The access is not very easy...a simple beaten path leads to the site, and you have to beware of tree limbs which will snag your antenna.

At noon, it is time to light the barbecues for the "merguez" (spiced sausage) and it is also time for a drink, of course. The next hour is spent chatting with one another. After the last merguez and the last drink, the camping equipment is put under the trees. Then coffee is served, to fortify those who would rather nap than try to find the fox.

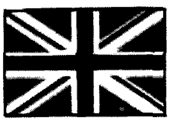
This year, two beacons (200 mW, 144.700 MHz) were hidden in the woods 2-3 miles apart. The winner of this eighth fox hunt was Daniel F6AJJ and his buddy William F6DLA. Daniel has won the hunt before, in 1979 and 1982, so he got to keep the club cup for 1983.

Thanks to all of the participants at this hamfest for their very nice spirit. Now we have to begin thinking of the next one!

5TH PHILIPS QSO PARTY

French Philips employees and employees of its affiliate companies have organized this year's QSO Party. Each ham who belongs to this group worldwide is welcome to participate. Rules can be obtained from the country coordinator or from Eric Ludwig F9LT, 9 Rue de la Broaderie, 78340 Clayes Sous Bois, France.

The HF CW contest will be held Nov. 5-6, and the HF SSB portion will be on Nov. 12-13. HF RTTY and SSTV entrants will be competing Nov. 5-13, and the VHF/UHF contest was held Sept. 17-18.



GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire, England

By the time you read this, you will probably have heard some new prefixes from the UK. On the HF bands, G0 calls will be active, whilst G1 calls will be on VHF (and may be heard in the US via satellite, of course).

It occurs to me, therefore, that an explanation of the UK callsign allocation system would be of help. Even without considering special-event callsigns or experimental licenses, the UK contributes no less than 58 prefixes to the WPX program!

UK callsigns are divided into three main parts: the country designator, the operator identifier, and the optional suffix. The most important of these items is the operator identifier and so I will deal with this first. It consists of a figure and two or three letters. In my case, the operator identifier is 4EJA and this, like all others, is unique (but there could be a 3EJA or an 8EJA, etc.).

The figure indicates the class of license held, this being either class A or class B. A class-A licensee may use all bands and all modes and has passed a written test and a 12-wpm code test. A class-B licensee may use only the VHF bands (144 MHz and above—note the exclusion of 50 MHz and the Region One allocation at 70 MHz) and any mode except CW. A class-B license is obtained by passing only the written test.

The prefix number (in conjunction with the number of letters in some cases) indicates the license class:

Number	Letters	Class
0	all	A
1	all	B
2	all	A
3	all	A
4	all	A
5	all	reciprocal
6	two	A
6	three	B
8	two	A
8	three	B

(Note that 7 and 9 are reserved for a few special experimental licenses.)

Preceding the figure is the country identifier. In my case, my station is licensed in England, so I use G. However, if I drive down to the Principality of Wales (which I can do in about 40 minutes), I must change the prefix to GW.

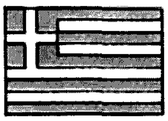
The country prefix therefore indicates the location from which the station is operating rather than in which it is licensed; if I travel to Scotland, I become GM4EJA. The full range of UK country prefixes is: G—England, GM—Scotland, GI—N. Ireland, GW—Wales, GD—Isle of Man, GJ—Jersey, and GU—Guernsey.

As well as a possible change in country prefix, the traveling ham will almost certainly have to use a suffix. Operating from my car in Wales, which I do occasionally with an FT-290 and a 30-Watt linear, I sign GW4EJA/M—the suffix indicating mobile.

If I walk into the mountains with my IC-2E handie-talkie (admittedly not very likely), I sign GW4EJA/P—this time the suffix indicating portable.

If I set up a semi-permanent (i.e., mains-powered) station in my trailer near Appleby in the English Lake District, I sign G4EJA/A—this indicating an alternative address.

Finally, I must mention GB prefixes which indicate special-event stations (usually at fairs or fetes, etc.) and which may be operating from any country in the Kingdom, as may beacons and repeaters which also use the GB prefix.



GREECE

Manos Darkadakis SV1IW
Box 3751
Athens, Greece

As in every country, Greek radio ama-

teurs have their preferences about which bands they enjoy working. There are HFers and VHFers, and others who prefer to spread their activities over all bands if possible, or in all modes. Of course, I left the most important thing until the end, and that is our wallets. You may want to do a lot, but...

Anyway, back in my first days of hamming, HF was what everyone was using. Many people had home-brew rigs, some had Heathkit or Yaesu gear, and the elite used Collins equipment.

Outside of the HF bands, a few people with Twoers were exploring the challenge and mystery of VHF. But the revolution in the electronics industry did not miss Greece. In my country, this started in 1978, but it was not only the competition between manufacturers—it also stemmed from competition among hams.

Those days, and for quite some time afterward, to be a respectable ham in Greece (and other places, too, I believe), you had to have a couple of HF rigs, two or three VHF radios (base, mobile, and portable), one or two UHF transceivers, and, of course, a RTTY or SSTV terminal—just to name a few.

The antenna was the last thing under consideration. Even today, can you imagine a $2000 FT-ONE on a CB antenna modified for 10 meters? Well, I can.

It is really amazing to see what has happened in Greece in the last two or three years. We can buy Yaesu and Icom gear even before it is advertised in England or the US. Therefore, most of the HF rigs in Greece today are Icom (720s, 730s, and 740s) and Yaesu (FT-ONEs, 707s, 102s, and 980s). There is also Drake and Kenwood gear, and even some fancy rigs like the Collins KW-380. Palomar's state-of-the-art rig was available some years ago.

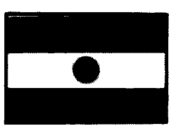
Nowadays, there are a lot of SV hams active on HF bands, but only a few of them are active DXers. About 80 percent of all hams in Greece have 2-meter rigs and 60 percent of those have an all-mode transceiver. 20 percent are active on UHF as well, again with all-mode rigs. Finally, five or six hams are active on the SHF bands.

Of course, SSB and FM are the most popular modes on most bands, with CW a distant third. In the specialty modes, about fifteen people are working RTTY and there is a handful of slow- and fast-scan TV and satellite operators.

In closing the column this month, I will mention the existing repeaters in Greece, with more information to come soon.

On VHF, we have R1 situated in Athens, R3 in Heraklion on the island of Crete, R5 in Volos in the central part of Greece, R6 in Thessalonika, and finally R8 on the island of Lefkas in the Ionian Sea. There is also a UHF repeater, RU1 in Athens and a UHF transponder linking the R6 VHF repeater with RU6 frequencies on UHF.

All repeater frequencies are established according to the IARU Region 1 band plan, with the input −600 kHz on VHF and −1.6 MHz on UHF. None of them has tone access.



INDIA

James Kalassery VU2ARL
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Cochin 682011
India

1983 is a remarkably good year for amateur radio in India. Thanks to our government and the Federation of Amateur Radio Societies of India (FARSI), we now have a few WARC bands and more privileges—more power for the Advanced class, more modes for Grade I, and more bands for the Grade II licensees.

The Wireless Planning and Coordination (WPC) Wing of the Ministry of Communications, which regulates amateur radio in India, has recently released two WARC bands—18 MHz and 24 MHz—for use by radio amateurs on a non-protective, non-interference basis. With this gesture, India is now placed among the few countries which have permitted their amateurs to operate on these new bands. After our government allowed the importation of amateur-radio equipment and accessories under the Open General License of Import Policy, many amateurs bought equipment which enabled them to start operation as soon as the new bands were released. We hope these new bands will open up new vistas of activities in the fields of operation and research for improved peripherals.

Now, Advanced-class amateurs can run up to 400 Watts (as opposed to 150 Watts previously) input on selected portions of the HF bands. Grade-I amateurs can work on all modes, some of which (SSTV, RTTY, etc.) were previously reserved for the Advanced class. Grade-II amateurs, who were allowed to operate only CW on 80 and 40 meters and phone on 2 meters, now can operate CW on all HF bands and phone on 10 and 2 meters. Their power also has been raised from 25 Watts to 50 Watts dc input.

Our government is now keen on promoting this unique hobby. While previously we had to obtain express permission from WPC to move stations even for demonstrations, etc., now we just have to intimate them in advance. Testing Morse code for the licensing examination also has been made simpler, though the speed standards are the same as before. The requirement of copying continously for five minutes with a maximum of five mistakes has been relaxed to copying correctly for any one minute (out of the 5 minutes) continuously.

These relaxations, announced during this World Communications Year, have come as a result of a meeting the representatives of our radio amateurs had with the Wireless Advisor last December. With more changes expected to be announced shortly, amateur radio certainly has a bright future in India.

ISRAEL

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85530 Israel

As I write these lines, the reverberations from the 35th annual General Assembly of the Israel Amateur Radio Club are still echoing in my mind. So, for this month's column, I would like to give you an account of the proceedings.

The meeting was opened by the chairman, Yankele 4X4AH, telling us that he believes that hams are a group of individuals wishing to enjoy their hobby with a minimum of interference from neighbors and authorities. With this in mind, he made a plea for unity, urging us to remember above all the purpose of our organization.

Naftaly Balaban 4Z4RM, the outgoing president, surveyed the past year's goals and achievements. He then went on to the presentation of awards and trophies for achievements in national competitions and to outstanding amateurs and clubs.

Alon Tavor 4Z4ZB was named amateur of the year in recognition of his devoted work at the Alyn Hospital for Handicapped Children in Jerusalem. He established there club station 4Z4SW and conducts classes and on-the-air sessions for the children who are largely confined to wheelchairs. Alon invites amateurs visiting Jerusalem to drop in on the club.

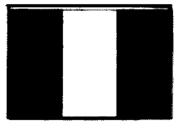
Ron Roden G4GKO was presented with honorary life membership in the IARC in appreciation of his representing us over the past years at meetings of the IARU. Ron, deeply moved, said it was his privilege to represent Israel, and he would continue to do so as long as needed. I must point out that the IARC, being a relatively small organization, has never been able to support sending a delegate to international conferences, and Ron, whose work takes him around the world, is happy to represent us. Ron spoke of the aims of the IARU in these days of crowded bands and said that in next year's meeting in Sicily, the organization will deal with band planning and try to set aside frequencies to be free from competitions.

Speaking for the Ministry of Communications, Israel Biber 4X4OR spoke of the problem of self-discipline in the amateur ranks. He said that the Ministry intervenes when "the waters run over" (translation mine) and that it was forced to take action against a few illegal operations this past year. These actions are most brutal, as the police make little distinction between illegally holding arms or transmitting equipment. Mr. Biber pointed out that there are currently 80,000 radio transmitters licensed in Israel, largely on VHF, averaging 200 stations per channel, all casting hungry looks at our wide spectrum allocations. Thusly ha exhorted us to keep our frequencies clean and preserve our rights.

After these presentations, a free discussion was held that, due to the late hour, was limited by time. A past treasurer, Tuvia 4X4GT hauled up to the podium an empty satchel. This bag, he said, could contain a hundred thousand shekels (roughly $2,000) for the club treasury, had a raffle of equipment been held, as was done in previous years. Ben 4Z4JS suggested that next year a raffle of only a few good pieces of equipment be held, instead of the time-consuming draw of scores of pieces of junk.

A slate of candidates for the new club executive was proposed by Aharon 4X4AT, and with no opposing candidates proposed, the list was unanimously accepted. The new officers are as follows: 4X4s AT, JT, GT, and NOE; 4Z4s NU, RZ, UR, US, and NUT; 4X6s DW, LM, and NFK. This is, to my mind, an excellent group of active and involved amateurs who have all pledged to give the most of themselves for the good of our national organization. This strongly contrasts the situation at last year's general meeting when arms had to be twisted to get people to agree to be nominated. This was reflected in much of the activity of last year's executive, and it looks like this year people were shaken out of their apathy and have come forward to give us a stronger club.

At 11:30 pm, the management began flashing the lights of the auditorium, signaling us that our time was up. For the next hour and a half, the 2-meter repeaters and simplex channels were buzzing as a few hundred hams made their way back from Jerusalem to Tel Aviv on the Mediterranean coast, to Beersheva and the Negev in the south, and to Haifa and Galilee in the north. Once again, the yearly rites of the IARC General Assembly had come to an end.



ITALY

Dr. Giancarlo Martelli I0XXR
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VATICAN CITY

For many hams, the HV prefix is still an elusive and rare one. Here is some late information about the stations active from Vatican City.

HV3SJ

This station is located in the Jesuit Headquarters Building, just a quarter of a mile from St. Peter's Square. The building is outside the Vatican State border, but being property of the Vatican itself, is considered extraterritorial by the Italian state, by virtue of the agreement between Italy and the Vatican. This station is active almost exclusively during the weekends and is operated by Pino D'Aurelio I0OUD, who prefers SSB. Father Larry, a CW enthusiast, also uses the station.

The HV3SJ facilities are a Collins S-Line and a threeband, twoelement, cubical-quad antenna. No low-frequency antennas are sat up there. The QSL traffic is managed by I0OUD at his home address: Giuseppe D'Aurelio, Via Fogazzaro 87, 00137 Roma, Italy.

HV1CN

The station is housed in a small room in the same building as the studios of Radio Vaticana, together with the VHF/FM broadcasting station.

The medium-wave and shortwave transmitters of Radio Vaticana are located at S. Maria Galeria, a locality 25 km from Rome, where the huge display of towers and curtains is the dream of any ham who passes by. An auxiliary 25-kW shortwave transmitter is located a few hundred feet from the HV1CN shack and radiates its power through a log-periodic rotary antenna.

The combination of HF and VHF waves fills the air at HV1CN, so heavy IMD and overloading occurs very often in the receivers of the ham station.

The equipment is a slightly-outdated Hallicrafters line, but its tube-equipped front end beautifully resists the attacks from the nearby broadcasting transmitters. The antenna is a TH8 beam for 10, 15, and 20 meters. No LF antennas are here, either.

The chief operator of HV1CN is Domenico Petti, the chief engineer of the broadcasting station; very often, he welcomes guest operators.

The station is not very active due to the fact that Domenico is an employee of the Radio Vaticana and lives in Rome, outside the Vatican borders, so he is very busy with his job when he is in the building.

QSL cards should be sent to HV1CN, c/o Vatican Post Office, Citta del Vaticano, Rome, Italy. Be careful not to send QSL cards for HV1CN through the bureau, because the only bureau in Italy is the ARI bureau, which has no connections with the Vatican.

HV2VO

This station is located in the Vatican Observatory of Castel Gandolfo. The building is a big, ancient castle which houses the summer residence of the Pope

and holds extraterritorial status. Castel Gandolfo is a small city about 20 miles from Rome.

The HV2VO station is operated by Father Edmund Benedetti, only on SSB. The antenna farm has a three-element beam for 10, 15, and 20 meters and inverted-V antennas for 40 and 80 meters. Since the Vatican Observatory building is on top of a hill, the location seems to be very good for radiating signals, and the HV2VO signal is very consistent around the world.

This station is fairly active when Father Edmund is not traveling abroad and offers the only chance to work the HV prefix on the 40- and 80-meter bands.

The QSL manager of this station is Giancarlo Gottnich I0GPY, Via Vigne Morena, 90-00040 Roma Ciampino, Italy.

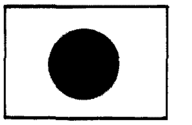
THE ARI DOCTORS AND RADIO AMATEURS GROUP

This group of radio-amateur hams was founded five years ago, and since then it has grown and achieved much acclaim for its emergency and welfare activities related to amateur radio. The group is working inside the ARI (Associazione Radioamatori Italiani) and is connected with the ARI CER (Corpo Emergenza Radioamatori).

Every year, the group's members meet in Foligno, a fascinating town located in Umbria, central Italy. There they discuss their activities with regard to radio telemetry and the transmission of medical parameters via amateur radio—things like electrocardiograms, radiographs, etc.

Some members of the group have recently been to China, where they gave demonstrations of the experimental work done through amateur radio. The Chinese Sports Ministry hosted these MD hams and invited them for another trip to China—this time with their ham equipment.

The group holds its net daily on 40 and 80 meters, so medical aid over the air is available in every emergency.



JAPAN

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ILLEGAL OPERATORS IN JAPAN? AMERICANS NOT ALLOWED TO QSO WITH AMERICANS?

Judging from the title of this month's column, one would get the impression that things are a little screwed up in Japan as far as ham radio is concerned. They are! Let's review the situation in brief, as those of you who may have tuned in late, that is, those of you who have not read the previous months' columns, may be a little confused. Shame on you.

As of this writing, Japan has no reciprocal licensing agreement with any country. A law was passed by the Japanese government in May, 1981, that ostensibly permits the signing of reciprocal agreements with other countries. The Japanese have privately stated that their goal is to sign the first agreement with America. The other countries can wait. The Japanese government made their proposal to the US government, but it was wisely rejected by the US because it contained certain objectionable provisions, such as station inspection, the necessity of permission from the owner of the premises where the station would be located, and a rip-off license fee.

While this is being written, the two governments are squabbling over these and other points. It is possible (but unlikely) that by the time you read this, the problems will have been resolved and that the first reciprocal agreement with Japan will have been signed. I wouldn't bet very much money on it, though.

However, American and German operators can operate in Japan by using a club station callsign and have been doing so since 1970. This was brought about by former US Ambassador to Japan, Armin H. Meyer W3ACE, who persuaded the Japanese authorities to make a minor change in the law. Under this system, most foreign operators run only 10 Watts, as higher power would require an inspection, requiring a 6-month or longer wait, plus an inspection fee. Note that the Japanese government does not issue callsigns to non-Japanese amateurs. Operators' permits only are given to foreigners who hold a valid FCC or German amateur license. The callsign must be in the form of a Japanese club callsign which is "lent" to the foreign operator.

Finnish and Irish hams also have been given this same privilege during the past two years.

And that's how things stand at present: Only amateurs from America, Germany, Finland, and Ireland can operate a club station in Japan.

ANOTHER WAY TO GET ON THE AIR IN JAPAN...

There is still one other way to get on the air in Japan. If you can read, write, and understand Japanese, you have the unique opportunity to take the Japanese-language amateur-radio exam. If you pass it, you will receive a lifetime Japanese operator's permit. But note that this still does not get you a callsign. Remember that under present regulations, callsigns are given only to Japanese citizens. So you still have to find a club station to operate. Several hams have done it. We believe that the first person to take and pass the Japanese exam was Norman Smith G3HFO, who was a member of the British Embassy. That was in 1970. Norman enjoyed operating a Japanese club station for several years. In more recent times, Keith Wilkinson ZL2BJR also obtained his operator's permit this way. It should be noted here that the JARL runs training courses designed to ensure that you pass the test. The test itself is a multiple-choice type. So, as you can see, although it is not impossible to do, and even though Japanese is not a difficult language to learn to speak, learning to read and write it takes some real effort.

AND STILL ANOTHER WAY...

There is one more way to get on the air in Japan. This is not necessarily the recommended way, and as a matter of fact, the only person to try was only marginally successful. Here is the way it works: It is said that from a legal standpoint, an embassy or consulate located in a foreign country is not really on foreign soil at all. In other words, the argument goes, the British Embassy that overlooks the Imperial Palace grounds (there's where the Emperor and Empress of Japan live) in central Tokyo is really British territory. Looks can be deceiving. Mr. John Donald G4JFM, who lives and works in the British Embassy here in...*uh*...Tokyo (or I should say in the British Embassy on British soil somehow transplanted to the center of Tokyo), realized this fact and went to the British Ambassador to get his opinion. The Ambassador said, in effect, "John, you're on British soil! Go on the air. I'll back you up." So, in February of this year, John went on the air, signing G4JFM/JA. John had a lot of contacts with stations all over the world, including QSOs with friends back in his home country.

He also received a lot of on-the-air threats from Japanese hams who asked a lot of questions. John answered them all honestly. The threats continued, ranging from the classical but unoriginal type of "I'm going to report you to the Ministry of Posts" to the more original type of "Get off the air, white pig!" This from our nice, gentle Japanese ham neighbors who can go to the United States, take the test, and obtain their own genuine US ham callsign. In fact, many Japanese hams are doing this as part of their collection, much the same as one goes overseas and brings back an ashtray or other souvenir (mostly made in Japan). Furthermore, Japanese hams can now go to the UK and obtain a permit to operate, even though no reciprocal agreement exists between Japan and that country. In fact, John worked a Japanese amateur operating from Britain. But some people are not persuaded by those arguments.

The slurs, threats, and especially the jamming got so bad that John finally gave up—temporarily, at least. Now you would think that in a democracy, as Japan is purported to be, the citizenry would understand that it is the exclusive duty of the government to decide if a law is broken and take whatever action is required. For a citizen to take it upon himself to interpret the law and censor another person without due process of law reminds one of the lynch mobs that once pervaded the western part of the US many years ago.

John has a good view at least. He is able to sit at his operating table and gaze from the shack-room window upon the beautiful Imperial Palace grounds on the opposite side of the street beyond the moat (no crocodiles or alligators in the moat) while he sips his tea. English tea.

NO OTHER WAY...

Some ham-radio operators who come to Japan do not have these options open to them. For instance, Rossella Strom I1RYS is not American, German, Irish, or Finnish. She is Italian and therefore she can't go on the air under the club-station system. She is not fluent in Japanese either, not having been in Japan very long, so she couldn't very well take the Japanese exam. And she is neither working nor living in the embassy of a foreign government. She is an attorney, although her reason for coming to Japan was to accompany her businessman husband. So for her, there is no way to get on the air in Japan. She can't even speak over the microphone of a Japanese friend's station, as that is prohibited in Japan. Only a holder of a valid Japanese operator's permit can do that. She will have to wait for a reciprocal agreement. Incidentally, she wasn't allowed to practice law in Japan either. That's prohibited, too! Last week she solved her problems in one fell swoop. She and her husband moved back to Italy.

AMERICANS NOT ALLOWED TO SPEAK TO OTHER AMERICANS!

As an American living overseas, it's sometimes nice to have a "local" QSO with another American living in Japan. Having QSOs with Japanese and other hams is always fun, but nothing beats having a QSO with a fellow American. No harm there, right? Well, it "ain't necessarily so" says the Japanese government.

Some of you may remember that there was once a war called World War II that ended in Japan's defeat in 1945. Allied occupation forces came into the country at that time, and the hams among the occupation forces were given permission to operate ham radio from Japan. When the peace treaty was signed in 1952, the US troops were no longer "occupation forces" but instead came under the agreement called the Status of Forces Agreement, or SOFA. Under SOFA, the military was given certain rights to establish communications as they saw fit. Under this authority, the US obtained a block of callsigns from the FCC to use for US hams stationed in Japan under SOFA. The FCC does not license these American military hams for Japanese operation, as they already possess FCC licenses. The licensing authority for operating in Japan is the American military command in Japan. The callsign prefix is KA, with various numbers following that which identify the region within Japan, followed by two letters.

The situation was going quite well until September, 1959, when, it is reported, a Japanese ham who apparently disliked American GI hams operating in Japan (in spite of the fact that we gave them their country back after fighting a vicious war) challenged the Ministry of Posts to define the legal status of these hams. Note that they were operating on military bases only. The military authorities prohibit KA operation off the base, thereby recognizing the sovereignty of the Japanese government to control ham-radio operation on pure Japanese soil. It's interesting that the US government considered and still considers US bases not to be on Japanese soil, for the most part. Sounds familiar, doesn't it? Anyway, the ministry buckled under and ordered, through the JARL, Japanese hams not to have QSOs with US military stations or face license revocation. The US military also ordered its KA stations not to have QSOs with Japanese hams so as not to aggravate the situation.

Now we move up to 1971, when a lot of American civilian types living in Japan, assigned to Japan on business or teaching positions, began to obtain Japanese club-station callsigns. This often resulted in some interesting exchanges. Sergeant John Smith KA2SS is located on a US Air Force base 30 miles west of Tokyo and operates from his on-base quarters. Roy Waite JA1YSH is a businessman and operates from his condominium in Tokyo:

KA2SS: "CQ, CQ, CQ. This is KA2SS calling CQ and standing by."

JA1YSH: "KA2SS. Calling KA2SS. This is JA1YSH calling KA2SS and standing by."

KA2SS: "Sorry, old man; I can't QSO with you. Are you an American using a Japanese callsign? Over."

JA1YSH: "Yes, I am. I am operating a Japanese club station. By your call I thought you were on the west coast of the US. Too bad we can't QSO. Do you get to Tokyo sometimes? Over."

KA2SS: "Sure do. Let me have your phone number and I'll contact you next time I come to town. By the way, you're 5 and 9 out here. The handle is John. Over."

JA1YSH: "OK, John. The handle is Roy. You're 5 and 9, too. Yes, I'll give you my telephone number. Too bad we can't QSO..."

Sounds a little silly, doesn't it? If you think that's funny, you should hear the SEANET (South East Asia Net) when a Japanese takes over as the net controller. During the roll call, whenever he comes to the KA stations, he has to turn over the controller job to a non-Japanese station such as a Hong Kong station, to call in the KA stations. When that's finished, the Japanese net controller resumes the roll

call for the rest of the stations. As you can see, the rest of the world recognizes the US military ham stations in Japan as legitimate hams, while Japan does not.

For a time, there were some US military civilian workers who were operating on both sides of the fence. That is, they used a KA station while on the base, and at night at home, they used a Japanese club station. This went on for a few years, until the Ministry of Posts realized what was happening. The Ministry of Posts has committed a number of mistakes and contradicted itself several times, such as allowing one thing one time and disallowing it later. The operating word here is "inept."

I said earlier in this article that ham radio is a little screwed up in Japan. After thinking it over, I'd like to retract that comment. It's more than a little.

LIBERIA

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POLE PIG REVISITED

So you have always wondered what we do in West Africa when we take diagonal cutters in hand and go outside to do a little antenna work, right? *Well, it is much* the same as you might imagine they do it in Florida, i.e., cut, sweat, trim, and measure the swr, over and over again. However, we do it more often than you do it.

Not that we aren't so good at cutting, sweating, trimming, and measuring the swr, but there are a few other factors that you must consider. You can't just pick up the telephone and have a nice antenna at your doorstep in less than a week, even if you have the money. So if you want a beam, you end up with a quad. Quads are a dream here, supposedly high gain with short booms on low towers, lots of free bamboo, no icing, and low wind. But the cutting, sweating, trimming, and measuring of the swr is a nightmare on a home-brew quad. And the humidity is so high that the bamboo rots in a couple of years, requiring restringing of the spider's web.

Also, a large portion of the amateur community is expatriate and lives here for only a few years. So, many of us are just setting up ham stations from scratch. And as the hams turn over, there is always someone else starting over again. Consequently, we make a lot of dipoles.

So here you are, out cutting copper wire on a hot weekend. The nice roll of #14 enamel-coated copper wire that you brought from the States that cost you a fortune is rapidly dwindling, and it makes you nervous to roll off another 20 feet. Cut, sweat, trim, and measure the swr. You would sure like to lend some of your friends some good wire when they make their own antennas, but soon you won't have enough for yourself. Your friends go to the electrical supply store in the capital city to buy their insulated rolls of copper wire, and you thank God during your evening prayers that you didn't have to stoop to paying for copper with gold and then have to strip the insulation off. Cut, sweat, trim, and measure the swr. The new antenna begins to take its final form. You pat yourself on the back and say to yourself that, if nothing else, you really know how to make an antenna. The antenna is finished and works fine.

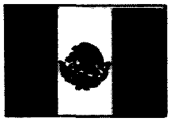
Later in the month, you help a new African ham make his own antenna using your design. Cut, sweat, trim, and measure the swr all over again. After a little snafu, it works perfectly. But that wire was just too expensive and you wish you had enough to just give the poor fellow so the struggling new ham didn't have to buy it.

Then you have a vision, you know, one of those sky-opening experiences where a voice calls out and gong goes off, something like when you have just worked a new country. You are walking past an old, dead, 10-kVA power-line transformer sitting on the ground. You know, the same one you have been walking by for the past three years. And you remember like a bolt of lightning the article you read a year ago about how there are nice high-tension transformers inside those big, ugly, rusting, grey cans. You also remember that even spoiled transformers have lots of wire in them, and that big spoiled transformers have big wires in them, and that the wires in transformers are enameled copper wires.

Then you plan for 2 or 3 weeks how you are going to get your hands on the transformer, and you make the necessary arrangements with the organization that you work with to take the old transformer which has been broken since as far back as anyone who presently works there can remember. They are, in fact, happy to get rid of it. Little do they know of the treasure inside. Why, you would steal for antenna wire in an emergency, and they are happy to get rid of it. The only catch is that they want the transformer coil that is inside, and that is just the part you don't want.

When you finally get the transformer out, it is so big you can hardly lift it off the ground. When you were a kid, you used to take a few small transformers apart and marvel at all the wire inside, but it was nothing like this. Lord knows that there must be hundreds of feet of wire in that thing. You get it home and start unwinding it. The wire on the high-tension primary is #14, exactly what you brought from the states, only 10 times as much, and free. There is so much wire that you will have enough for retirement when you can make antennas every day. And the low-tension secondary wire is the biggest single-strand wire you have ever seen in your life. In fact, it looks like a long copper bar 1/4 inch wide and 1/8 inch thick. There isn't so much of that, but you can already think of hundreds of uses for it.

And you suddenly realize that there are thousands of old broken transformers all over this country, and 10 kVA is the smallest that you can get. And you realize there will never be a wire problem again. And you sleep unusually well that night. Now if there was only an easy way to get insulators . . .



MEXICO

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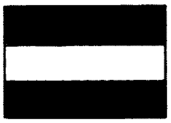
Little has been written with regard to "Mexico airwaves" and ham activity here down south of the border over the years. Nevertheless, much has been going on and most of it is known by our fellow colleagues within the country. We are constantly having DXpeditions, contests, and radio-club get-togethers, and ham-radio operators from all around the globe can qualify for one of the many diplomas (awards) available from the Liga Mexicana de Radio Experimentadores (what we might call the "Mexican Radio Relay League" or the "Mexican Radio Experimenter's League") which has its base in Mexico City and controls the radio clubs all around the country.

Many of the different radio clubs from different parts of Mexico also offer attractive diplomas to fellow hams around the world. Now that Mexico joins "73 International" with its own monthly column, I hope to cover practical material and up-to-date information for all of you *73* readers so you can qualify for and obtain diplomas from our Mexican Radio Experimenter's League, make your OSOs with our DXpeditioners, and enjoy current information that is also shared with our local hams.

At the time of this writing, a couple of DXpeditions happen to be going on here! One is going on at what we call "El Mar de Cortes" (The Sea of Cortes) near Baja, California, and the other at "La Isla de los Alacranes" (Scorpion Island) near the southern tip of the Yucatan Peninsula. There are also rumors of a few hams from Mexico who will be on a DXpedition by boat from Mexico via Africa. We will keep you informed of their schedules and frequencies beforehand.

Are you thinking about taking a vacation to Mexico in the near future? Did you realize that there are all kinds of tourist opportunities with Mexico's past devaluations? Perhaps you would like to listen in on two meters and would like to know more about the repeaters available throughout the country, especially in tourist zones. You will be informed about this, too, now that Mexico has joined "73 International." You may also have a few questions about regulations here in Mexico and agreements between Mexico and other countries. This also will be considered. As a correspondent for *73* from Mexico, I would like to invite our Mexican readers to get in touch with me by radio or mail upon hearing of or planning any DXpeditions, contests, radio-club activities, or otherwise. So, *look for* my column next month! Join in with Mexico, as Mexico joins "73 International." *Adios* and *hasta la vista* for now. 73 and DX!



THE NETHERLANDS

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The national Dutch amateur-radio station PA0AA owned and operated by the largest amateur radio society in Holland, VERON, is on the air every Friday on the 80-, 20-, and 2-meter bands on 3.600 kHz, 14.100 kHz, and 144.8 MHz with the following schedule (times in UTC):

1900 News in Dutch (weather forecast, news about contests, etc.)
1915 News in English (weather forecast, news about contests, etc.)
1930 Code course for beginners
2000 Code course for the advanced
2030 RTTY news bulletin
2100 Repetition of the news in Dutch
2115 Repetition of the news in English

At 2130 UTC, PA0AA will be listening for amateurs with questions and will make some OSOs.

CB RADIO IN HOLLAND

Although it has little to do with amateur radio, I want to write something about CB radio in Holland. Every Dutch citizen who has reached the age of fourteen can get a license for CB. In Holland, only factory-made rigs with a special certification mark on the front are allowed. The output must not exceed 2 Watts. Furthermore, only the use of 40 channels and FM modulation with an omnidirectional antenna is permitted. The annual license fee is 35 Dutch florins. It is also possible for foreigners to get a CB license in Holland. For details and information, you can write to the Dutch Post and Telecommunication Administration. The address is: PTT Radiocontrole Dienst, afd.MARC.-machtigingen, Postbus 570, 9700 AN Groningen, The Netherlands.

SPECIAL AWARD

Among the many awards which we have in Holland, there is a very interesting and special one. It is the Airborne Memorial Award. This award is founded in remembrance of the airdrops of September, 1944, at Renkum, Wolfheze, and Oosterbeek previous to the battle of Arnhem (September 17, 1944).

The clear profit of this fund goes to the Airborne Forces Security Fund. The money from this fund in many cases helps the close relatives of flyers to come to Holland (Oosterbeek) and to make a visit to the graves of the men who gave their lives for our freedom during WWII.

Every year on the 17th of September, the hams who live in the region of Renkum and Oosterbeek will come on the airwaves and identify themselves with "CO AMA" (Airborne Memorial Award). For details and information, write: PO Box 80, 6860 AB Oosterbeek, The Netherlands. Please enclose two international reply coupons.

NEW ZEALAND

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Greetings from ZL again. Over the next few months, I shall endeavor to cover some of the specialist groups within the structure of New Zealand amateur radio. The first on the list, in honor of its 21st birthday year, is the WARO Club, the Women's Amateur Radio Operators' Club of NZART.

WARO was formed as a result of a suggestion made to a small group of YL operators at the 35th annual conference of NZART at Hamilton in June, 1961. The idea was met with enthusiasm, national nets were begun in July, 1981, and all YL operators were contacted by letter outlining the proposal and advising details of the inaugural meeting at Rotorua on March 10, 1982. Those present at that first meeting were Thelma Souper ZL2JO, Florence Voss ZL1AXP, Judith Holland ZL1AWM, Celia Reed ZL1ALK, Jannette Barker ZL1ANA, Vicki Shaw ZL1OC, and Enid Rosen.

WARO was honored to have among its founding members a few YLs who had been on the air since the early 1930s, notably Thelma Souper, the first secretary/treasurer, and Myrtel Earland ZL4GR, New Zealand's first licensed YL operator, a lady of some renown who is still active after more than 50 years of amateur-radio operating.

The constitution of WARO, "to promote and encourage friendship and interest in

radio amongst women radio operators," has been well fulfilled since the beginning with just a handful of members. Today, there are 92 licensed YLs, 37 overseas YL operators, and 23 associate members. These figures mirror the steady progress which is continuing, as well as WARO gaining worldwide recognition within international amateur-radio circles. The first overseas WARO member was Mildred K9HRH, who joined in 1963. She became a silent key in 1989.

In 1969, the WARO Award was introduced—it features an attractive certificate of "Pania of the Reef" (a female from Maori legends), with additional seals for extra YL contacts after the basic award. The details of the WARO Award appear later in the column.

The WARO also have an annual HF contest which is thoroughly enjoyed by YLs and OMs alike, the winner receiving the "Thelma Souper Memorial Cup," named in honor of Thelma, a founding member and past president of WARO, who bacame a silent key on 16 December 1977.

In 1981, WARO adopted an emblem and included it in a WARO badge which is now proudly worn by all members.

Pen pictures of some of the early WARO members must include the Grand YL of New Zealand amateur radio, Myrtle Earland ZL4GR. Myrtle, of Dunedin, better known to operators around the world as "Myrt," became ZL's first licensed woman amateur-radio operator in 1930 with the callsign OZ3AG. Like so many of the very early licensed operators, Myrt was an expert at CW; during World War II, Myrt and her OM, Fred ZL4AM, were at a QTH about 120 miles from Dunedin at Omakau. There they monitored the HF bands, recording coded enemy messages and sending them by a direct telephone "wire" to Dunedin. As Myrt dryly comments, it was the longest antenna she's ever had, but the landline had to be used because during the war years, amateur-radio operation was suspended and transmitters were sealed by the government to prevent unauthorized transmissions. In later years, Myrt moved to Dunedin, where she has had many contacts, but the most exciting to her was the one with an operator on board the prime recovery ship for the Apollo X astronauts on 28 May 1969.

Myrt has also been involved in emergency operations over the years, the earliest being the 1931 Napier earthquake, when she acted as a relay station for messages. More recently, Myrt was on duty in the Green Island (Dunedin) Civil Defense Headquarters during the Abbotsford landslip emergency.

For her 50 years as an amateur-radio operator, WARO presented Myrtle with a very special WARO Award in 1980, in recognition of the Grand YL of ZL radio.

Thelma Souper ZL2JO (silent key), who was first licensed in March, 1931, as ZL2FR, later ZL1CN and ZL2AO, operated 40 meters when 40 was a CW-only band. After World War II, Thelma was allocated ZL2JO, the callsign she held until her passing to the hall of silent keys. Thelma was a very active amateur operator during her career as a YL ham; she participated in the Eyeball Amateur Radio network, an American eye-bank net assisting the medical authorities with the transfer of eyes for transplants after accidents or medical emergencies. She was also a founding member of WARO, as well as holding the offices of secretary/treasurer and president over the years.

Florence Voss ZL1AXP, the first president of WARO, became interested in amateur radio when her OM, Sandy ZL1AWA, got his license. Florence was licensed in 1961 and was one of the small group of YLs at the Hamilton conference where WARO was conceived. She reminisces, looking back through her logbook, noting that the net members have increased so much in the ensuing years that there are now three WARO nets, a North Island, a South Island, and a National net, held on Monday nights through the month.

Another early member, Sylvia Kirkland ZL2LS (ex-ZL2QZ and -ZL1BCM) was first licensed in 1954, but her interest in radio goes back to 1922 when she was at school in Oxford, England. A demonstration at the school took two men two days to set up. They erected a massive antenna and had two large tables in the school hall loaded with gear. They were supposed to be listening to a stage musical relayed from London, but the set had no selectivity and all that could be heard were several CW stations, weather stations, shipping, etc., as well as plenty of static, but very little music. The men gave a talk on radio and how it worked; it was that demonstration which kindled her interest in radio and led her to a ham-operator's call in 1954. Sylvia now lives at Eskdale, a short distance north of Napier, New Zealand, and is still active on the air with the TS-520 her family gave to her for Mother's Day about seven years ago.

AWARDS

The WARO Award mentioned above is outlined here.

General: The certificate depicting "Pania of the Reef" is awarded for contacts on any band, SSB/CW/AM, from the same QTH, but net contacts or contest contacts are ineligible for the award. No QSLs required—send a certified list to: Custodian ZL1OC, PO Box 2088, Whakatane, New Zealand, with sufficient postage (IRCs) for the return of the certificate.

The Legend: An old Maori legend tells how Pania, a young Maori maiden, lured by the siren voices of the sea people, swam out to meet them. When she endeavored to return to her lover, she was transformed into the reef which now lies beyond the breakwater at Napier, New Zealand, and bears her name.

HF Bands: DX stations, work 6 resident ZL WARO members. Contacts to date from June 1, 1969. Endorsements for each additional 6 WARO member stations worked, which can include up to 3 overseas WARO members, are available. VK and ZL, work 6 North Island and 6 South Island WARO members for the basic award. Endorsements for every additional 12 WARO members worked.

Listeners: DX listeners, list 10 QSOs dating from June 1, 1969. Endorsements for each additional 5 QSOs heard. VK and ZL listeners, 20 QSOs heard. Endorsements for every additional 10 QSOs heard.

For those interested in this award, ZL YLs may be found each month on International YL Day, the 6th day of every month, on 14.288 either in QSO or calling on the hour, every hour, from about 0600Z. Good luck, and good certificate-hunting, as it is a very nice certificate to have.

BITS 'N' PIECES

NZART World Communications Activity Day, May 21, 1983, was an outstanding success, even though propagation for DX communication was not as good as it could have been. The 8 stations, ZLs 1/4 and 6/9WCY, operated most modes and most bands during the 24-hour period; the stations worked a total of 10,000+ contacts in nearly 100 countries, and about 300 participating hams and helpers were involved at some time or other during the day. QSLs will be sent from the log sheets for all contacts made with ZL WCY stations on that day, and there is no need for return QSL cards. Arthur Law ZL2HE, NZART vice president and coordinator of WCY Activity Day, 1983, and the New Zealand amateur fraternity thank all the DX and local stations who participated in our WCY day and helped to make it such a great success.

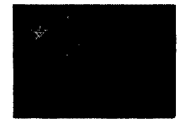
FUTURE HAPPENINGS IN ZL

JOTA, the Jamboree of the Air for the scouting movement, again will be well supported by ZLs in October; we look forward to many good QSOs with other DX stations during the JOTA.

ZL9WCY will be on the air again at a special-event station from the annual Hawkes Bay Agricultural and Pastural Show in October this year. Operating times from the show on 40, 20, 15, or 10 meters, depending upon propagation, will be from 2200Z to 0400Z, approximately, October 19, 20, and 21. The station also could be on the air at other times activated from home stations.

Rose City Conference, 1984: The Annual NZART Conference, 1984, will be held at Palmerston North, New Zealand. For any overseas amateurs who may be touring in this area, the conference will be held over the weekend of June 1-4. Enquiries sent to PO Box 1718, Palmerston North, will be promptly answered. If your holiday plans include ZL-land, we'd like to have you at our conference.

DX News: The Kermadecs, Raoul Island ZL/K, will be activated again soon. Warwick ZL3AFH, currently ZK1WL, Northern Cooks, will be working on Raoul Island for a period commencing later this year, but he will not be properly organized with antennas, etc., until about January, 1984. Warwick, I understand, will be as active as his duties permit and could be on RTTY and OSCAR as well as SSB. More information about the Kermadecs as it comes to hand. It is a rare one and has not been activated for a number of years.



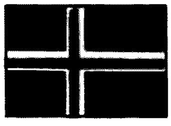
PEOPLE'S REPUBLIC OF CHINA

Rod Hallen KB7NK/DU1
Amembassy-RCPO
APO San Francisco 96528

On 27 May 1983, in the company of Karl K4YT and Jan KG3R, I visited BY1PK in Beijing, People's Republic of China. With the help of an interpreter, we had a long discussion about present and future ham-radio operations in China with Mr. Tong and Mr. Yan. BY1PK is now operating CW only, but plans for SSB operation at some unspecified future date are in the works. BY8AA is also on the air (CW only) from another Chinese province. It is expected that operations will also be started from Shanghai and Guangzhou (Canton) soon, possibly within the next 6 months.

The equipment at BY1PK at the present time consists of a Yaesu FT-107M, a Kenwood-Trio TS-930S, a Canadian 1-kW amplifier, and various clocks, keyers, etc. Antennas which are on top of a 7-story building about 100 feet above ground consist of a rotary Hy-Gain TH6DXX and 2 broadband dipoles. The antenna installations are very heavy-duty and look very professional. The station location is in a new building. Attempts last summer to visit BY1PK were not successful because the building was still under construction at that time. Mr Tong stated that all amateur-radio operators visiting in the People's Republic of China would be welcome to visit BY1PK. Arrangements can be made through the China Radio Sports Association and it would be well to bring your own interpreter since they are not always available at the station location.

When we explained to Mr. Tong, through the interpreter, the meaning of "eyeball QSO," he was quite happy to provide us with BY1PK cards commemorating our visit. When you visit, bring along a few of your own cards, also.



NORWAY

Bjorn-Hugo Ark LA5YJ
Postboks 39, Manglerud
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Oslo 6, Norway

MOBILING IN NORWAY

Norway is a wonderful country to spend your holidays in, especially while mobile operating. As always, plenty of time is essential, but who has enough time to spend on their vacation? It is wise to take it easy and concentrate on one part of the country instead of running through the country at full speed on the highways. That would not be much of a vacation at all. Spend some time in planning the vacation, select certain points to stay for a couple of days or more, and take shorter trips in that specific area.

On most maps, Norway may look little and tiny due to the type of projection used, but on the contrary, it will be nothing like that in reality. As an example, from the southernmost point, Cape Lindesnes, to the northernmost, the well-known North Cape, is over 2600 kilometers—and add another 700 kilometers if you would like to cover the distance to the Russian border. This distance is the same as the distance between Oslo, the capital, and the near-southernmost point in Italy, and bear in mind this is not the road distance, which will turn out to be quite a bit more.

I would suggest visiting the southeast or southwest part or, if the midnight sun is dragging, the northern part of the country. The scenery in any part is worthwhile seeing. Shifting from stony, treeless seasides to fertile green flatlands bulging with grain and vegetables, from endless spruce and pine forests to the wild and naked mountain ranges cut with vigorous valleys, together these form the country we Norwegians are so fond of.

Remember that the country has existed since about the year 1,000, and the oldest city, Tonsberg, is over 1,000 years old, closely followed by Trondheim, which will reach this age around 1990. It seems unbelievable, but all over the country you will very easily find buildings and other sights several hundred years old, with the exception of the northwestern part and northern Norway, where in coastal cities most of the buildings were bombed and burned down during the invasion and retreat of the German army in WWII.

You will find it quite interesting mobiling through a country with so much space for its inhabitants. Even in the city and county of Oslo, three-quarters of the area is covered with forest, wilderness, and farmlands. I wonder how many capital cities around the Western Hemisphere can show off something like that?

Some good advice before starting. Apply for your reciprocal license early so you will be sure to have it on hand before leav-

Continued on page 137

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Fargo ND 58102

Take the Drudgery Out of Contesting

Let your Radio Shack computer dupe the log while you relax.

Field Day is over; you've let down the antennas, carted away the gear, and stowed the generator until next year. Now comes the real fun, verifying and checking the log sheets for dupes. Bet you can't wait to get started, can you?

Since Ken and I each purchased a TRS-80 Color Computer™, we have been looking for applications relating to amateur radio. (One gets tired of balancing the checkbook and playing Space Invaders.) After Field Day last year, Ken decided he had found another computer application—and CALLSORT was born. This year, it was used again during Field Day and for other contests. CALLSORT is thoroughly debugged and can assist you when it is time to go over those log sheets.

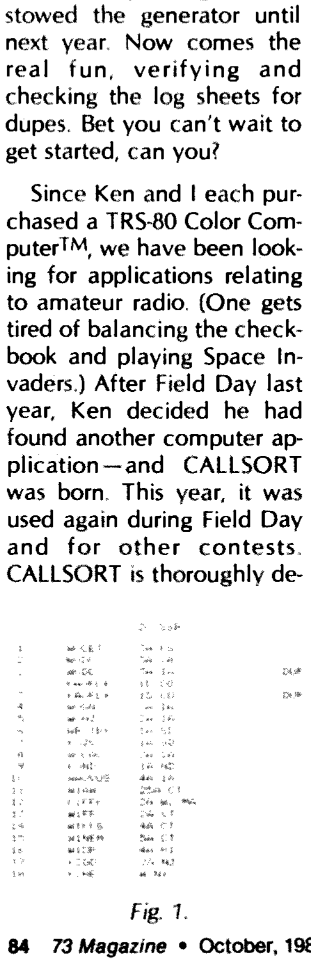

Fig. 1.

The program will let you enter data directly from a log sheet and print a sorted list with or without duplicates on a printer or the CRT. The program handles up to 500 calls if you have a 32K computer. (I probably will never work 500 stations on a single band in my life.) If you have a 16K machine, you will have to modify only lines 20 and 30. When you are done, you can save the log to tape for future reference. You also may stop at any time, save the calls you have entered, and continue entering calls at a later time. This works nicely when you get interrupted by those rare DX calls on 20 meters.

The program is well remarked and should be easy to follow. All remarks may be removed (the REM-line numbers end with a 5). For optimum speed, delete unnecessary spaces when entering the program; they have been left in our listing for easy readability.

One more note, before we look at the program operation in greater detail: In several locations you will find POKE commands. These are used to increase the processing speed of the Color Computer. Just before entering the sort routine in line 170, the computer processing speed is increased. Before tape and printer routines, it must be slowed down again.

Some color computers will not work when you try to increase the speed. If you have never tried this POKE before, *be sure* you save a copy of the program and verify it before you run the program! If the computer "locks up," your machine will not accept the high-speed POKE. To regain control, you will have to press RESET. Control should return to Basic and you should be able to continue work. Just remove the POKEs; the only thing you will lose is a little speed. (If you would like more information on using the high-speed POKE on machines that lock up, send your request and an SASE to Ken W0CZ.

Once the program is typed in and run, you will be prompted for keyboard or tape input. Select the keyboard option. Enter the call, a space, and the section. Fig. 1 is a sample printout of the program; use it as a guide to inputting call data. The numbers on the left are generated by the print routine and are not to be entered from the keyboard. If you make a mistake while entering a call, just press the backspace key. The entire line will be erased and you just reenter the line again.

Once all of the calls have been entered, enter #. You will be asked if you want to save to tape. Then you will be asked if you want a printed list. Just follow the prompts as desired.

The tape file is stored using the contest name. Contest names will automatically be abbreviated to an eight-letter filename. Each tape will contain the band and mode information you enter.

The program is also easily converted to Color Computer disk files. Remove the tape prompts and change all references to buffer #−1 to

```
5 'CALLSORT BY KEN CHRISTIANSEN V 1.1 8-23-82
10 CLS
20 PCLEAR 1:CLEAR 12000
30 DIM A$(500),AA$(500),AB$(500),AD$(500)
40 P=0
50 I=0
60 PRINT@11,"CALLSORT":PRINT@37,"BY KEN CHRISTIANSEN"
70 PRINT@224,"PRESS 1 TO INPUT FROM KEYBOARD"
80 PRINT@288,"PRESS 2 TO INPUT FROM TAPE"
90 R$=INKEY$:IF R$=""GOTO 90
100 IF R$="2" GOSUB 1590
105 '************GET CALLS*******
110 CLS
120 PRINT:PRINT "INPUT CALL SIGN AS IN THIS       EXAMPLE       :A9ABC SECTION"
130 PRINT:PRINT "PRESS <@> TO START SORT"
140 IF R$<>"1" THEN:PRINT@426,R$
150 GOSUB 880
160 POKE 65494,0:GOSUB 710
165 '**********SORT CALLS*******
170 POKE 65495,0
180 X=0
190 X=X+1
200 IF X>I THEN GOTO 650
210 IF A$(X) = "ZZ" THEN 190
220 FOR Y=1 TO I
230 IF A$(Y)<A$(X) THEN X=Y
240 NEXT Y
250 POKE 65494,0
260 Z=Z+1
270 IF J=2 THEN Z=0
280 IF O=2 THEN Z=0
290 G$=AA$(X)+AB$(X)
300 IF G$=H$ GOTO 320
310 P=P+1
320 IF P=0 GOTO 380
330 PRINT USING "####";P;
340 PRINT TAB(6) AA$(X)+AB$(X);
350 PRINT TAB(13)AD$(X);
360 IF X=I GOTO 380
370 IF G$=H$ THEN PRINT TAB(28)"DUP";
380 PRINT
390 IF O=2 GOSUB 850
400 IF J=2 GOSUB 480
410 IF Z=10 GOSUB 450
420 A$(X)="ZZ"
430 H$=AA$(X)+AB$(X)
440 GOTO 180
450 INPUT "  PRESS <ENTER> TO CONTINUE";Z
460 Z=0
470 RETURN
475 '********PRINTER ROUTINE****
480 IF K<>2 AND G$=H$ THEN GOTO 570
490 PRINT#-2,TAB(LL)"";
500 IF P<100 THEN PRINT#-2," ";
510 IF P<10 THEN PRINT#-2," ";
520 IF P<>0 THEN PRINT#-2,P;
530 PRINT#-2, TAB(10+LL) AA$(X)+AB$(X);
540 PRINT#-2,TAB(20+LL) AD$(X);
550 IF X=I GOTO 570
560 IF G$=H$ THEN PRINT #-2,TAB(40+LL)"DUP";
570 PRINT #-2,CHR$(13);
580 IFX/50=INT(X/50)THEN GOTO 600
590 GOTO 640
600 PRINT@480,"":PRINT "TO CHANGE LEFT MARGIN ENTER NEW LEFT MARGIN":INPUT"PRESS
 <ENTER> TO CONTINUE";LZ
610 IF LZ<>0 THEN LL=LZ
620 PRINT#-2,TAB(10+LL)R$" CONTINUED"
630 PRINT#-2,"      "
640 RETURN
650 POKE 65494,0
660 IF J<>2 THEN 680
670 PRINT#-2,CHR$(13);
675 '*********END ROUTINE*********
680 CLOSE #-1:CLS:PRINT@224,"ANY MORE CALLS (Y/N)?"
690 A$=INKEY$:IF A$="" THEN 690
700 IF A$="Y" THEN RUN ELSE END
705 '*GET TAPE AND PRINT OPTION*
710 CLS:PRINT:PRINT:PRINT:PRINT:INPUT "    ENTER 2 FOR TAPE COPY ":O
720 IF O<>2 GOTO 740
730 CLS:PRINT@132,"POSITION TAPE AND PRESS          RECORD AND PLAY"
740 PRINT:PRINT:PRINT:PRINT:PRINT:INPUT "    ENTER 2 FOR HARD COPY ";J
750 IF J<>2 AND O<>2 THEN 840
760 CLS:PRINT@198,;:INPUT "BAND AND MODE";R$
770 CLS:PRINT@198,;:INPUT "AMOUNT OF LEFT MARGIN";LL
780 IF J<>2 THEN 810
790 PRINT#-2,TAB(20+LL)R$
800 CLS:PRINT@195,;:INPUT "ENTER 2 IF YOU WANT DUPLICATES PRINTED ON HARD COPY";
K
810 IF O<>2 THEN 840
815 '*********SAVE TO TAPE********
820 INPUT "ENTER NAME OF CONTEST";FI$:IF LEN(FI$)>8 THEN FI$=LEFT$(FI$,8)
830 OPEN"O",#-1,FI$
840 RETURN
850 IF G$=H$ THEN GOTO 870
860 PRINT#-1, R$,AA$(X),AB$(X),AD$(X)
870 RETURN
875 '***GET CALL AND SECTION****
880 I=I+1
890 BJ=128+(32*I)
900 IF BJ>448 THEN BJ=448
910 PRINT@BJ,"                                  ";
920 PRINT@BJ,"";
930 BA$=INKEY$
940 BH$=""
950 IF BA$=CHR$(13) THEN BA$=""
960 IF BA$=CHR$(8) THEN I=I-1
970 IF BA$=CHR$(8) THEN BJ=BJ-32
980 IF BA$=CHR$(8) GOTO 900
990 IF BA$="" GOTO 930
1000 IF BA$="@" GOTO 160
1010 PRINTBA$;
1020 BB$=INKEY$
1030 IF BB$=CHR$(13) THEN BB$=""
1040 IF BB$=CHR$(8) GOTO 890
1050 IF BB$="" GOTO 1020
1060 BB=ASC(BB$)
1070 IF BB>47 AND BB<58 THEN BC$=BB$
1080 IF BB>47 AND BB<58 THEN BB$=""
1090 IF BB$="" GOTO 1160
1100 PRINT BB$;
1110 IF BB$="" GOTO 1170
1120 BC$=INKEY$
1130 IF BC$=CHR$(13) THEN BC$=""
1140 IF BC$=CHR$(8) GOTO 890
1150 IF BC$="" GOTO 1120
1160 PRINT BC$;
1170 BD$=INKEY$
1180 IF BD$=CHR$(13) THEN BD$=""
1190 IF BD$=CHR$(8) GOTO 890
1200 IF BD$="" GOTO 1170
1210 PRINT BD$;
1220 IF BD$="&" GOTO 890
1230 BE$=INKEY$
1240 IF BE$=CHR$(8) GOTO 890
1250 IF BE$="" GOTO 1250
1260 IF BE$=CHR$(13) GOTO 1290
1270 IF BE$=CHR$(32) GOTO 1290
1280 GOTO 1320
1290 BE$=""
1300 BF$=""
1310 GOTO 1420
1320 PRINT BE$;
1330 BF$=INKEY$
1340 IF BF$=CHR$(8) GOTO 890
1350 IF BF$="" GOTO 1330
1360 IF BF$=CHR$(13) GOTO 1390
1370 IF BF$=CHR$(32) GOTO 1390
1380 GOTO 1410
1390 BF$=""
1400 GOTO 1420
1410 PRINT BF$;
1420 PRINT TAB(8)"";
1430 BG$=INKEY$
1440 IF BG$=CHR$(8) GOTO 890
1450 IF BG$=CHR$(13) AND BH$="" THEN BG$=""
1460 IF BG$=CHR$(32) AND BH$="" THEN BG$=""
1470 IF BG$="" GOTO 1430
1480 IF BG$=CHR$(13) GOTO 1530
1490 PRINT BG$;
1500 BH$=BH$+BG$
1510 GOTO 1430
1520 PRINT
1530 AA$(I)=BA$+BB$
1540 AB$(I)=BC$+BD$+BE$+BF$
1550 AD$(I)=BH$
1560 A$(I)=AB$(I)+AA$(I)
1570 PRINT:PRINT:
1580 GOTO 880
1585 '****LOAD A TAPE FILE******
1590 CLS:PRINT@224,"POSITION TAPE AND PRESS PLAY"
1600 INPUT"ENTER NAME OF CONTEST";FI$
1610 IF LEN(FI$)>8 THEN FI$=LEFT$(FI$,8)
1620 CLS:PRINT@234,"SEARCHING"
1630 OPEN "I",#-1,FI$
1640 I=0
1650 I=I+1
1660 IF EOF(-1) THEN 1710
1670 INPUT#-1, R$,AA$(I),AB$(I),AD$(I)
1680 PRINT@426,R$
1690 A$(I)=AB$(I)+AA$(I)
1700 GOTO 1650
1710 CLOSE#-1
1720 I=I-1
1730 CLS:PRINT@141,R$
1740 PRINT@419,"PRESS <ENTER> TO CONTINUE"
1745 '*DELETE UNWANTED ENTRIES**
1750 PRINT@131,"";:INPUT "TYPE IN NUMBER OF RECORD IF      YOU WANT TO DELETE AN
ENTRY      THAT WAS ON THE TAPE?                 ";ZA
1760 A$(ZA)="":AA$(ZA)="":AB$(ZA)="":AD$(ZA)=""
1770 RETURN
```

Program Listing.

#1 by just deleting the − sign. To convert CALLSORT to run on a Model I or III, the OPEN and CLOSE statements may be deleted. Disk systems should run as is, with the buffer number change. Change all PRINT #−2 references to LPRINT and remove the POKEs.

As you can see by Fig. 1, you can list duplicate entries on the printer. If you want to use the printout to send to the contest authorities, just press <ENTER> when prompted about printing duplicate entries. If you don't have a printer, a sorted list of the calls will be displayed, a screenful at a time. If you are copying them by hand, just press <ENTER> to view the next group of calls.

The program produces a total count of entries—notice that duplicates have the same number on the list. The number by the last call on the list is your total number of valid contacts. To delete a call from the list, read the list in from tape. Enter the number of the call to be deleted as listed on the printout and rewrite the file to tape. You will be prompted for this if you select the INPUT FROM TAPE option 2 at the beginning of the program.

One last comment about the sort. Those who are interested in such things will find the sort routine to be a Basic bubble sort. Though relatively slow, it is infinitely faster than I could sort by hand. Typically, it takes about 3 seconds for the next call on the list to be displayed. I would be interested, though, in hearing from anyone who might improve the performance of this routine.

Ken and I have found that the program takes out just about all of the drudgery of contest logging. Just a few minutes entering the log sheets into the computer is all that is required. The program is especially useful when used by multi-operator stations where duplicates are easily overlooked on multiple log sheets.

If you are like me, you hate to type in long Basic programs. We will send a copy of the program on cassette for $5.00. Specify cassette or disk version, and mail your request to Ken.

A few moments entering this program now will save lots of time after the next contest—time that can be much more profitably used discussing contest results over the local repeater. 73 and happy contesting! ■

Robin Rumbolt WA4TEM
1134 Glade Hill Drive
Knoxville TN 37919

World's Fair Super Squelch

With this two-digit DTMF decoder—a perfect club project—you hear only calls meant specifically for you.

Early in the planning stages for the world's fair amateur radio station, WA4KFS, it was decided that a telephone in the station would not be desirable. After all, we wanted to demonstrate the usefulness of radio—and the budget was tight. A telephone seemed out of place. Still, there was a need for a way to get through to the station's control operator without forcing him to monitor a normally busy repeater. Since each of the directors of the Tennessee Wireless Association, the station's sponsor, had touchtone™ capabilities, a touchtone-operated squelch was the obvious answer. The circuit presented here is the one that we used at the fair.

Description

The circuit in Fig. 1

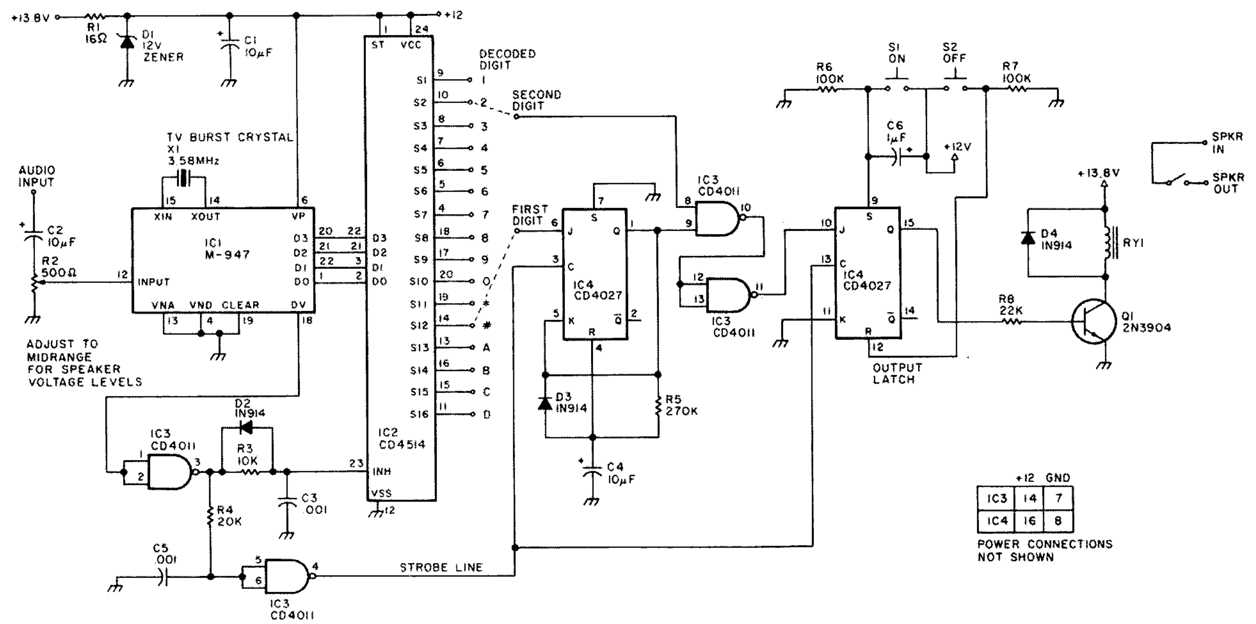

Fig. 1. Touchtone squelch schematic.

makes use of the M-947 DTMF decoder from Teltone, of Kirkland, Washington. The 947 has, on a single IC, all of the filters, amplifiers, and tone detectors needed to detect all 16 touchtone digits and output the corresponding binary codes.

These binary codes are then routed to a CD4514 four-to-sixteen-line decoder 1C which activates a single output line for each touchtone digit. The outputs of this IC should then be connected to the proper stages of the sequence detector corresponding to your desired access code.

Also attached to the 947 decoder are a couple of gates wired as inverters and used with a couple of RC networks to provide delays in strobe-line timing needed to ensure proper clocking of the sequence detector.

The CD4027 dual J-K flip-flop IC is used as a sequence detector. In our case, we needed only a two-digit sequence. However, any number of flip-flops may be wired in series to provide sequence codes of any length. One flip-flop is needed per digit. A four-digit sequence detector is shown in Fig. 2.

Resistor R5 and capacitor C4 form a timer which resets the detector about one second after the first digit of the sequence is received. In this way, not only must the proper sequence be received, but it also must be received in a given time. This guard time may be adjusted for longer sequences according to the formula: Time in seconds = RC/2, where R is in Ohms and C is in microfarads.

The last stage of the sequence detector is the output latch. Attached to its set-and-reset inputs, momentary push-button switches S1 and S2 are provided for local control of the squelch. Pressing S1 will enable the speaker, while pressing S2 will disable the speaker until the next correct sequence is received.

Transistor Q1 is used as a buffer/driver between the output latch and reed relay RY1. Relay RY1 is connected in series with the radio's speaker leads.

One last comment. Since the M-947 is limited to a maximum power-supply voltage of 13.5 V, a 12-volt zener is included to protect the decoder from power supplies with 13.8-volt outputs. Yes, it is *that* critical!

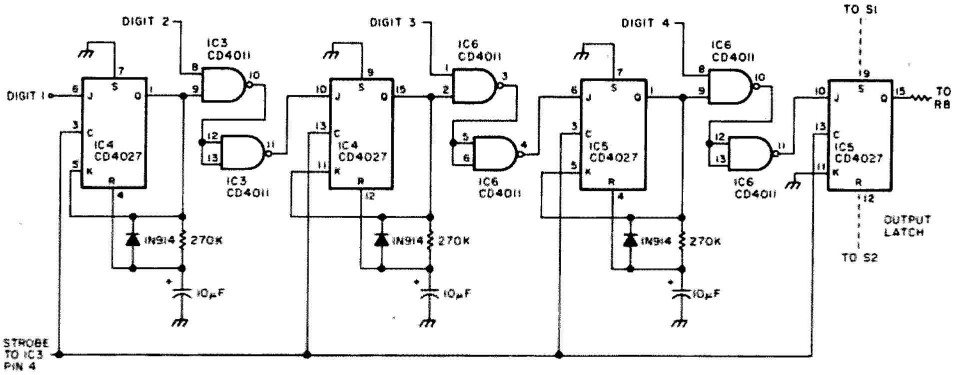

Fig. 2. Four-digit sequence detector.

Construction and Operation

Our two-digit detector was built on perfboard in a Bud CU124 die-cast minibox. It was then wired into the accessory socket of a KDK2025 MK11 2m transceiver.

Before applying power, set your rig's volume control to a normal listening level and then apply power to the circuit. The circuit will always come on in the unsquelched condition. If the opposite is desired, connect capacitor C6 across the off switch, S2, instead of across S1. Now, using another transmitter, send the desired access code to the receiving rig. The speaker will be enabled after the last digit of the access code is released. The speaker then will remain enabled until turned off locally with the off button. Although no circuit for turning off the speaker remotely was included in this design, another sequence detector could be built with its output feeding the K input of the output latch to accomplish this task. ■

Parts List

Designation	Description	Price Each	Total
R1	16 Ohm, ¼ W, 5% (15 Ohm may be used)	.06	$ .06
R2	500 Ohm, ¼ W potentiometer	.59	.59
R3	10k Ohm, ¼ W, 10%	.06	.06
R4	20k Ohm, ¼ W, 5%	.06	.06
R5	270k Ohm, ¼ W, 5%	.06	.06
R6, R7	100k Ohm, ¼ W, 10%	.06	.12
R8	22k Ohm, ¼ W, 10%	.06	.06
C1, C2, C4	10-uF electrolytic, 15 volt or greater	.59	1.77
C3, C5	.001-uF, 50-volt ceramic disc	.20	.40
C6	1-uF electrolytic, 15 volt or equivalent	.59	.59
D1	Zener diode, 12 volt, 1 Watt, 1N4742 or equivalent	.45	.45
D2-D4	1N914 or equivalent	.10	.30
Q1	Transistor NPN 2N2222, 2N3904, or equivalent	.69	.69
IC1	*Teltone M-947 DTMF decoder	53.00	53.00
IC2	CMOS CD4514, 4-bit latch, 4-to-16-line decoder	3.95	3.95
IC3	CMOS CD4011, quad NAND gate	.39	.39
IC4	CMOS CD4027, dual J-K flip-flop	.69	.69
X1	Crystal TV Color Burst, 3.579545 MHz	1.98	1.98
RY1	12 V dc SPST	2.99	2.99
S1, S2	Push-button momentary SPST (RS 275-1547)	.50	1.00
MISC	IC socket, 14 pin	.20	.20
	IC socket, 16 pin	.22	.22
	IC socket, 22 pin	.37	.37
	IC socket, 24 pin	.38	.38
	Perfboard (RS 276-1390)	1.39	1.39
	Minibox, Bud CU124	4.40	4.40
		Total	$76.17

*Available from Teltone Corp., PO Box 657, 10801 120th Ave. N.E., Kirkland WA 98033; (206)-827-9626.

Terry F. Staudt W0WUZ
4807 S. Blue Spruce Road
Evergreen CO 80439

Defuse RFI

A clean signal starts with a good earth ground. Make yours better with some coax and capacitors.

As a long-time denizen of 10 meters, I have learned along with my like-minded compatriots to suffer when the band is really running well and our friends from 80, 40, and 20 come up to partake of the fun and games. Suffer? You bet!

A ground wire is totally ineffective over 1/8 wavelength on the frequency in use. Dc yes; rf no. This works out to about 4 feet on ten. I realize it is extremely difficult to achieve a situation where your ground wire is 4 feet or less, *to the earth,* not the toilet!

Another problem (coincidental with the above) is rf feedback in the TX audio which in its least annoying form makes your voice sound like vibrating chicken wire and in its worst sends spurs running 100 kHz up and down from your center frequency (or from dc to daylight, as we used to say in Navy ECM).

For considerably less than $5.00, there are steps to take that can result in hearing, either while in QSO or afterwards when the station you worked is talking with someone else, "Lord, that guy in—had beautiful audio!" These measures are not new, but like so many other pieces of hands-on know-how, need to be repeated and correlated every now and then to refresh and instruct those who don't read electronics books on the john.

If your rig is in the basement, effect a ½" 45° hole in the wall with a masonry bit or star drill and drive a 6- to 8-foot ground rod, leaving about 5 inches protruding. Seal with waterproof putty or silicone. Properly placed, this will give you about a 1-foot ground connection. For those not in the basement, a coaxial ground[1] is needed. This is a simple miracle that makes your effective ground length only a few inches!

A coax ground is made using *good* quality (95% shield braid) coax such as Columbia 1107 or 1108 RG-8X or Mini-8 with a stranded center conductor. The center conductor is used as the ground wire, connected to the *rf generating unit* and the outside ground system. It's by-passed at each end with a .01-uF, 1-kV disc capacitor to the shield braid (see Fig. 1). Don't tie all of your station's components together with zip cord or aluminum wire. Let the coax shield handle the dc grounding between units as it is seldom over a foot or so long. Otherwise you set up ground rf loops that defeat everything you've done.

Microphones seem to be universally designed for use in high school auditoriums, with no rf suppression whatsoever. This is simple, so simple that there is absolutely no excuse for rf feedback in this area. All that is usually necessary is to install a .01-uF disc capacitor across the microphone cartridge (do it quickly, because it can't take much heat!) and add a 1-mH choke in series with the audio high lead. This may be done at the mike or on the inside of the mike jack of the transmitter, which is more convenient when using several microphones. If using a power mike, ferrite beads on the transistor base leads and a "pi" filter using two .005-uF capacitors with a 1-mH choke is called for (Fig. 2).

In summation, there is absolutely no excuse for the cruddy signals on HF, and if you're not going for the solution, you're certainly part of the problem. These steps will also knock an RFI problem in the ditch. ■

Reference

1. ***73 Magazine*, May, 1980, p. 82, "The Capacitive Coaxial Ground Wire."**

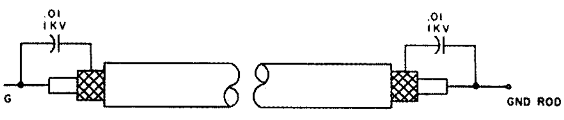

Fig. 1.

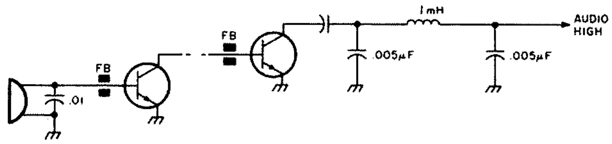

Fig. 2.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

WOODBRIDGE NJ
OCT 1

The De Vry Technical Institute Amateur Radio Club will hold its annual flea market on October 1, 1983, from 9:00 am to 4:00 pm, in the school parking lot, 479 Green Street (between Rtes. 1 and 9), Woodbridge NJ. Admission is $3.00 for sellers and free for buyers. No electricity will be available. For further information, contact Frank Koempel WB2JKU, De Vry Technical Institute, 479 Green Street, Woodbridge NJ 07095.

SYRACUSE NY
OCT 1

The Radio Amateurs of Greater Syracuse (RAGS) will hold their annual Hamfest and Computer Display on Saturday, October 1, 1983, from 9:00 am to 6:00 pm, at the Art and Home Center, New York State Fairgrounds, Syracuse NY. Admission is $3.00 at the door. Featured will be commercial exhibitors, a large indoor and outdoor flea market, tech talks, an ARRL booth, displays, women's activities, contests, and entertainment. Hot food and beverages will be served. Talk-in on .90/.30, .31/.91, and .52 simplex. For further information, contact RAGS, Box 88, Liverpool NY 13088.

WARRINGTON PA
OCT 1-2

The Pack Rats (Mt. Airy VHF ARC) cordially invite all amateurs and their friends to the 7th annual Mid-Atlantic VHF Conference which will be held on Saturday, October 1, 1983, from 9:00 am to 5:00 pm, at the Warrington Motor Lodge, Route 611, Warrington PA, and to their 12th annual Pack Rat Hamarama on Sunday, October 2, 1983, at the Bucks County Drive-In Theater, Route 611, Warrington PA. The conference will feature an all-day VHF program, a cocktail hour and get-together at 6:30 pm, and a buffet dinner ($12.00 each) at 7:30 pm. Conference registration is $5.00 at the door and includes admission to the Hamarama. Admission to the Hamarama flea market on Sunday is $3.00 and tailgating is $5.00. The gate will open at 7:30 am, rain or shine (bring your own tables). Talk-in on 146.52 MHz (W3CCX). For further information, contact Lee A. Cohen K3MXM, 8242 Brookside Road, Elkins Park PA 19117, (215)-635-4942.

ROME GA
OCT 2

The Coosa Valley ARC will sponsor the Rome Hamfest on Sunday, October 2, 1983, at the Rome Civic Center, Turner-McCall Boulevard, Rome GA. A barbecue and all the trimmings will be available. For further information, contact Libbie Steadham WD4PTE, 18 Poplar Street, Rome GA, or phone (404)-291-4658.

ROCK HILL SC
OCT 2

The 32nd annual Rock Hill Hamfest will be held on October 2, 1983. For further information, contact YCARS, Box 4141 CRS, Rock Hill SC 29730.

CEDAR RAPIDS IA
OCT 2

The Cedar Valley Amateur Radio Club (WØGQ) will hold its 9th annual ARRL CVARC Hamfest on Sunday, October 2, 1983, beginning at 7:00 am, at the Hawkeye Downs Exhibition Building, Cedar Rapids IA. Tickets are $2.00 in advance and $3.00 at the door. Tables are $5.00 for the first and $7.00 for others. There is an overnight camping area, picnic facilities, ample parking, and a concession stand. There will be movies, manufacturers, dealers, and ARRL representatives featured. Talk-in on 146.16/.76, .52, and 223.34/.94 MHz. For advance tickets or reservations, write CVARC Hamfest, PO Box 994, Cedar Rapids IA 52406.

YONKERS NY
OCT 2

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Fair and Giant Flea Market on Sunday, October 2, 1983, from 9:00 am to 4:00 pm, rain or shine, at the Yonkers Municipal Parking Garage, corner of Nepperhan Avenue and New Main Street, Yonkers NY. Admission is $2.00 each and children under 12 will be admitted free. Gates will be open to sellers at 8:00 am and there will be a $6.00 admission per parking space which will also admit one (bring your own tables). Refreshments, free parking, and sanitary facilities will be available, as well as unlimited free coffee. There will be live demonstrations all day and a giant auction at 2:00 pm. Talk-in on 146.265T/146.865R or .52 direct. For more information, write YARC, 53 Hayward Street, Yonkers NY 10704, or phone (914)-969-1053.

ORLANDO FL
OCT 7-9

The second of two Great Southern Computer and Electronics Shows will be held on October 7-9, 1983, at the Orlando Expo Center, Orlando FL. Features will include computer hardware and software, peripherals, accessories, and word and data processing. Exhibits will include commercial and personal electronics, video products, robotics, and communications equipment. There will also be classes, workshops, seminars, and panel discussions. For registration information, exhibitors and attendees should contact Great Southern Computer and Electronics Shows, PO Box 655, Jacksonville FL 32201, or phone (904)-384-6440.

DEERFIELD NH
OCT 8

The Hosstraders will hold their annual autumn swapfest on Saturday, October 8,

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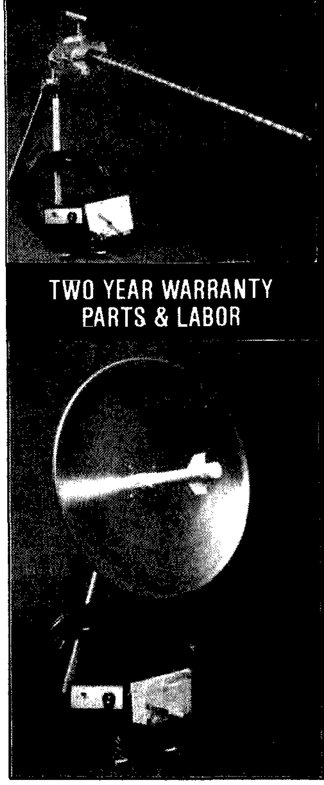

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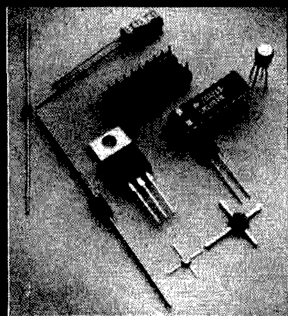

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1983, rain or shine, at the fairgrounds, Deerfield NH. Admission is $1.00, which includes tailgating. After 4:00 pm Friday, there will be camping for self-contained rigs; no reserved spaces will be available. Profits benefit the Shriner's Burns Institute (last May's donation was $2,702). For further information or a map, send an SASE to Norm WA1IVB, RFD Box 57, West Baldwin ME 04091; Joe K1RQG, Star Route, Box 56, Bucksport ME 04416; or Bob W1GWU, Walton Road, Seabrook NH 03874.

MEMPHIS TN
OCT 8-9

Six Memphis radio clubs will sponsor the Memphis Hamfest on Saturday and Sunday, October 8-9, 1983, at the Mid-South Building, Memphis Fairgrounds, Memphis TN. There will be computer displays, software, radio displays, and a flea market (tables on site). Dealers and flea-market sellers may set up on Friday evening, October 7th, until 9:00 pm. Activities will include radio and computer forums, women's programs, and a hospitality party on Saturday night. There will be on-site hookups. Talk-in on .28/.88 and .34/.94. For reservations or more information, contact Clayton Elam K4FZJ, 28 No. Cooper, Memphis TN 38104, or phone (901)-274-4418 (daytime) or (901)-743-6714 (nighttime).

VIRGINIA BEACH VA
OCT 8-9

The 8th annual Tidewater Amateur Radio Hamfest/Computer Convention/Electronic Flea Market will be held on Saturday and Sunday, October 8-9, 1983, at the pavilion at Virginia Beach VA. For both days, the admission is $4.00 and the hours are 9:00 am to 5:00 pm. Flea-market tables are $5.00 for one day and $8.00 for both days; for commercial dealers for both days, table space in the exhibition area is $15.00 and booths are $30.00. Features will include dealers, special displays, forums, computers, and satellite equipment. For tickets and more information, write Jim Harrison N4NV, 1234 Little Bay, Norfolk VA 23503, or phone (804)-587-1695.

BOSTON MA
OCT 8-10

PC '83, an international conference and exposition featuring IBM personal computers and compatibles, will be held on Saturday, Sunday, and Monday, October 8-10, 1983, from 10:30 am to 5:30 pm daily, at the Bayside Exposition Center, Boston MA. A three-day exhibit-and-conference ticket is $25.00 and a one-day exhibits-only ticket is $10.00. Features will include PC application discussions, technical information, and general sessions for IBM PC users. For more information, write Northeast Expositions, 822 Boylston Street, Chestnut Hill MA 02167, or phone (617)-739-2000, or (800)-841-7000 (outside Massachusetts).

WAUKESHA WI
OCT 9

The Kettle Moraine Radio Amateur Club will hold its annual Ham, Computer, Video Fest on Sunday, October 9, 1983, at the Waukesha County Expo Center, Highways F and FT, Waukesha WI. Tickets are $2.00 in advance and $3.00 at the door. Tables are $3.00 for each 4-foot length; reservations will be accepted until September 26, 1983. Since all facilities will be indoors, the hamfest will be open rain or shine, beginning at 8:00 am. There will be food available and commercial exhibitors. For reservations, send a check (payable) to KMRA Club, PO Box 411, Waukesha WI 53187.

BEDFORD IN
OCT 9

The Hoosier Hills Ham Club will hold its 22nd annual Hoosier Hills Hamfest on Sunday, October 9, 1983, at the Lawrence County 4-H Fairgrounds, 4 miles southwest on US Highway 50, Bedford IN. Registration is $3.00 per person and the swap shop is $2.50 (bring your own tables). The gate will open at 10:00 am on Saturday, Oct 8th, for campers and flea-market setups (registration required). There will be a free fish fry, campfire, entertainment, coffee, and overnight camping on Saturday night. Features will include ladies' free bingo and food served at the hamfest on Sunday. Talk-in on 146.13/.73 and setup on 3910 kHz. For further information, contact Dick Reistter KA9JTZ, Secretary, Hoosier Hills Ham Club, Box 891, Bedford IN 47421.

GRAND LEDGE MI
OCT 9

The Central Michigan Amateur Radio Club and Lansing Civil Defense Repeater Association will hold their annual Hamfair on Sunday, October 9, 1983, from 8:00 am to 3:00 pm, at the high school in Grand Ledge MI (7 miles west of Lansing). Donations for adults are $2.50 and tables are 75¢ per foot. There will be amateur radio equipment, antennas, computers, publications, demonstrations, films, a cafeteria, dealer sales, a swap shop, and handcrafted items. For additional information, write Rowena Elrod KA8OBS, 111 Lancelot Place, Lansing MI 48906, or phone (517)-372-5462, or write Hamfair 83, PO Box 18044, Lansing MI 48901.

LIMA OH
OCT 9

The Northwest Ohio Amateur Radio Club will sponsor the 9th annual hamfest on Sunday, October 9, 1983, beginning at 6:00 am, at the Allen County Fairgrounds, Lima OH (exit 125/126 east, 1 mile from I-75). Admission is $3.00 in advance and $3.50 at the gate; full tables are $6.00 and half tables are $3.50. Camping will be free and electrical hookups are $7.00. Talk-in on 146.07/.67 (primary), 147.63/.03, and 146.52/.52. For more information or reser-

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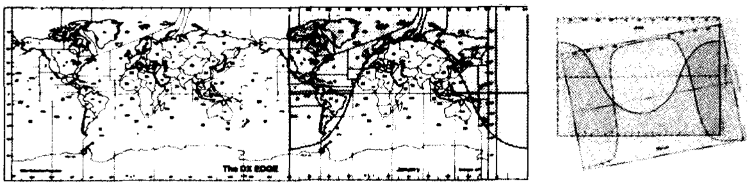

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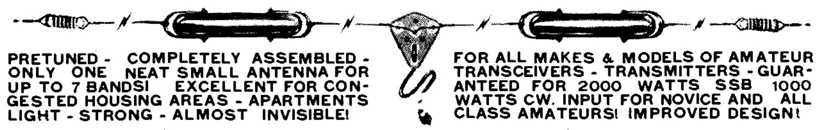

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vations (please include check), write NOARC, Box 211, Lima OH 45802.

IRWIN PA
OCT 15

The Irwin Area Amateur Radio Association will hold a Swap & Shop on Saturday, October 15, 1983, at the Circleville V.F.D., just off Route 30, 3.5 miles west of the Pennsylvania Turnpike, Exit 7. There will be food, vendors, a flea market, and free parking. Talk-in on 146.925/.325 and 146.52 MHz. For further information, contact Rick Jackson N3DAA, 39-D Lower Boone Drive, Turtle Creek PA 15145, or phone (412)-829-1953.

NEW ORLEANS LA
OCT 15-16

The New Orleans hamfest-computertest, Amacom '83, sponsored by the Jefferson Amateur Radio Club, the Greater New Orleans Amateur Radio Club, the Delta DX Association, and the New Orleans VHF Club, will be held on October 15-16, 1983, at Delgado Community College's City Park campus, New Orleans LA. Admission is $5.00 per person and $1.00 per family member. Features will include an expanded flea market, commercial electronics exhibits, a banquet, tours of New Orleans, meetings, amateur radio tests by the FCC, and many interesting speakers. The host hotel is Howard Johnson's Motor Lodge Airport, 6401 Veterans Memorial Boulevard, Metairie LA 70003. Talk-in on 147.285/.885 or 449.0/444.0 (W5GAD/R). For reservations (deadline is October 5th) and more details, write Amacom '83, PO Box 73665, Metairie LA 70033, or call W. D. "Bill" Bushnell WA5MJM, Chairman, at (504)-887-5022.

REVERE MA
OCT 16

The 19-79 Amateur Radio Association of Chelsea MA will hold its fall flea market Sunday, October 16, 11:00 am to 4:00 pm (open to sellers at 10:00), at the Beachmont VFW Post, 150 Bennington Street, Revere. Admission is $1.00. Sellers' tables are $6.00 in advance, and $8.00 at the door if available. Talk-in on .19/.79 and .52. For table reservations, send a check to 19-79 Amateur Radio Association, PO Box 171, Chelsea MA 02150.

CHICAGO IL
OCT 16

The 2nd annual CCRL Hamfest will be held on Sunday, October 16, 1983, from 7:00 am to 2:00 pm, at the American Legion Post #21, 6040 N. Clark Street, Chicago IL 60660. Admission is $1.00 in advance or $1.50 at the door. Tables are $2.00 each. Talk-in on 145.030 simplex. For more information, write John Ibes KA9FUI, 2934 N. Mobile, Chicago IL 60634, or Fred Marlette KA9FUO, 1851 W. Chase, Chicago IL 60626.

SAVANNAH GA
OCT 22-23

The Amateur Radio Club of Savannah will hold a hamfest on October 22-23, 1983, at the National Guard Armory on Eisenhower Drive, Savannah GA. Admission is $2.00 for adults and children under 12 will be admitted free. Tables are $7.00 for the first table, which includes one admission ticket, and $5.00 for each additional table. There will be dealers, forums, a flea market, refreshments, and plenty of free parking. On Saturday, doors will be open from 9:00 am to 4:00 pm; on Sunday, from 9:00 am to 3:00 pm. Talk-in on .37/.97 and .28/.88. For further information, write Amateur Radio Club of Savannah Hamfest, PO Box 13342, Savannah GA 31416.

CHATTANOOGA TN
OCT 22-23

Hamfest Chattanooga and the Tennessee State ARRL Convention will be held on October 22-23, 1983, at the Chattanooga State Technical Community College, Amnicola Highway, Chattanooga TN. Activities will include forums, contests, and non-ham programs. The college cafeteria will be open for serving breakfast and lunch both days. For reservations for special "Hamfest Chattanooga" rates, write Ramada Inn, East Ridge (I-75 and US41), or phone (615)-894-6110. A hospitality party will be held at the Inn on Saturday, October 22. For further information, inside dealer area reservations, and inside and outside flea-market spaces, contact Hamfest Chattanooga, PO Box 3377, Chattanooga TN 37404, or phone Nita Morgan N4DON at (404)-820-2065.

LANCASTER PA
OCT 23

The Red Rose Repeater Association and Sercom, Inc., will sponsor the Red Rose Computerfest on Sunday, October 23, 1983, from 9:00 am to 4:00 pm, at the Guernsey Sales Pavilion, junction of Rtes. 30 and 896, east of Lancaster PA. Admission is $3.00; children under 14 and XYLs will be admitted free. Inside tables are available by reservation and tailgating is $2.00. Computers and amateur radio equipment will be featured. Talk-in on 147.615/.015, 146.01/.61, and 146.52 simplex. For more information, contact the Computerfest Committee, PO Box 5029, Lancaster PA 17601.

KALAMAZOO MI
OCT 23

A hamfest/electronic flea market will be held Sunday, October 23, 1983, 10:00 am to 4:00 pm, at the Kalamazoo Fairground. Tickets are $2.00 in advance and $2.50 at the door. Over 400 4-foot table spaces and table rentals are $2.50 each in advance, $3.00 at the door. Trunk sales $2.00 if all

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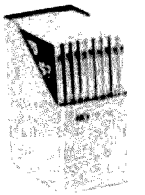
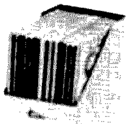

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BALTIMORE MD
OCT 23

The Columbia Amateur Radio Association will hold its 7th annual hamfest on Sunday, October 23, 1983, from 8:00 am to 3:30 pm, at the Howard County Fairgrounds, 15 miles west of Baltimore MD, just off I-70 on Rte. 144, 1 mile west of Rte. 32. Admission is $3.00. Indoor tailgating is $3.00 additional. Food will be available. Talk-in on 147.735/.135 and 146.52/.52. For table reservations and more information, write Ed Wallace K3EF, 9905 Carillon Drive, Ellicott City MD 21043.

GRAYSLAKE IL
OCT 29

The Civil Air Patrol, Waukegan Squadron, will hold its third annual hamfest on Saturday, October 29, 1983, from 0700 to 1700, at the Lake County Fairgrounds, Rtes. 45 and 120, Grayslake IL. Admission is $3.00 and tables are $5.00. There will be free parking and a large indoor heated flea market. Talk-in on 146.52. For reservations and more information, send an SASE to Civil Air Patrol, 637 Emerald Street, Mundelein IL 60060.

FRAMINGHAM MA
OCT 30

The Framingham Amateur Radio Association, Inc., will hold its 9th annual fall flea market on Sunday, October 30, 1983, in the Framingham Civic League Building, 214 Concord Street (Route 126), downtown Framingham MA. Admission is $2.00 and tables are $10.00 (pre-registration required). Sellers may begin setups at 8:30 am and doors will open at 10:00 am. There will be radio equipment, computer gear, and food in-house. Talk-in on .75/.15 and .52 direct. For more information, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701.

MARION OH
OCT 30

The Marion Amateur Radio Club will hold its 9th annual Heart of Ohio Ham Fiesta on Sunday, October 30, 1983, from 0800 to 1600 hours, at the Marion County Fairgrounds Coliseum, Marion OH. Tickets are $3.00 in advance and $4.00 at the door. Tables are $5.00. Food and a large parking area will be available. Talk-in on 146.52, 147.90/.30, and 223.34/224.94. For tickets, tables, information, contact Paul Kilzer W8GAX, 393 Pole Lane Road, Marion OH 43302; (617)-389-5573.

SATELLITES

STS-9 LAUNCH POSTPONED

NASA has announced that the shuttle mission carrying Dr. Owen Garriott W5LFL has been postponed by one month. The launch is now scheduled for Oct. 28 rather than the original date of Sept. 30.

According to the Westlink News Service, the launch has been delayed to give additional time for one of the shuttle data relay satellites to be prepared for the mission.

The satellite is an essential component in Spacelab, a series of experiments that will be conducted on board the shuttle *Columbia* during its mission. Although the satellite was launched during a previous shuttle flight, it was behind schedule in achieving the necessary geostationary orbit.

The ARRL has released the operating frequencies for Dr. Garriott's communications with earthbound hams. In North America, hams should listen for him on 145.550 and transmit on 20-kHz channels between 144.91 and 145.090 MHz.

OSCAR 10

Although no Mode L plans have been finalized, use of AMSAT OSCAR 10's Mode B (70 cm uplink, 2m downlink) was scheduled to begin Aug. 6. Unlike previous OSCARs, the new bird remains above the horizon for long periods of time, making reliable VHF/UHF DX possible for the first time in amateur radio.

The band plan for Mode B calls for the lower third of the downlink passband to be reserved for CW, the upper third to be used for SSB, and the center of the passband to be used by both CW and SSB operations. The band plan also reserved Special Service Channels for nets, bulletins, and other scheduled activities.

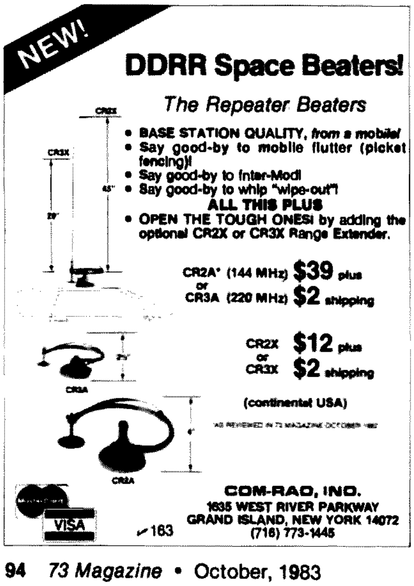
AMSAT recommends that stations use no more than 750-1000 W erp on the Mode B SSB uplink, and less than that will be necessary for successful CW operation. LSB is the agreed standard for SSB emissions, and right-hand circular polarization should be used for both Mode B and Mode L.

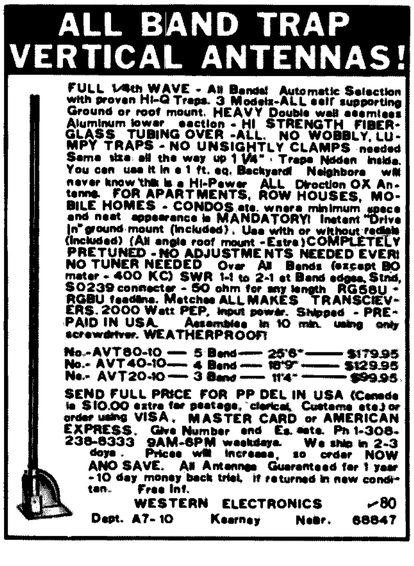
The elliptical orbit of AMSAT OSCAR 10 will also require different tracking techniques than were necessary for the near-circular orbits of previous OSCARs.

Unless specifically designed to include AO-10, run-of-the mill OSCAR locators and programs will not provide correct data for the new satellite. However, programs for many different computers are available from AMSAT for tracking AO-10. Write to AMSAT Headquarters, PO Box 27, Washington DC 20044, for more information.

Amateur Satellite Reference Orbits

		OSCAR 8		RS-5		RS-6		RS-7		RS-8		
Date		UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
Oct	1	0028	94	0015	89	0116	110	0055	127	0146	110	1
	2	0032	96	0010	89	0101	107	0045	126	0143	111	2
	3	0036	97	0004	89	0045	105	0035	125	0140	112	3
	4	0041	98	0159	119	0030	103	0026	124	0137	112	4
	5	0045	99	0153	119	0015	100	0016	123	0135	113	5
	6	0049	100	0148	120	0158	128	0007	122	0132	114	6
	7	0054	101	0142	120	0142	126	0156	151	0129	115	7
	8	0058	102	0137	120	0127	123	0146	151	0126	116	8
	9	0102	103	0132	120	0112	121	0137	150	0123	117	9
	10	0107	104	0126	120	0056	119	0127	149	0120	117	10
	11	0111	106	0121	120	0041	116	0117	148	0118	118	11
	12	0115	107	0116	121	0025	114	0108	147	0115	119	12
	13	0120	108	0110	121	0010	112	0058	146	0112	120	13
	14	0124	109	0105	121	0153	139	0048	145	0109	121	14
	15	0128	110	0100	121	0138	137	0039	144	0106	121	15
	16	0133	111	0054	121	0122	134	0029	143	0103	122	16
	17	0137	112	0049	122	0107	132	0020	143	0101	123	17
	18	0141	113	0044	122	0052	130	0010	142	0058	124	18
	19	0003	89	0038	122	0036	127	0000	141	0055	125	19
	20	0007	90	0033	122	0021	125	0150	170	0052	125	20
	21	0011	91	0028	122	0005	123	0140	169	0049	126	21
	22	0016	92	0022	123	0149	150	0130	168	0046	127	22
	23	0020	93	0017	123	0133	148	0121	167	0044	128	23
	24	0024	94	0012	123	0118	146	0111	166	0041	129	24
	25	0029	95	0006	123	0103	143	0101	165	0038	130	25
	26	0033	97	0001	123	0047	141	0052	164	0035	130	26
	27	0037	98	0155	154	0032	139	0042	164	0032	131	27
	28	0042	99	0150	154	0016	136	0033	163	0029	132	28
	29	0046	100	0144	154	0001	134	0023	162	0027	133	29
	30	0050	101	0139	154	0144	161	0013	161	0024	134	30
	31	0055	102	0134	154	0129	159	0004	160	0021	134	31
Nov	1	0059	103	0128	154	0113	157	0153	189	0018	135	1
	2	0103	104	0123	155	0058	154	0143	188	0015	136	2
	3	0108	105	0118	155	0043	152	0134	187	0012	137	3
	4	0112	107	0112	155	0027	150	0124	186	0010	138	4
	5	0116	108	0107	155	0012	147	0114	185	0007	139	5
	6	0121	109	0102	155	0155	175	0105	185	0004	139	6
	7	0125	110	0056	156	0140	173	0055	184	0001	140	7
	8	0129	111	0051	156	0124	170	0045	183	0158	171	8
	9	0134	112	0046	156	0109	168	0036	182	0155	172	9
	10	0138	113	0040	156	0053	166	0026	181	0152	173	10
	11	0142	114	0035	156	0038	163	0017	180	0149	174	11
	12	0003	90	0030	157	0023	161	0007	179	0147	174	12
	13	0008	91	0024	157	0007	159	0156	208	0144	175	13
	14	0012	92	0019	157	0150	186	0147	207	0141	176	14





CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

VK/ZL/OCEANIA DX CONTEST

Phone
Starts: 1000 GMT October 1
Ends: 1000 GMT October 2

CW
Starts: 1000 GMT October 8
Ends: 1000 GMT October 9

Sponsored by WIA and NZART, the National Amateur Associations in Australia and New Zealand. Use all amateur bands (but no crossband operation is permitted). Only one contact on CW and one contact on phone per band is permitted with any one station for scoring purposes. Only one amateur is to operate any one station under the owner's callsign. Should two or more operate any particular station, each will be considered a competitor and must submit a separate log under his own callsign. This is not applicable to overseas competitors operating club stations.

EXCHANGE:

Send 5 or 6 digits made up from the RS(T) report plus a three digit QSO number starting with 001. Exchange must be acknowledged before points can be claimed.

SCORING:

Stations outside VK/ZL score 2 points per QSO on a specific band with VK/ZL stations. Single-band score will be QSO points for that band multiplied by total VK/ZL call areas worked on that band. Allband score will be total QSO points for all bands multiplied by the total VK/ZL call areas worked on all bands.

AWARDS:

Certificates will be awarded the top scorers in each country (each call area in USA, USSR, and Japan). Depending on reasonable degree of activity, separate awards may be made for top scorers on different bands.

ENTRIES:

Logs must show information in this order: date/time in GMT, callsign of station contacted, band, serial number sent, and serial number received. Underline each NEW VK/ZL call area contacted and make a separate log for each band used. Include a summary sheet to show: callsign, name and address (*please use block letters!*), details of equipment used and, for each band, QSO points for that band and total VK/ZL call areas worked on that band. Failure to remove duplicate contacts will incur heavy penalties, and greater than 2% duplicates will disqualify the entry.

All logs should be posted to: WIA VK/ZL Contest Manager VK3BGW, 1 Noorabil Court, Greensborough, Victoria 3088, Australia. Any logs, even for small numbers of contacts, will be greatly appreciated!

SWL SECTION:

The rules are similar to the transmitting section but it is open to all members of any SWL society in the world. No transmitting station is permitted to enter this section. The contest times and logging of stations on each band per weekend are as for the transmitting section except that the same station may be logged twice on any band, once on phone and on CW.

To count for points, the station heard must be in QSO exchanging data in the VK/ZL DX contest and the following details noted—date/time in GMT, call of the station heard, call of the station he is working, RS(T) of the station heard, serial number sent by the station heard, band, points claimed. Scoring is on the same basis as for the transmitting section and a summary sheet should be similarly set out.

Overseas stations may log only VK/ZL stations, but VK receiving stations may log overseas stations and ZL stations, while ZL receiving stations may log overseas and VK stations. Certificates will be awarded as listed in the section under awards.

CALIFORNIA QSO PARTY

Starts: 1600 GMT October 1
Ends: 2159 GMT October 2

Sponsored by the Northern California Contest Club, with strong efforts being made to have all 58 counties in California on for the contest duration.

Single-operator stations may operate only 24 hours of the contest period; off times must be clearly marked in the log and must be at least 15 minutes long. Multi-operator stations may operate the full 30 hours. Stations may be worked only once per mode per band. All contacts must be simplex. All CW contacts must be made in the CW subband. California stations that change counties are considered to be new stations and may be contacted again for points credit.

EXCHANGE:

CA stations send QSO number and county. Others send QSO number and state, province, or ARRL country.

FREQUENCIES:

Novice—3725, 7125, 21125, 28125.

CW—1805, 3560, 7060, 14060, 21060, 28060.

SSB—1815, 3895, 7230, 14280, 21365, 28560.

Try CW on the half-hour and 160 meters at 0500.

SCORING:

Each completed phone contact is worth 2 QSO points. Each completed CW contact is worth 3 QSO points. For multiplier, CA stations use the number of states, VO/VE 1-7, and VY1/VE8 for a possible of 58. Others use the number of CA counties worked for a possible total of 58. The final score is the number of QSO points multiplied by the total number of multipliers.

AWARDS:

Certificates for highest scoring station in each CA county, each state/province, and each country. Certificates also to each station scoring 100 or more QSOs. Trophies to the highest scoring out-of-state single op, highest scoring CA single op, and highest scoring DXpedition to a CA county by single and multi-ops.

ENTRIES:

All logs and summary sheets must be sent by November 1 to: NCCC, c/o Alan Brubaker K6XO, 34456 Colville Place, Fremont CA 94536. Please include a business-size SASE with your entry.

QSLS:

QSLs to NCCC California stations without an SASE will be responded to via the QSL Service (USQS), PO Box 814, Mulino OR 97042. This will enable CA stations to confirm contest QSOs at minimum expense to all concerned. To claim these and other QSLs from USQS, send a business-size SASE to USQS. For further details, send an SASE to USQS or see any issue of *World Radio News*.

OREGON QSO PARTY

1700 GMT October 1 to
0800 GMT October 2
1500 GMT October 2 to
0000 GMT October 3

Sponsored by the Hermiston Amateur Radio Club. Operating categories include mixed mode or CW only. Each station may be worked once per band and once per mode.

CALENDAR

Oct 1-2	California QSO Party
Oct 1-2	VK/ZL/Oceania Contest—Phone
Oct 1-3	Oregon QSO Party
Oct 8-9	ARRL QSO Party—CW
Oct 8-9	VK/ZL/Oceania Contest—CW
Oct 9-10	ARRL QSO Party—Phone
Oct 15-16	ARRL Simulated Emergency Test
Oct 15-16	Maryland-DC QSO Party
Oct 15-16	Scout Jamboree On The Air
Oct 22-23	MF Runde SW Activity Weekend
Oct 22-23	Clara Ac-Dc Contest
Oct 22-23	QRP ARCI Fall QSO Party
Oct 22-23	Pennsylvania QSO Party
Nov 5-6	ARRL Sweepstakes—CW
Nov 6	DARC Corona 10-Meter RTTY Contest
Nov 19-20	ARRL Sweepstakes—Phone
Dec 3-4	ARRL 160-Meter Contest
Dec 10-11	ARRL 10-Meter Contest
Feb 4-5	South Carolina QSO Party
Feb 18-19	America Radio Club International DX Contest

Beaver County QRM

NEWSLETTER OF THE MONTH

Beneath the full masthead of this newsletter (part of which is above), if you look closely, you can make out the words "Founded: 1922." Here's a club with history, and the members of the Beaver Valley Amateur Radio Association have not forgotten their spark-gap roots.

The *Beaver County QRM*, edited by Joseph Ross KF3X, is a newsletter the club's founders could be proud of. Editor Ross ensures that the newsletter does not merely inform but entertains as well, and part of his editorial repertoire stems from the club's long history. Features such as "Club Capsule," which reincarnates the news of 40 years ago, remind members of their heritage.

The June issue also included a reprint of minutes from the club's 11-member reorganizational meeting in 1946. Less than 10 years later, the club incorporated, evidence of its strong post-war growth.

Ross does not limit the *QRM* to Beaver Valley club news only. Through the newsletter, he keeps members up to date on other news, too—such as an interview with ARRL Atlantic Division Director Hugh Turnbull on volunteer exams and no-code licenses. He also culls the best from other newsletters, such as the Indiana County ARC's *Sine of the Times* and the Triple States Radio Amateur Club's *BNT*, and reprints them in the *QRM*. And for those whose interests fall in areas outside of ham radio, Ross has thoughtfully included some interesting no-ham features. "If You Are A Beer Drinker and Like to Keep Your Weight Down" is (or should be) of particular interest to the summertime ham.

So if you want to know not only the latest FCC regs or satellite news, but also the number of calories in 807 Ale—*Beaver County QRM* is for you

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send a copy to *73*, Pine Street, Peterborough NH 03458.

RESULTS

1982 MARYLAND-DC QSO PARTY

Non-Maryland Stations

Callsign	QSO	Mult.	Score	Power	Mode	State/ Country
W5WG	58	17	*1479	A	CW/SSB	LA
VE3KK	57	17	*1454	A	CW/SSB	Canada
KS8Q	46	15	1035	A	CW/SSB	MI
K4DDB	45	12	*774	A	CW	FL
W8WVU	32	15	720	A	CW/SSB	MI
K1ØV	35	12	630	A	CW/SSB	CT
KE5B	28	14	*588	A	CW	AR
KMØA	28	14	588	A	CW	MO
W3EFY	25	13	488	A	CW/SSB	PA
N9AUZ	20	14	420	A	CW	IL
AD5F	25	11	413	A	CW	TX
AG5C	33	8	369	A	CW/SSB	TX
W8YL	17	14	357	A	CW	MI
W8EAO	23	9	311	A	CW(QRP)	OH
WB2IPX	22	9	297	A	CW	NY
WA3UNX	13	8	216	A	CW/SSB	PA
WD4SIG	13	11	215	A	CW	TN
W5NR	17	12	204	B	CW	TX
KVØE	13	10	195	A	CW	CO
K3WGR	16	7	168	A	CW/SSB	PA
W8VEN	13	10	*130	B	SSB	WV
WA2UDT	13	8	104	B	CW/SSB	NJ
VO1AW	17	6	102	B	CW	Canada
WA3JXW	13	7	91	B	CW/SSB	PA
WB9HGS	8	6	72	A	CW/SSB	WI
ON7YU	9	8	*71	A	SSB	Belgium
KA8IIN	6	5	45	A	CW/SSB	MI
NØCLV	6	3	27	A	CW/SSB	KS
KD4PP	4	4	24	A	CW	TN

Maryland-DC Stations (County)

Callsign	QSO	Mult.	Score	Power	Mode	County
WA3VYQ	620	92	*57040	B	SSB	Howard
K3WUW	306	74	*33966	A	CW/SSB	Prince Geo.
N3AC	248	41	*15252	A	CW	Mobile(1)
W3FG	182	51	*13923	A	CW	Anne Arundel
N3QA	153	46	10557	A	CW	Queen Anne
K3LK	211	30	9495	A	CW	Mobile(2)
W3GG	174	44	7656	B	CW	Montgomery
WB3JKC	98	38	5586	a	SSB	Baltimore City
WB3HUP	138	25	5175	A	SSB	Mobile(3)
KA3JLW	24	17	617	A	CW	Montgomery

(1) N3AC was mobile in Anne Arundel, Calvert, Caroline, Charles, Dorchester, Howard, Prince Georges, Queen Anne, St. Mary's, Talbot, Wicomico.

(2) K3LK was mobile in Montgomery, Prince Georges, Howard, Baltimore, Baltimore City, Hartford, Cecil, Kent, Queen Anne, Caroline, Talbot, Dorchester, Wicomico, Somerset.

(3) WB3HUP was mobile in Calvert, Charles, St. Mary's, Prince Georges, Washington, DC, Montgomery, Howard, Anne Arundel, Talbot, Dorchester, Wicomico, Somerset, Worcester, Caroline, Kent, Cecil.

Power: (A) 200 Watts or less input; (B) > 200 Watts input.

*: Certificate winners.

RESULTS

1983 SPRING CONTEST— BRITISH AMATEUR RADIO TELEPRINTER GROUP

Single Operator

Callsign	Points	QSOs
ON4UN	716690	365
YU7AM	341736	276
I1HUH	339600	226
DJ6JC	289100	187
Y25DL	288696	197
YB2BLI	280578	164
HB9AAA	280200	161
SM6ASD	270940	197
W3FV	243212	179
W2IUC	225792	201
GI4AHP	223380	206
YO2IS	211684	201
KB2VO	195506	158
I4JXE	182188	151
VK2SG	167570	158
IØUIQ	164604	167
I8JRA	159510	132
K4AGC	158796	147
GM3ZXL	158148	130
W3FIZ	154100	118
IØZSG	142400	166
WB3HAZ	141858	108
UT5RP	137350	215
ON7EP	133080	105
DL9MBZ	131216	113
KØJH	126852	121
9M2CR	121968	121
K6WZ	119048	142
WD5ELJ	118320	156
JA2VFW	109300	101
GW3EHN	103000	106
W6JOX	101332	118
G4NYO	96000	84
JR2CFD	94188	79
JR2TZL	92610	93
SM5BKA	91800	74
IØWOP	88920	127
OK2SPS	88896	106
VE2AXO	87710	99
LA7AJ	86940	74
OH8TA	82560	148
VK1GM	74400	88
JA1BYL	73800	72
VK2BQS	72068	80
DK1BX	71516	69
SM5FUG	70664	74
OH2BDN	69156	125
DK9CK	66144	52
KB9DM	62968	66
PY2ERA	61440	100
DL8QP	60420	63
WB4UED	60104	63
SM7LSU	59544	67
PY6ACP	56440	70
DF9XI	56364	87
WB3IGR	56160	44
VE8CM	55020	78
OK1MP	53690	36
N7AKQ	50928	113
OK1AWC	48112	58
VE7VP	47740	54
W2KHQ	45954	65
ON8ZM	45760	56
SM7ABL	42630	47
YU2CB	41664	51
DF5BX	39234	67
JR6AG	38976	45
WA6WGL	38760	50
WA3ZKZ	37590	49
Y37UF	36120	42
G4MKO	32660	42
SM6AEN	32344	46
G4NJW	30144	28
XT2AU	28130	37
W3AOH	27360	34
OZ1GRF	26180	39
IK1AAW	25200	26
JH2PDS	24886	29
DJ8WCY/P	22288	47
SM7BGE	22088	42
OH5YW	21630	23
DL3YBU	20480	24
F3IJ	19418	23
YO8FR	16942	71
JF2PZH	16768	32
W7CBY	16586	33
Y55ZF	14490	33
SMØBYD/7	14436	21
PY6SL	13468	17
G3RDG	12996	30
TI2DO	12900	26
ON7EU	12492	31
Y53VA	12236	34
Y71SH	10008	39
K2TY	8736	24
YO2AC	7548	26
PY2FWX	5808	14
F3PI	4928	16
SM5AAY	4860	14
HA6VX	2512	13
OK3TZL	1596	9
W8TCO	720	4
Y59ZF	672	4

Multiple Operator

Callsign	Points	QSOs
LZ1KDP	441604	274
OH2AA	413996	310
G3ZRS	378566	249
LZ2KRR	310460	246
GW4RDO	182700	141
OK1RJB	159256	119
G4ALE	156996	118
HA5KBM	133052	131
HA6KVD	102700	107
OK3KJF	92312	114
KD4RT	73950	73
OK3KGI	69888	112
G4LLR/A	63900	86
KL7RS	25116	50
Y83KMF	20256	33
SM6LTO	5408	24

Short Wave Listener Section

Callsign	Country	Points	QSOs
ONL-5566	Belgium	354348	233
OZ-DR 2135	Denmark	312984	221
I1-053GE	Italy	261096	175
NL-4483	The Netherlands	194668	119
John Mathews	United States	111936	92
OK2-21478	Czechoslovakia	95900	170
FE-3700	France	66290	71
Y2-19600/A	German Dem. Rep.	51768	67
BRS 31976	England	32214	35
FE-1107	France	27432	44

EXCHANGE:

Signal report and state, province, country, or OR county.

FREQUENCIES:

Phone—1810, 3829, 7260, 14300, 21370, 28600.

CW—80 kHz up from bottom of each band.

Novice—10 kHz up from bottom of each Novice band.

SCORING:

Count one point per QSO. OR stations multiply QSO points by the sum of states, provinces, countries, and OR counties. All others multiply by the sum of OR counties worked (36 max).

ENTRIES AND AWARDS:

All entries must have a log and summary sheet. Official sheets are available from KA7IXH for an SASE. Logs must be received by November 4 and should be addressed to Bob Franklin KA7IXH, Rt. 3, Box 3783, Hermiston OR 97838. Include a large SASE for a copy of the results.

MARYLAND-DISTRICT OF COLUMBIA QSO PARTY

Starts: 1800 GMT October 15
Ends: 2100 GMT October 16

Sponsored by the Columbia Amateur Radio Association, the contest is open to all single-operator stations. The same station may be worked on each band and mode.

EXCHANGE:

QSO number, RS(T), and state, province, country, or MD county. Remember

RESULTS

1982 CAN-AM CONTEST

Trophy Winners

Canadian champion, combined	VE6OU, John Sluymer
American champion, combined	AA5B, Bruce Draper
Canadian phone trophy	VE5ADA, B.J. Madsen
American phone champion	AH6BK, Mike Hart
Canadian CW trophy	VE3DZV, Ken Dixon
American CW champion	K6LL/7, David Hachadorian
Canadian multi-op champion	VE7ZZZ, Prince George CC
American multi-op champion	N5FA/6, Harvey Mudd College RC
Club competition	Albuquerque DX Assn.

Single Operator

Canadians		Americans	
Combined Phone and CW			
VE6DU	1026997	AA5B	743589
VE3DZV	163404	W5JW	729008
VE1CEG	123574	AH6BK	722127
VE3ATD	115830	AG7M	527828
VE5ADA	100772	K6HNZ	424732
VE3NBE	60462	K6LL/7	344768
VE3FHZ	26390	KB5FU	314788
VE3KOY	19147	KJ7K	294168
VE3BMY	18966	KF6A	277580
VE7IQ	16653	KBØG	223295
Phone			
VE6OU	631410	AH6BK	536089
VE5ADA	100772	AA5B	485415
VE3FHZ	26390	K6HNZ	424732
VE7EGD	15480	W5JW	387121
VO1QU	13792	KJ7K	294168
VE3BMV	9231	AG7M	288786
VE3CKR	7020	KB5FU	274988
VE7DKS	5859	KF6A	158330
VY1DD	1260	KU5I	100737
VE4AKN	1256	KC7JO	91304
CW			
VE6OU	394956	K6LL/7	344770
VE3DZV	163404	W5JW	341887
VE1CEG	123574	AA5B	258174
VE3ATD	115830	AG7M	239040
VE3NBE	60270	KB0G	223295
VE3CKR	53658	KG5U	216216
VE3KOY	19147	AH6BK	186038
VE7IQ	16653	KQ8M/0	128202
VE3KZE	12578	KF6A	119250
VE3MKK	10170	W7TC	100512
Multi-Operator, Combined Phone and CW			
VE7ZZZ	666510	N5FA/6	917856
VE1DXA	484530	K5LZO	314689
VE5GF	315341	KO8T	360458

Club Competition

Albuquerque DX Assn.	2443049
Northern Alberta CC	1026366
Texas DX Society	946410
River City Contesters	329004
Sturdy Mem. Hospital ARC	147912

that Baltimore and Washington are independent cities!

SCORING:

MDC stations multiply total QSOs by sum of MD counties, states, provinces, and countries. Others multiply MDC OSO total by number of MD counties and independent cities (25 maximum). Also, multiply score by 1.5 if running 200 Watts or less.

FREQUENCIES:

Phone—3950, 7250, 14290, 21390, 28590.
CW—60 kHz up from low end.
Novice—3720, 7120, 21120, 28120.

AWARDS AND ENTRIES:

Maintain a continuous log for phone and CW but indicate on entry which category (phone, CW, or mixed) you are entering. Certificates for top scorers in each category will be awarded. Mail logs, dupesheets (for over 200 contacts) and summary by November 30th to CARA, c/o Robert K. Nauman WA3VUQ, 4017 Font Hill Drive, Ellicott City MD 21043.

MINNESOTA QSO PARTY
1800 to 2300 GMT October 15

Sponsored by the Paul Bunyan Wireless Association. Work stations once per band and mode. Repeater QSOs are not allowed.

FREQUENCIES:

Phone—3890, 7230, 14280, 21375, and 28875.

CW—40 kHz up from low end of the band.

Novice—25 kHz from the low end of the band.

EXCHANGE:

Exchange signal report and QTH (county for Minnesota stations; state, province, or country for others).

SCORING:

Count 1 point for each phone QSO and 2 points for each CW QSO. MN stations multiply total QSO points by the sum of the number of states worked. Other stations multiply by the total of Minnesota counties worked (maximum, 86). Add 100 bonus points if you work 10 Minnesota counties.

ENTRIES:

Entries must be mailed no later than November 1, 1983, to PBWA, Steve Scott KCØUJ, 801 6th St., Staples MN 56479.

JAMBOREE ON THE AIR
Starts: 0001 GMT October 16
Ends: 2400 GMT October 17

This is the 26th annual Scouting/ham radio event sponsored by the World Scout Bureau, Geneva, Switzerland. Boy Scouts and Girl Scouts of all ages, from Tiger Cubs through adult Scouters, and anyone interested in Scouting and ham radio are welcome. If you have never been a Scout, talk to some Scouts about amateur radio and give them the thrill of talking to you. There should be activity from about 100 countries, just enough for DXCC! The World Bureau station, HB9S, the BSA station, K2BSA, and many camporee and special-event stations will also be operating.

The exchange is just good Scout talk about Scouting experiences, ham radio, and friendship greetings, many of which may lead to lasting pen-pal exchanges.

FREQUENCIES:

Scout frequencies published by the World Bureau are as follows:
Phone—3940, 7290, 14290, 21380, 28990.
CW—3590, 7030, 14070, 21140, 28190.
Novice—SSTV and RTTY on usual frequencies.

Postcard-size certificates issued by the World Bureau are available to anyone participating in any manner. Send SASE to: Boy Scouts of America, International Division/JOTA Cards, 1325 Walnut Hill Lane, Irving TX 75062-1296 (twenty cents affixed postage for up to 8 cards and 17 cents for each additional 8 cards). Cards/certificates may be ordered before the event for distribution during JOTA activities or after.

A distinctive temporary insignia pocket patch is available for the first time, for wear on the Scout uniform, at $1.00 per patch, postpaid, any quantity. Send personal check or money order (no stamps) to BSA, International Division/JOTA PATCH, at the same address as above. Checks should be made out to: Boy Scouts of America. Please send separate orders for certificates and patches.

Logs or lists of participants are *not required*, but reports of activity, news articles, bulletin announcements, narrative reports of activity, and photos are welcome for inclusion in the BSA report to the World Bureau and possible use in Scout publications. Send them to the JOTA Coordinator W2GND, 218 Maxwell Avenue, Hightstown NJ 08520.

PENNSYLVANIA QSO PARTY
1600 GMT October 22
to 0500 GMT October 23
1300 GMT October 23
to 2200 GMT October 23

Sponsored by the Nittany Amateur Radio Club. CW contacts must be in the CW subbands. Stations may be worked once per mode (phone and CW) on each band. Mobiles may be reworked as they change counties. Repeater contacts are not permitted.

There are four classes of entry: single operator with no assistance allowed, fully mobile (multi-op OK), multi-operator with single transmitter and no spotting receivers, and multi-multi where anything goes.

EXCHANGE:

RS(T), 3-digit sequential serial number, and ARRL section or PA county. Stations on county lines will give out one number but the two counties will count as two separate multipliers.

FREQUENCIES:

SSB—3980, 7280, 14280, 21380, 28580.

CW—40 kHz up from bottom of CW bands.

Novice—10 kHz up from bottom of Novice subbands.

Try 160 meters CW on 1810 at 0400 GMT and SSB on 1835. New WARC bands are not permitted.

SCORING:

Count 1 point for SSB QSOs, 1.5 points for CW QSOs, and 2 points for 160- and 80-meter CW QSOs. PA stations multiply QSO points by the total number of ARRL sections plus the total number of PA counties plus a maximum of one DX country (142, total maximum). Others, multiply QSO points by the total number of PA counties worked (67, maximum).

AWARDS:

Plaques for top scorers in both eastern and western PA, top out-of-state station, top mobile station (assuming at least 3 entries), and top multi-operator entry. Revolving trophy to the club with the top aggregate score from membership. Certificates to winner in each county, each section with a minimum of 20 QSOs, and winner in each club with a minimum of 3 entries.

Special awards to the first station which scores 150,000 points (single operator), 2,000 QSOs (any class), 200,000 points (multi-single), 500 QSOs (out of state), 1,000,000 points (club competition), and all the 67 counties in the contest.

ENTRIES:

Logs must be submitted on official forms or on reasonable duplicate. Also include a dupesheet for entries with over 100 QSOs. For each dupe QSO removed by checkers 100 points will be deducted from your final score. Illegible logs will be treated as check logs. Send logs no later than November 25 to Douglas R. Maddox W3HDH, 1187 S. Garner Street, State College PA 16801. Note: Please include $0.50 postage for results!

QRP ARCI
FALL QSO PARTY
Starts: 1200 GMT October 22
Ends: 2400 GMT October 23

The contest is open to all amateurs and all are eligible for the awards. Stations may be worked once per band and mode for QSO and multiplier credits. Partici-

pants may operate a maximum of 24 hours during the contest period.

EXCHANGE:

Members—RS(T), state, province, or country, and QRP ARCI membership number.

Non-members—RS(T), state, province, or country, power output.

SCORING:

Each member QSO counts 5 points regardless of location. Non-member QSOs are 2 points with US and Canadian stations; others, 4 points each. Multipliers are as follows: 4-5 Watts output CW or 8-10 Watts output PEP—×2, 3-4 Watts output CW or 6-8 Watts output PEP—×4, 2-3 Watts output CW or 4-6 Watts output PEP—×6, 1-2 Watts output CW or 2-4 Watts output PEP—×8, and less than 1 Watt CW or 2 Watts output PEP—×10.

Entries from stations running more than 5 Watts output CW or 10 Watts output PEP will count as check logs only. Stations are eligible for the following bonus multipliers: if 100% natural power (solar, wind, etc.) with no storage—×2; if 100% battery power—×1.5.

Final score is total QSO points (total all bands) times total number of states, provinces, or countries times the power multiplier and times the bonus multiplier, if any.

FREQUENCIES:

CW—1810, 3560, 7040, 14060, 21060, 28060, 50385.

SSB—1810, 3985, 7285, 14285, 21385, 28885, 50385.

Novice/Tech—3710, 7110, 2110, 28110.

No 30-meter contacts will be counted.

AWARDS:

Certificates to the highest-scoring station in each state, province, or country with 2 or more entries. Entries automatically considered for annual Triple Crowns of QRP Awards.

LOGS AND ENTRIES:

Separate log sheets are suggested for each band for ease of scoring. Send full log data plus separate worksheet showing details and time(s) off the air. No log copies will be returned. All entries desiring results and scores please enclose a business-size envelope with return postage for one ounce or an IRC.

It is a condition of entry that the decision of the QRP ARCI Contest Chairman is final in case of dispute. Logs must be received by November 20th to qualify. Logs received after that date or missing information will be used as check logs. Send all logs and data to William W. Dickeron WA2JOC, QRP ARCI Contest Chairman, 230 Mill Street, Danville PA 17821.

CLARA AC-DC CONTEST
Starts: 1800 GMT October 22
Ends: 1800 GMT October 23

Sponsored by the Canadian Ladies Amateur Radio Association, the Ac-Dc Contest is open to all YL and OM amateurs. Each station may be worked twice, either once on CW and once on phone, or on two different bands.

EXCHANGE:

Signal reports, QTH, and name. Bonus stations will operate in each province and will identify!

FREQUENCIES:

Phone—3900, 3775, 7150, 14280, 14160, 21300, 28588, 28488.

CW—3690, 7035, 14035, 21035, 28035.

SCORING:

CLARA members score 1 point per contact with non-members, 2 points per CLARA member contact, and 3 points per bonus station. Multiply by two for contacts made on CW. Multiply total of the above by the number of Canadian provinces/territories worked for total score. Non-CLARA members count points the same except only CLARA member contacts are to be counted.

AWARDS:

First place, CLARA Cup, and certificate to first-place CLARA winner, certificates to second and third. Plaque and certificate to first-place non-CLARA winner, certificates to second and third.

ENTRIES:

All logs submitted are eligible for the mini-prize drawing. Mail all logs and scores with your name, call, address, and postal code by December 15th to Muriel Foisy VE3LQH, Box 122, Janetville, Ontario, Canada L0B 1K0.

MF RUNDE SW ACTIVITY WEEKEND
Starts: 0400 GMT October 22
Ends: 2200 GMT October 23

The society of hamming ex-naval radio operators (MF Runde) offers this SW activity weekend for the easier application of the society awards. Every licensed ham is invited to take part, but QSOs must be between MF members and non-members. No club stations are permitted—only single-operator stations. Use all bands except the new WARC 10-, 18-, and 24.9-MHz bands, using CW and/or SSB.

This is the second weekend of activity. The official rules were received too late to publish before the first weekend in April.

The society club stations, DL0MF and DL0MF/A, are coordinating the traffic: Every full hour they pile up competitors (MF members and non-members) on SSB and divert them to frequencies where MF members are QRV for QSOs. Every 30 minutes after the hour they do the same thing with CW competitors. The advantage is that the club stations are able to tell competitors what MF members within the next hour are QRV. Every 3 hours the working frequencies are changed. General call for all is "CQ MF."

EXCHANGE:

RS(T) for non-members, RS(T) and MF number for members.

SCORING:

Every MF member worked on CW counts 2 points; on SSB, 1 point. QSOs with DL0MF on CW are 10 points or 5 points on SSB. QSOs with DK0MG and DK0DW are 6 points on CW and 3 points on SSB. Remember that every MF member can be worked on SSB and CW; that means 3 points for both contacts! Final score is the sum of QSO points.

AWARDS:

Awards are issued for 50 points (bronze), 100 points (silver), 150 points (gold), and 250 points (trophy). Awards for CW-only operation will have special engraving! For further information on award rules and MF membership lists, please send addressed envelope and IRCs to award manager.

ENTRIES:

Every operator is asked to send his signed logs no later than November 15th to Kurt Wuestner, Award Manager, PO Box 25, D-4600 Dortmund, Federal Republic of Germany. Award applicants outside the Federal Republic should use a GCR list and add 20 Deutschmark in cash or equivalent value. Logs must show callsign, name, and home address, plus date/time in GMT, band, station worked, and exchanges sent and received.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

HELVETIA 26 AWARD

This award has been instituted by the Union of Swiss Short Wave Amateurs (USKA) with the object of furthering friendly relations and the competitive spirit between its members and radio amateurs abroad.

Foreign amateurs must submit QSL cards showing evidence of contacts with stations in each of the 26 cantons and half-cantons of the Swiss Confederation on any bands between 1.8 and 30 MHz.

All contacts claimed must be made on or after January 1, 1979. Cross-mode contacts will not be valid. Awards will be offered for all phone, all CW, phone/CW mixed mode, radioteletype (RTTY), and slow-scan television (SSTV).

QSL cards submitted must clearly show the location (canton) of the Swiss station at the time of contact. Any QSL card from a Swiss station operating from a temporary or portable location at the time of the contact must show the canton of such location in order to be recognized as a valid contact.

In addition to QSL cards, applicant must submit a signed list of all contacts in alphabetical order by canton, include the station's callsign, date and time in GMT, band and mode of operation, and RS(T).

The 26 cantons are as follows: AG—Aargau, AI—Appenzell Inner Rhoden, AR—Appenzell Outer Rhoden, BE—Berne, BL—Basel Country, BS—Basel City, FR—Fribourg, GE—Geneva, GL—Glarus, GR—Grisons, JU—Jura, LU—Lucerne, NE—Neuchatel, NW—Nidwalden, OW—Obwalden, SG—Saint Gall, SH—Schaffhausen, SO—Solothurn, SZ—Schwyz, TG—Thurgau, TI—Ticino, UR—Uri, VD—Vaud, VS—Valais, ZG—Zug, ZH—Zurich.

The applications for the award must have sufficient postage enclosed in the form of IRCs to allow the safe return of your QSL cards.

Mail your application to the attention of Walter Blattner HB9ALF, PO Box 450, 6601 Locarno, Switzerland.

STATE CAPITALS AWARD

The Newark News Radio Club of Newark, New Jersey, takes pleasure in announcing its sponsorship of the SCA (State Capitals Award), which is available to licensed amateurs throughout the world for working stations located in state capital cities of the United States on or after January 1, 1960. This award is also available to shortwave listeners on a "heard" basis.

The purpose of this award is to offer recognition for operating achievements and to offer still another worthwhile contribution to the field of competitive radio-amateur operation.

It is hoped by the directors, officers, and members of NNRC that amateurs everywhere will accept the award as a gesture on the part of the sponsor to further promote and expand goodwill and better understanding among amateur operators and shortwave listeners.

The State Capitals Award is offered in three (3) classes: Class C—work 30 state capital cities; Class B—work 40 state capital cities; Class A—work 50 state capital cities.

There are no band or mode endorsements. Cross-mode contacts will not be valid.

To apply, applicants should prepare a list of contacts claimed, listing them in alphabetical order by US state. Include the usual logbook information for each contact. Have this list verified locally by two amateurs, a local radio club secretary, or a notary public. Do not send QSL cards. Have your verified list sent along with the $1.00 award fee to S. J. Knox WB2MRA, 212 North Jerome Avenue, Margate, New Jersey 08402.

DIPLOME DES 100

This award is given by the ITU to radio amateurs and shortwave listeners everywhere in recognition of their achievement in communicating with, or logging the reception of, amateur-radio stations in the territory of 100 or more member administrations of the ITU. Any licensed radio amateur or shortwave listener is eligible for this award. It is given to the individual, and the qualifying contacts may be made over any period of time subsequent to the dates shown in the ITU official countries list available from the awards manager.

Applications shall be made by letter and shall include a list of stations claimed in alphabetical order, showing claimed dates. No special form is required for this purpose. Only frequencies, modes, and prefixes approved by the Radio Regulations of the ITU may be used. To qualify, 100 or more contacts must be made.

QSL cards or proper log entries will be considered proof of contact to back up an award application. Attached to the application should be a statement from two licensed amateurs or an ITU administration representative to the effect that all claimed contacts have been verified. No other proof is required. Do not send QSL cards! Do not send logs!

There will be no endorsements for special conditions. Stickers will be given for each ten (10) additional contacts.

The administration of this award has been delegated to the International Amateur Radio Club, 4U1ITU, PO Box 6, 1211 Geneva 20, Switzerland. The IARC has

named Mr. L.M. Rundlett K4ZA as awards manager. All applications should be accompanied by 10 IRCs or US $2.00 for the award, and one IRC or a US self-addressed, stamped envelope for each sticker. Mail all applications to L.M. Rundlett K4ZA, Route 3, Box 447, Lake Placid FL 33852.

AWARDS FROM MOSCOW

I received a very complete package of information from the Central Radio Club in Moscow and take pleasure in featuring their award program in more detail. It is unfortunate they did not send samples of their certificates, as I'm sure they are unique diplomas to possess.

R-100-0 Award

This award (as is the case for all awards listed below) is issued to all licensed radio amateurs and shortwave listeners throughout the world who can meet the requirements. For the R-100-0, radio amateur applicants must carry out two-way contacts with, and shortwave listeners must log reception reports of, radio stations in 100 oblasts (provinces) of the Soviet Union.

There are three categories of R-100-0 awards. The First Class is for two-way contacts on the 3.5-MHz band only, the Second Class is for two-way contacts on the 7-MHz band only, and the Third Class is for two-way contacts on any amateur band. All contacts must be made on phone or CW only. Endorsements will be given for each mode of operation, but cross-mode or mixed-mode contacts are not allowed. All reports exchanged between stations must be RST 337 or RS 33 as a minimum. All contacts or observations must be made on or after January 1, 1957, to be valid.

Applications must include a list of contacts or observations with date, calls, mode, and frequency shown in order of callsign prefix. QSL cards must be submitted along with the award fee of one ruble or 14 IRCs to cover the cost of the award and safe handling of your QSL cards back to you. One should allow three to six months for the processing of any of the awards I am describing. Send all applications and inquiries related to this or any of the following awards to The Central Radio Club USSR, Postbox 88, Moscow, USSR.

W-100-U Award

The W-100-U Award (worked 100 radio stations in the USSR) was established in 1959 on the 100th anniversary of the birth of A.S. Popov, the great Russian scientist claimed to be the inventor of radio. For this award, amateurs must carry out two-way contacts on one or more amateur bands with 100 different amateur stations of the Soviet Union, including 5 radio stations of the 9th region (Minskaya). All contacts must be on either phone or CW, and applications must state which mode is to be credited for the award. Cross-mode or mixed-mode contacts do not count. All contacts must have been made January 1, 1959, or after and all signal reports exchanged must be at least RS 33 or RST 337 to be claimed. As with the R-100-0 award, the applicant must prepare a list of contacts claimed and give the calls, date, frequencies, and type of emissions used to achieve the contacts. The cost of the award is 1 ruble or 14 IRCs, to be sent with your application, and QSL cards are required. The award fee is used to provide for the safe return of your confirmation cards.

R-6-K Award

The worked-all-six-continents award is offered by the Central Radio Club to amateurs and to shortwave listeners who can carry out 12 two-way contacts or observations on SSB, CW, and phone with radio amateurs as follows: one contact each in Europe, South America, Africa, Asia, North America, and Oceania, plus 3 contacts each in the European USSR (UA1, UN1, UW1, UA2, UC2, UP2, UQ2, UR2, UA3, UW3, UV3, UA4, UW4, UB5, UO5, UT5, UY5, UA6, or UW6) and the Asiatic USSR (UD6, UG6, UF, UL7, UI8, UJ8, UH8, UM8, UA9, UW9, UV9, UA9, or UW0). The award has three categories: First Class is for two-way contacts on 3.5 MHz only, Second Class is for two-way contacts on 7 MHz only, and Third Class is for two-way contacts on any amateur band. As with all awards of the Central Radio Club, confirmation cards must be sent with your application. To qualify, all contacts must have been made May 7, 1962, or after. The award fee is 1 ruble or 14 IRCs, the same as it is for each of the awards of the Central Radio Club.

R-10-R Award

The R-10-R Award (worked 10 radio amateur regions in the USSR) is available to those who carry out, on one or more amateur bands, two-way contacts with 10 radio amateur regions in the USSR. These regions may also be termed call districts; in any case, numbers one (1) throughout zero (0) must be worked. All contacts must be made on either phone or CW. Mixed-mode or cross-mode contacts will not count. All contacts must be made after July 1, 1958, and signal reports must be a minimum of RST 337 or RS 33. The submission of applications and the cost of the award is the same as noted with the other awards in the Central Radio Club portfolio.

R-15-R Award

The R-15-R Award (worked radio stations in 15 USSR Republics) is offered to those who work at least 15 of the 18 USSR Republics within a period of 24 hours. They are: European Russian SFSR, Franz Josef Land, Kaliningradsk, Asiatic Russian SFSR, Ukraine, White Russian SFSR, Azerbaijan, Georgia, Armenia, Turkoman, Uzbek, Tadzhik, Kazakh, Kirghiz, Moldavia, Lithuania, Latvia, and Estonia.

All contacts for the R-15-R Award must be made on CW or phone on or after July 1, 1958. Applicant must submit a list of claimed contacts giving date, emission, and frequency for each contact and must provide a QSL card for each contact claimed. Cost and mailing directions are the same as for the other Central Radio Club awards.

R-150-S Award

Probably the most sought-after award in the program offered by the Central Radio Club is the R-150-S Award. Amateurs and shortwave listeners throughout the world are eligible to compete for this award and must complete the following operating requirements to qualify.

The R-150-S Award requires the applicant to work at least 150 countries of the world and 15 Republics of the USSR from a special USSR DX countries listing.

There are no band restrictions, but contacts must be made on either phone or CW. All contacts must be made on or after June 1, 1956. Signal reports exchanged must be a minimum of RST 337 or RS 33.

Submission of applications and cost of the award is the same as noted for the other Central Radio Club awards.

RSES 150

The amateurs of Redford Township, Michigan, invite everyone to help them celebrate their sesquicentennial—150 proud years. This special event station, KG8W, is the culmination of much work by Redford amateurs. The year started with little organization and a station at Thurston High School which had not been on the air in 8 years. For this event, our amateurs have rehabilitated the Thurston station, which consists of a Collins S-Line with 30S1 linear, a Drake TR4C with L4 linear, and a Heath HW16 Novice station. Dave Riley KG8W, who is allowing us to use his call, was one of the last to operate the Thurston station as a student before it was closed down. After this September 24, 0000Z-2400Z event, the station will be operational for use in the Thurston High School electronics program. A specially designed QSL will be returned for your OSL (with contact number) and SASE to: RSES 150, 18800 Beech-Daly, Redford MI 48240. Operating frequencies, dependent on propagation, will be up from 3.6, 3.88, 7.065, 7.215, 14.05, 14.215, 21.09, 21.34, 28.09, 28.6; Novice—bottom 10 kHz of band.

SUNBELT AGRICULTURAL EXPOSITION

The Colquitt County Ham Radio Society will be operating club station WD4KOW from the site of the sixth annual Sunbelt Agricultural Exposition on October 11, 12, and 13, 1983. The hours of operation will be 0900 to 1700 EDST each day.

This annual Sunbelt Expo is held each year at Spence Field Airbase, located near Moultrie, Georgia, and is the largest agricultural show in the south. This event draws over 200,000 visitiors from all over the United States and foreign countries.

Operations will be in the General portion of the HF bands. The members will also be listening for visiting hams on the local repeater (146.19/.79). Visiting hams are invited to visit the amateur booth at the Expo and operate the amateur station. A special QSL card is available for those making contact during this event who submit an SASE.

SUFFOLK COUNTY NY

Suffolk County Radio Club will operate W2DQ from 0000Z October 28 until 2400Z October 30 in celebration of Suffolk County's 300th birthday.

Frequencies: phone—15 kHz up from lower 40-15-meter General-class band edges; Novice—21.135.

For a special certificate, send a large SASE to Richard Tygar AC2P, 5 Chelmsford Drive, Wheatley Heights NY 11798.

NAVY WEEK SPECIAL EVENT STATION

On October 30, 1983, the Laurel, Maryland, Amateur Radio Club will operate K3LDE on board the *USS Constellation* from 1200 to 2200 GMT. Operating frequency will be 7225 with QSY to 14225 and 21400 per band conditions. They request 3 first-class stamps to cover mailing tube and specially-designed certificate. Send requests to: Laurel MD ARC, Box 259, Annapolis Junction MD 20701.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½"×11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye." and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

Vertical Vibroplex and other old keys wanted for a private collection.

Dick Randall K6ARE
1263 Lakehurst Rd.
Livermore CA 94550

Wanted: a 21-MHz radiator trap or a set of traps for the Telrex TC99C antenna.

Dan A. Summers W4JB
1712 SE 14th St.
Ft. Lauderdale FL 33316

I have photocopies of manuals for the following gear: Drake 2NT, 2B, 2LF, 2AQ, and 2AC; Hammarlund HQ-100A; and Hallicrafters HT-144 and SX-117. If you need a copy of any of these, I will send it to you in return for shipping and copying costs.

C. R. Weinstein N0EHD
Box 52
Golden City MO 64748

I want to replace the tubes in my Collins R-392 receiver with solid-state devices. Any information on replacement parts would be greatly appreciated. I also need information on the R-392 Club and sources for 2-kHz filters for the Collins R-390A.

J. P. Barnes G8AHN
2 Mappins Rd.
Calcliffe, Rotherham
South Yorkshire S60 5TH
England

I need schematic diagrams and service manuals for a Hewlett-Packard model 130A oscilloscope. Please write to me before sending the material; I will pay copying and postage costs or will copy and return original.

Andrew Zenisek
941 Maryvitte Dr.
Lockport IL 60441

I want to use an American Microsystems S2559 touchtone pad in a standard rotary-dial telephone and in an amplified version. Can anyone help me?

John Hendry
KKYN
Box 147
Plainview TX 79072

I need manuals and schematics for Terminal Communications models TC 235 and TC 62. I will pay for copying and postage.

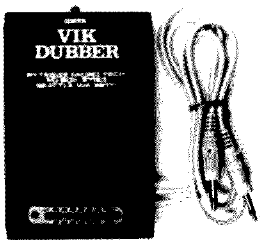
Jerry Dotson
27 Center Street
Worthington IN 47471

NEW PRODUCTS

BYTESIZE OFFERS A CASSETTE INTERFACE

The VIK-Dubber cassette interface allows VIC-20 and C64 users to save and load data using any standard cassette recorder. The VIK-Dubber circuitry filters and enhances the cassette data, virtually eliminating bad loads. It also includes several features to allow easier cassette use; it allows you to connect two cassette recorders together to make high-quality backup copies of cassette programs, even machine language. An indicator light and quiet audible tone help you to adjust cassette volume for proper use and allow you to monitor the cassette data. The VIK-Dubber gets its power from the computer, so no batteries are needed. It comes in an attractive case, tested and ready for immediate use.

For more information, contact *Bytesize Micro Technology, PO Box 21123, Seattle WA 98111; (206)-236-BYTE.* Reader Service number 481.



The VIK-Dubber cassette interface from Bytesize Micro Technology.

TURNING THE TRS-80 COLOR COMPUTER INTO A CW MORSE-CODE TERMINAL

A recently introduced modem called the KA9FSQ CW modem interface changes the RX tone into a signal pulse. This makes it possible for ham-radio operators to transmit or receive Morse code on their TRS-80 Color Computers.

A visual indicator (signal LED) is mounted on the unit for the indication that you're locked in on the signal and it is being received. While other units use a mechanical relay for TX, the KA9FSQ CW modem uses an optoisolator to keep keying voltages away from your computer and give a clean digital pulse to your transmitter. This unit can also be used with other CW programs with proper software modifications.

The modem is easy to use. Just plug the cartridge into the ROM-PAC slot on the side of your Color Computer and connect two cables, one from your transmitter and one from your receiver. Turn your computer on and CLOAD the program from tape. RUN the program and sit back for Color-Computer Morse.

For more information, contact *Mitronix, 5953 N. Teutonia Avenue, Milwaukee WI 53209.* Reader Service number 478.

NEW CATALOG FROM UNIQUE COMMUNICATIONS

Unique Communications has released its new 72-page catalog of telephones and accessories. This catalog lists a variety of products ranging from desk-type rotary telephones complete with memory dialing, mute switch, and automatic redial. Reconditioned and new telephones are available in many price ranges.

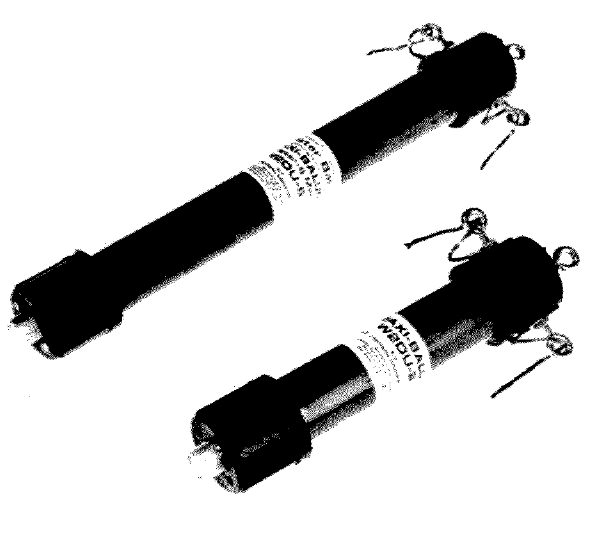
Other telephones available from Unique Communications include one-piece rotary and touchtone phones, Slimline-style phones, and cordless extension phones.

For more information, contact *Unique Communications, 6335 S. R. 97, Galion OH 44833; (419)-468-6972.* Reader Service number 483.

MICROWAVE FILTER CO. "MAXI" BALUNS

The Unadilla/Reyco/Inline W2DU-(6) and W2DU-(2) "Maxi" baluns handle 3.5 kW of power. Model W2DU-(6) is used for 160–6-meter applications, while the W2DU-(2) handles those in the 6-1-1/4-meter range. Pull-apart tensile strength is rated at more than 600 pounds. The baluns are adaptable to dipoles, inverted vees, quads, and yagi antennas. Both are contained in weatherproof housing and have built-in lightning arrestors.

For more information, contact Sandy Weegar at *Microwave Filter Co., Inc., 6743 Kinne Street, East Syracuse NY 13057; (800)-448-1666.* From New York, Canada, Hawaii, and Alaska, call collect at (315)-437-3953. Reader Service number 479.



"Maxi" baluns from Microwave Filter Co.

A VARIABLE-TEMPERATURE SOLDER SYSTEM BY UNGAR

A low-priced variable-temperature-controlled soldering system has been introduced by the Ungar Division of Eldon Industries, Inc. A rotary control on the base enables the user to vary the temperature in 50-degree increments from 400 to 800 degrees F. While the unit makes temperature-controlled soldering feasible for hobbyists and do-it-yourselfers, the Electronic Soldering System 9100 has features previously developed for the Electronic System 9000 for high-technology induction use.

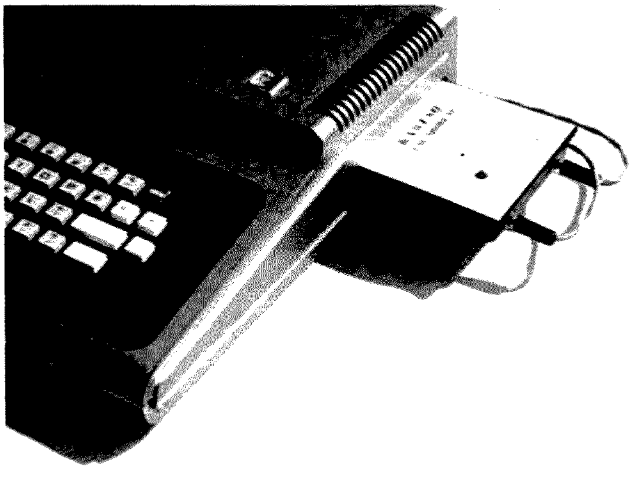
Ungar's recently introduced Thermo-Duric™ heating element, which combines an efficient heater and sensitive tip-temperature sensor, quickly recovers tip temperature after each solder joint. The smaller heating element also makes possible a thinner, cooler handle.

The iron holder can quickly be changed to the left or right side of the stand. Any of five Ungar soldering iron tips can be used. The system is electrically conductive from the tip to a grounded wall plug to prevent static electricity damage to microcircuits.

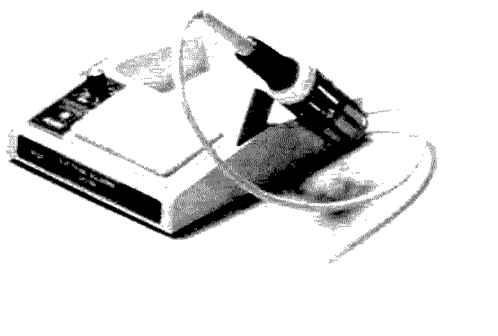
Further information is available from *Ungar, 100 W. Manville St., Compton CA 90220; (213)-774-5950.* In Canada: *Eldon Industries of Canada, Markham, Ontario L3R 1H5; (416)-495-9407.* Reader Service number 477.

THE FLESHER CORPORATION ROM-116 INTERFACE

Flesher Corporation has announced that it now exclusively distributes and sells the ROM-116. The ROM-116 interfaces to the Radio Shack TRS-80 models I, III, and IV with 16K minimum memory. Some of the features included are two serial ports, fourteen buffers, formatted or unformatted split-screen display, vertical status display, automatic CW ID, PTT control, selcal, error correction, and a text



The KA9FSQ CW modem from Mitronix.



The variable-temperature-control "Soldering System 9100" from Ungar.

editor. The interface also offers two independent callsign buffers, adjustable line length, all standard Baudot and ASCII baud rates (up to 1200 baud), and CW receiving and transmitting with full break-in.

Several software packages, including a mailbox program, are available.

For more information, contact *Flesher Corporation, PO Box 976, Topeka KS 66601; (800)-HAM-RTTY.* Reader Service number 476.

NEW HUSTLER ANTENNAS

With the renewed interest in 6-meter amateur operation, Hustler has added three new models to fulfill most antenna requirements.

The 6-MB3 3-element yagi features a 6-dB forward gain while maintaining a front-to-back ratio of 28 dB. Bandwidth is 2 MHz with an swr under 2:1. Resonance is centered at 50.1 MHz with an swr under 1.2:1.

Model G-3754 is an omnidirectional vertical endfed collinear antenna for fixed-station use, appropriate for repeater applications. Bandwidth is 1 MHz with an swr under 2:1. The antenna's gain is 3.4 dB developed from a .64-wavelength radiator. Vswr is 1.2:1 at resonance. The G-3754 and 6-MB3 are constructed of high-grade seamless aluminum tubing and stainless-steel hardware for durability and long life.

For mobile use, the new BBL-4554 base-loaded antenna features a 48-inch overall height and shunt-fed design for performance on any mode—FM, AM, or SSB. The antenna is supplied complete with stainless-steel impact spring, 3/4-inch hole mount, and 17 feet of RG-58/U coaxial cable with a PL-259 connector installed.

For further information, contact *Hustler, Inc., 3275 North B Avenue, Kissimmee FL 32741.*

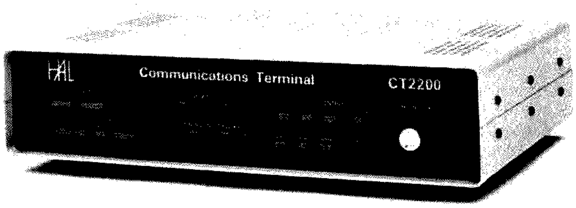
NEW 10M TRANSCEIVER FROM HEIL SOUND, LTD.

A very economical amateur-radio transceiver is now in production at Heil Sound, Ltd., in Marissa, Illinois. The 10-meter FM-10T is a completely wired and tested version of the kit that Heil introduced in 1979. The FM-10T is a complete transceiver capable of operating 29.60 to 29.70 MHz. Several added options are included in the FM-10T, such as the 6-kHz wideband FM filter, repeater offset, microphone, transmit-receive LED, and the 40-channel program switch and knob. The FM-10T is in a black and white aluminum housing.

For more information, contact *Heil Sound, Ltd, Heil Industrial Blvd., Marissa IL 62257.* Reader Service number 484.

The Flesher Corporation ROM-116.

Icom's IC-120 1.2-GHz transceiver.



The Hal Communications Corporation CT2200 communications terminal.

HT POWER AMPLIFIERS FROM MFJ

MFJ Enterprises now offers 430-MHz and 2-meter power amplifiers which are small enough to mount on your HT. The MFJ-2040 (for 144–148 MHz) will deliver from 7 to 20 Watts output with an input from 0.1 to 3 Watts. The MFJ-2045 (for 430–440 MHz) will produce 4 to 15 Watts for the same input. Transmit/receive switching is carrier operated. The die-cast aluminum body is 1-1/2 inches in diameter and 3-3/4 inches long, which makes these amplifiers small enough to fit between your antenna and HT. The amplifiers require 12 to 13.8 V dc at 50 mA for receive and 1 to 2 Amps for transmit.

For more information, contact *MFJ Enterprises, Box 494, Mississippi State MS 39762; (800)-647-1800.* Reader Service number 482.

ICOM'S NEW 1.2-GHZ FM MOBILE TRANSCEIVER

The IC-120 is a 1.2-gigahertz FM mobile transceiver covering 1260 to 1300 MHz. This unit is styled similarly and has features similar to the IC-25A/H series of 2-meter transceivers and has many common features. Duplex split is variable, but is initiated at 20 MHz when the unit is first turned on. Duplex up and down as well as scanning features are offered. Power output is 1 Watt. Icom is the first to offer hams a full-featured mobile transceiver for this mostly unused band.

For more information, contact *Icom America, 2112-116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

HAL OFFERS NEW CT2200 COMMUNICATIONS TERMINAL

The CT2200 is the successor to the CT2100 communications terminal. It offers all of the features of the CT2100 plus keyboard programming of all eight "brag-tape" messages and programmable selective call control of the printer output. The terminal also has a manual printer on/off control, non-volatile storage of HERE IS, "brag tape," and selective call codes, and new rear-panel connections for use with the ARQ1000. The CT2200 is a new product that replaces the previous CT2100, but an update kit (including a new front panel) is offered to upgrade the CT2100.

For more information, contact *Hal Communications Corp., PO Box 35, Urbana IL 61801; (217)-367-7373.* Reader Service number 480.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Let me take a wild guess. I will bet that many of you active on RTTY are still using some form of old, boat-anchor type of equipment. Right? I thought so. For just because this equipment is old does not mean it cannot still put out a fine signal on RTTY. With proper interfacing—such as we have covered here in months gone by—even a thirty-year-old transmitter can be connected to a modern RTTY terminal.

But just as there are changes which bring a new season, so have hams changed from power- and space-hungry tube equipment to the new state-of-the-art, solid-state, compact transceivers. Many of them feature a RTTY or FSK detent on their mode switch, but are they really usable? Promotional literature does little to point out those minute features which make operation on FSK a pleasure or a pain, but the average ham will turn them up in a few hours of on-the-air time.

I recall the flap which arose a number of years ago when a well-known company offered a transmitter which featured an FSK mode, ostensibly designed for radioteletype. However, entering that mode shifted the transmit frequency almost three kilohertz from the receive frequency, making it impossible to use the transmitter with its companion receiver in transceive mode on RTTY. It is because of such problems that modifications are made, and I solved that one and published the solution some years back.

Let me know what your experiences are with some of the newer HF equipment being sold which features a RTTY mode. I will try to pass along whatever information I get that I can verify on what's good, bad, or super in the way of equipment to put RTTY on the air. And if you are considering buying a new transceiver, watch here for whatever information we turn up which may influence your choice.

Speaking of your choices, the mail has been running heavy lately. Let's see what some of you have to say.

From St. Leonard, Maryland (quite a distance from me here in the Baltimore area), comes a letter from V. L. Thrasher KB3FS. V. L. writes that he has looked through all the catalogs he has in search of some 88-mH toroids mentioned here some months back, with no luck. He is using a Model 15 Teletype® with an ST-5 type demodulator and wants to build an oscilloscope display which will require the toroids.

Well, V. L., several years ago it was relatively easy to find a parts house that advertised the toroids in question. Usually surplus or removed from service in bundles of five, they most often originated with telephone company equipment. But as that source has modernized and thus obviated the need for toroids in tuned circuits, the supply of toroids has also dried up. I would first suggest searching

through catalogs of surplus jobbers, as I assume you have done. Coming up blank there, ask around at the local ham club or the like; often a pack-rat ham, such as I was in my younger days, will have two or three bunches of toroids stashed for a rainy day.

If all this fails to find any, I have found that the best place to find odd parts at the right price remains a hamfest, and this column should be published right around the time of the big Foundation for Amateur Radio hamfest which takes place in Gaithersburg, Maryland (a suburb of Washington DC), every fall. Check the tables there, and good luck.

As an aside to those of you in the sales end of this parts problem, don't forget the home-brewer. Even though a great bulk of hams purchase high-tech gear, a trend which this magazine has shown, building it yourself is far from dead! We need parts—resistors, capacitors, coils, and the like—besides the semiconductors that are available everywhere. Address that market and you may find that you are alone in the field, with plenty of takers.

Regards to Ron Hatton WA4BDY/DA2SR, who currently uses an APO box in New York for his mail. Ron is a computer buff who numbers himself among those waiting for a RTTY program. Also in that crowd is Ray Baumiller WB3HDZ, from Montgomery, Pennsylvania. What these fellows and many others are interested in is a program to place one of the easiest microprocessors ever devised, the Motorola 6800, on RTTY as a full-featured RTTY terminal. Such schemes are being used commercially, as with the excellent series of products being produced in Gaithersburg, home of the hamfest, by Microlog. By choosing the 6800 as their CPU, this fine company is able to produce a versatile RTTY terminal with all of those features the active ham requires.

Of course, as has been stated here before, many consider the 6800 and its family of related chips a dead series. But as Larry Antonuk WB9RRT/1, in Keene, New Hampshire, puts it, "Is the Model 28 dead? Of course not." He is another in the group that would like to see a program devised to transmit and receive RTTY which would not require buying the latest high-tech box.

Unfortunately, it would appear that such a program may well be too limited in appeal to publish here, no matter how vocal are those who desire it. Therefore, I shall be investigating other ways of disseminating the kernels of this program so that it can be used by those interested. At the same time, I will not bore those who are tired of reading about CPUs, RAM, ROM, etc., by continuing to discuss those topics in "RTTY Loop."

That said, I would like to add one thing. Nothing is cast in concrete. If there is a topic you would like to see covered in this column, and I have not covered it to your liking, write me and write the editors of *73*. Let your voice be heard! If enough of you want to read about this or that, I am sure the editors will give it the nod.

On a sadder note, I have received word that the Stark RTTY group in Massillon, Ohio, is dwindling. I am not sure of the origin of the dwindle but hope that the situation is only temporary. Through the years I have been involved with many clubs and organizations (not all of them amateur radio in nature) which go through such a period of ebb tide. Often they just fade away, and all the work and love put into them by the founding members is discarded as so much old rubbish. But sometimes, not often, but sometimes, a new spark is felt which rekindles the interest. Let's hope such a spark strikes in Ohio real soon. Keep me posted, folks.

Observant readers will note that the address at the top of the column has changed once again. I am now at the new QTH and shall do what I can to get on the air as quickly as time, finances, and the XYL allow. In the meantime, I plan some rather exciting editions of "RTTY Loop" in the months to come: a look at AMTOR for example—the new, but really not so new, technique of sending RTTY that is essentially error-free. And we'll also have feedback from my questions to you about on-the-air mailboxes, commercial equipment, and the other things that bug and cheer the amateur on RTTY. Stay with me, and let me know what you are doing!

DR. DIGITAL

Robert Swirsky AF2M
412 Arbuckle Avenue
Cedarhurst NY 11516

Good news! The FCC has lifted that silly identification restriction for RTTY. Since June 15, 1983, there is no longer any need to ID in CW or voice while running Baudot, ASCII, or AMTOR. If you are running some other digital code, you must ID in any one of the three "accepted" digital codes. Of course, you can still ID in voice or CW if you like that sort of thing.

A while back, John Edwards KI2U (you know him as Mr. Fun!) petitioned the FCC concerning this very issue. John correctly pointed out that the CW ID requirements were a major annoyance to RTTY operators; the CW often messed up the printout. Just as a courtesy, John sent a copy of the petition to the ARRL. He received a nasty reply saying his request was a foolish one and the FCC would "*never* in a million years" go for such a silly proposal. Well, ARRL? Don't tell me a million years have already elapsed.

I found it interesting that many amateurs are upset about the new identification rule. It seems that some feel the RTTY people will now take over amateur radio, transmitting in their "secret code" that only other RTTY operators can copy. I wonder if the AMers wanted the SSB people to identify in AM, or if the spark-gap people wanted the CW people to identify with a modulated spark-gap rig? Why is it that even the most minor rule changes must overcome considerable inertia before being accepted by the amateur community?

Cyclic Redundancy Checks

Last month, we discussed the Longitudinal Redundancy Check. While the LRC is certainly easy to implement, it isn't that *efficient*. There are many errors that it can't detect or correct. A better error-correcting scheme is called Cyclic Redundancy Check (CRC). It is more efficient that the LRC and can detect and correct a wider variety of errors. But there is a catch...

"There is no such thing as a free lunch," the adage goes. The CRC is a little bit more difficult to understand than the LRC and is harder to implement. Bear with the explanation. It might seem difficult at first.

The CRC involves representing a series of bits as the coefficients of a polynomial expression; let's call this expression the message function M(x). This message function is operated on by a generator function of a lower degree than M(x). Before the transmission of data, the message polynomial is operated on as shown in Fig. 1.

The generator polynomial is chosen according to certain criteria depending on amount of redundancy desired and the number of bits transmitted in each block. Also, multiplying the message polynomial M(x) by X^P will result in adding P zeroes in the least significant positions of M(x) without disturbing the higher-order bit positions. Division by the generator polynomial P(x) is done using modulo-2 arithmetic (no carries). Q(x) is the quotient, and the ratio R(x) over P(x) is, of course, the remainder. The result of this process yields a string of x bits which is appended to the data block and transmitted along with the message data. The transmitted message is the polynomial T(x).

On the receiving end, the message is operated on using the same generator polynomial as the transmitter. Fig. 2 shows the equation for this operation. If the remainder is anything other than zero, an error has occurred. The position of the errors can be represented by another polynomial, E(x), which would be of the same form as T(x) (the transmitted message). The relationships among all these polynomials can be seen in Fig. 3.

To recapitulate in simpler terms, the

$$M(x) = Cx^n + Cx^{n-1} + Cx^{n-2} + \ldots + Cx^0$$
$$M(x)x^P/P(x) = Q(x) + R(x)/P(x)$$
$$T(x) = M(x)x^P + R(x)$$

Fig. 1. Equations for the message polynomial, the generator operation, and the transmitted message.

CRC involves subjecting your data to a specific formula. The person receiving the data applies the same formula; if the remainder is non-zero, there was an error. By examining the value of the remainder, it is possible to detect a large number of errors. Cyclic codes are more efficient in detecting errors than any other method; less redundancy can find more errors.

Need Help With Math?

If it has been a while since high school and you are out of practice with mathematics, there are two books I strongly recommend. The first is *Realm of Algebra*, by Isaac Asimov, Fawcett Crest, New York, 1967. This concise 143-page book clearly describes arithmetic and algebra and demonstrates practical applications. If you just want to brush up on your algebra, this book is ideal.

Less succinct, but covering more topics, is the classic *Mathematics for the Millions*, W. W. Norton & Company, New York, 1983. First published in 1937 by Lancelot Hogban, this 648-page book is regarded as one of the best guides to mathematics for the layman. Despite its length, it is not prolix; this book is a complete course in mathematics starting at the very beginning and leading into advanced topics. In fact, given the comprehensiveness of this volume, it is remarkable that it is under 1000 pages. Both of these books are in paperback. If you feel limited because of an inadequate mastery of math, these books will prove most helpful.

Computer Slow Scan

Using the graphics capabilities that many microcomputers have combined with a reasonable amount of memory, microcomputer slow scan is feasible. Although few of the home computers have the proper graphics features for a full-resolution SSTV picture, reasonable results can be obtained by sacrificing grey levels. A commercial scan converter (e.g., Robot)

$$T(x)/P(x) = M(x)x^P + R(x)/P(x) = Q(x) + \text{Remainder}$$

Fig. 2. If remainder is not zero, an error has occurred.

$$T(x) + E(x)/P(x) = T(x)/P(x) + E(x)/P(x)$$

Fig. 3.

usually produces a picture that has 128 by 128 pixel resolution with 16 shades of grey. Many microcomputers can easily handle the 128 by 128 pixels but lack the grey-scale capabilities.

One of the earliest efforts with computer SSTV was by Dr. C. H. Galfo WB4JMD. The Galfo SSTV program, without *any* additional hardware, enables an Apple II owner to receive SSTV. Using a resolution of 128 by 128 with three grey levels, the program adds some random noise to the picture to give the illusion of an increased grey scale. While the pictures are very high contrast, they are quite acceptable. I have found *that* the smaller the monitor, the better the results; on a 5-inch TV, the pictures are very clear.

SSTV uses the following tones: 1200 Hz (sync), 1500 Hz (black), 1900 Hz (grey), and 2300 Hz (white). Of course, if the hardware is capable of handling more grey levels, additional tones between black and white will be decoded.

Dr. Galfo's program is able to decode SSTV with no additional hardware due to the characteristics of Apple's cassette interface. The program is an excellent example of software replacing hardware. Also integrated with the Galfo SSTV program is a routine to transmit SSTV. Characters and block graphics are entered using the keyboard, and the computer translates them into the appropriate SSTV tones which come out the cassette port.

Apple uses a zero-crossing detector in the circuit of the cassette port. Every time the audio waveform into the detector crosses the zero line, the detector changes its state; if it was a 1, it is now 0 (and vice versa). Since the Apple II uses memory-mapped I/O, the state of the cassette port can be determined by doing a read to the proper location. If the computer is programmed to count from one 0 to 1 transition of the cassette port to another, and if the amount of time it takes for the counting routine to increment is known, the frequency can be determined. This is the method that Dr. Galfo uses in his SSTV program; the same method has also been used in a number of programs that demodulate RTTY with an Apple and no additional hardware.

It should not be all that difficult to use other computers for SSTV. One micro that might be suitable is the Atari. Atari uses a custom microprocessor to control the graphics; this is separate from the main 6502 microprocessor. The graphics pro-

cessor is controlled by a special program called a display list. Further control over the graphics can be obtained by controlling the amount of Direct Memory Access (DMA) the chip gets during the horizontal-scanning interval. In the highest resolution graphics mode, with the DMA register set for 128 pixels across and the display list constructed for 128 lines vertically, the 128-by-128 resolution can be achieved without wasting any memory.

Because the graphics memory can be located anywhere in main memory and an interrupt can be generated during the vertical blanking interval, it is a simple matter to swap among a number of graphics memory pages every 60th of a second. Since the swap occurs during the vertical blanking interval, no flickering will occur. If four 128-by-128-bit pages are cycled on the screen, it can give the appearance of 6 grey levels.

The Atari's DMA requests from the graphics microprocessor leads to a problem: The computer can't time an event by counting clock cycles. Whenever a DMA request occurs, the microprocessor will halt briefly, causing timing disturbances. This would make it difficult to decode SSTV in software. One possible solution is to have a one-line tuning indicator on the screen while the computer is decoding. The DMA calls needed to display 1 line of character graphics would not interfere with the 6502 microprocessor as severely as a full-screen graphics display. The disturbances in timing that the DMA requests do incur can be accounted for.

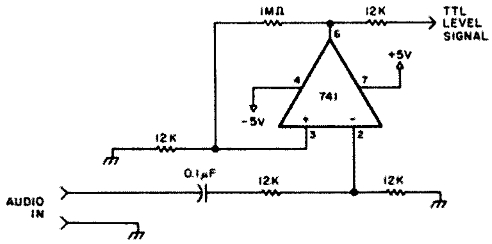


Fig.4. Zero-crossing detector.

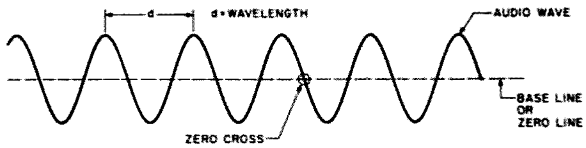


Fig.5.

The Atari cassette port, unlike Apple's, does not have a zero-crossing detector (it is incorporated within the 410 or 1010 recorder). A suitable circuit for a zero-crossing detector is in Fig. 4. This circuit will provide a TTL-level signal. Every time the audio signal crosses the base line (Fig. 5), the state, 0 or 1, will change.

Graphics Standards

It would be nice if one could exchange graphics over the air between computers. Since many computers have graphics, all that is needed is a standard. While protocols exist—such as NAPLPS (North American Presentation Level Protocol Syntax)—they are probably overkill for a radio amateur's needs. A simpler way, which can be made compatible with NAPLPS, would be to devise a special graphics character set that would contain symbols needed for amateur radio. The advantages of character-set graphics are numerous: Many computers can accommodate alternate character sets, standard ASCII can be used to transmit the data, any printer with programmable character sets can be used for hard copy, and it will keep graphics information compact.

I would appreciate any suggestions regarding a ham-radio graphics character set. My final decision as to what the character set contains will be in an upcoming column. It would be nice if such a character set became commonly used on amateur radio; just think, using the character-set symbols over RTTY, you'll be able to exchange schematic diagrams and flowcharts!

Keep those letters coming in! Remember: If you want a reply, please enclose an SASE.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

HAM SLANG

What do you think Mr. FUN! does when he goes looking for excitement? Well, one of the things he's likely to do is grab his brother, catch the Eastern air shuttle, and spend a day museum hopping in our nation's capital.

While my favorite spot is the National Air and Space Museum (with its OSCAR 1 exhibit), a close second is the recreation of the 1876 Centennial Exposition at the Science and Technology Museum. Last Saturday, as my brother and I were browsing through the impressive display of ladies' bustles, steam engines, and patent medicines, we stumbled upon a section of the museum we had never noticed before—an exhibit devoted to Samuel Morse (of Morse code fame). Among the objects on display were Morse's notebooks, his medals, and a very wide selection of telegraph keys, relays, and related equipment.

"Hey!" shouted my brother (WB2LWJ). "You know something?"

"What?" I replied.

"Everything else in this museum is straight out of a history book. But this exhibit looks like it came out of a modern ham shack."

"Jim, you're very astute," I noted. "You see, many hams regard 'state-of-the-art' technology as equipment that existed at the year of their birth. Most think that change is something to be feared. 'If it worked in the past it's good enough for today,' is the conventional wisdom."

"Is that why the ARRL intends to use CW nets in the event of nuclear disaster?" asked Jim.

"Yes," I answered, admiring my reflection on the surface of one particularly nifty bug.

"Isn't that sort of like the Polish government relying on its cavalry to defeat the invading German Panzer Corps?" he questioned.

"Museums can teach their visitors all sorts of things," was my response as we moved over to the display of hand-cranked printing presses.

Our topic this month is ham slang—you know—the buzzwords and jargon we use to scare newcomers away from our hobby. Next to CW, it's our best line of defense.

ELEMENT 1
MULTIPLE CHOICE

1) While there are many explanations for the origin of the term "ham," which of the following is the most commonly accepted?
   1) A telegrapher's term for a show-off
   2) A telegrapher's term for a poor operator
   3) A telegrapher's term for a good operator
   4) We were named after the "ham switches" found in most turn-of-the-century shacks

2) In the early days of our hobby, what was another common nickname for a radio amateur?
   1) Spark Jockey
   2) Plug
   3) Beefer
   4) Wirelessist

3) One hundred and sixty meters is often called:
   1) The top band
   2) The bottom band
   3) The DX band
   4) The quiet zone

4) You'll find the "graveyard":
   1) On 27 MHz
   2) On 2 meters
   3) In the AM broadcast band
   4) After standing near a microwave dish

5) Prior to 1976, what was meant by the term "Novice Gallon"?
   1) The supposed amount of perspiration generated by a prospective ham during the Novice theory test
   2) 100 Watts of input power
   3) 250 Watts of input power
   4) 75 Watts of input power

ELEMENT 2
MATCHING

Q signals were originally developed to help speed CW communication. Today, ham radio just wouldn't be ham radio without these confusing little buggers popping up during our daily "QSOs." Try and match the Q signal in Column A with its correct meaning in Column B.

A	B
1) QRG	A) I have nothing for you
2) ORH	B) Repeat your last message
3) QRI	C) It is my turn
4) QRK	D) I am busy
5) QRL	E) Increase your power
6) QRM	F) Your antenna is faulty
7) QRN	G) Send faster
8) QRO	H) I am calling you on
9) QRP	I) Your signal is fading
10) QRQ	J) I am ready
11) QRS	K) Stop sending
12) QRT	L) Your frequency varies
13) QRU	M) You are being called
14) QRV	N) I am acknowledging receipt
15) QRW	O) Decrease your power
16) QRX	P) Call me again
17) QRY	Q) Send messages
18) QRZ	R) Your signal is distorted
19) QSA	S) Send slowly
20) QSB	T) I am troubled by static
21) OSD	U) Your transmission is being interfered with
22) OSG	V) Your exact frequency is
23) QSK	W) The tone of your transmission is
24) QSL	X) Your intelligibility is
25) OSM	Y) Your strength is
	Z) Break your transmission

ELEMENT 3
SCRAMBLED WORDS

Unscramble these examples of ham slang:

NIEACMH	MINTERDO
QCHLESU	CAIND
YREKE	MCTAMSNART
PUPIEL	TEN
AXF	GIR
TFIHS	UADQ

THE ANSWERS

Element 1:

1—2 Then what's a "lid"? A bad, bad operator?

2—2 A plug, like a ham, was a poor operator.

3—1 Tops in wavelength; also known as the "gentleman's band."

4—3 That portion of the band (roughly between 1200 and 1400 kHz) where the FCC assigns low-powered broadcasters.

5—4 Using crystal control, of course.

Element 2:

1—V, 2—L, 3—W, 4—X, 5—D, 6—U, 7—T, 8—E, 9—O, 10—G, 11—S, 12—K, 13—A, 14—J, 15—H, 16—P, 17—C, 18—M, 19—Y, 20—I, 21—R, 22—Q, 23—Z, 24—N, 25—B.

Element 3:

(reading from left to right) MACHINE, INTERMOD, SQUELCH, NICAD, KEYER, TRANSMATCH, PILEUP, NET, FAX, RIG, SHIFT, QUAD.

SCORING

Element 1: Seven points for each correct answer.

Element 2: One point per match.

Element 3: Three points for each word unscrambled.

Where do you stand in the jargon jungle?

- 1-20 points—Think a Wouff Hong is a new Japanese HT.
- 21-40 points—Call CQ on repeaters.
- 41-60 points—Reside in a QTH, but think 10-codes are silly.
- 61-80 points—Five by nine.
- 81+ points—FB, OM!

REVIEW

READER COMMENTS: GORDON WEST TAPES

I read with pleasure the comments of Avery L. Jenkins WB8JLG, *73* Staff (page 120, *73*, July, 1983), regarding the code cassettes of Gordon (Gordo) West WB6NOA.

Gordon West's cassettes are truly a great advance. In addition to being in stereo compatible with mono, the cassettes are professionally recorded on C-90 high-quality cassettes. West's cassettes—unlike the ARRL code-practice cassettes—are generated by computer and sound *exactly* as the FCC exams sound. For some reason, the ARRL generates code at 16 wpm with spacing to slow it down, and at 13 wpm the sound does not sound similar to the FCC tests. I used the ARRL cassettes to get my speed up (I thought) to 13 wpm and promptly flunked the FCC 13-wpm code exam twice. Then I discovered the West cassettes, and in March, 1983, I passed the FCC 20-wpm code and written exams on the first attempt (I now have an Extra-class license).

Also, there are excellent West cassettes available for the theory part of the Novice, Technician, Advanced, and Extra written FCC exams. These are not designed to stand alone but, in my opinion, are excellent training aids. The West cassettes certainly worked for me and I am extremely grateful to Gordon West.

It should be pointed out that my only contact with Gordon West is as a customer (a very well-satisfied customer).

These cassettes are very useful to listen to in an automobile using the cassette stereo system. While learning the code, the trainee can merely listen—without writing the copy—to recognize the letters instantly. Of course, one must also learn to write copy while listening to prepare for the FCC code exams.

The FCC code exams are not random characters but are plain copy. If one is interested in passing the FCC code exams, working on plain copy is the proper study method to use.

Gordon West says on the cassettes, "There will be no surprises." I attest to the fact that this is certainly the case. Anyone preparing for an FCC exam, even those given by volunteer examiners, should contact Gordon West WB6NOA for the appropriate cassettes.

Earl W. Long KA0MOE
Joplin MO

READER COMMENTS: THE AUTEK QF-1A

Concerning your recent review of the Autek QF-1A audio filter, I am writing you with my own review.

As a heavy (95 percent) CW operator, the QF-1A is for me a valuable tool in bringing a signal up out of the noise. For me, the best results are obtained by using the Aux Notch control to take out QRN and then peaking the CW note with narrow selectivity to keep down QRM. Extra bonus: With the filter's audio amplifier, the CW sidetone of my HW-101 comes through very loud. A quarter-turn of Aux Notch brings sidetone levels down nicely.

I have not had a chance to use the filter on SSB very much. It seems to do a nice job in making "trash audio" fairly intelligible. The peaking of mid-range audio seems to be the best bet.

Autek's suggestions of appropriate functions for different modes/conditions are of great help in discovering how to improve audio. Their condensed list of the above (given in the instructions) I copied onto some index cards and taped to the top of the unit for quick reference.

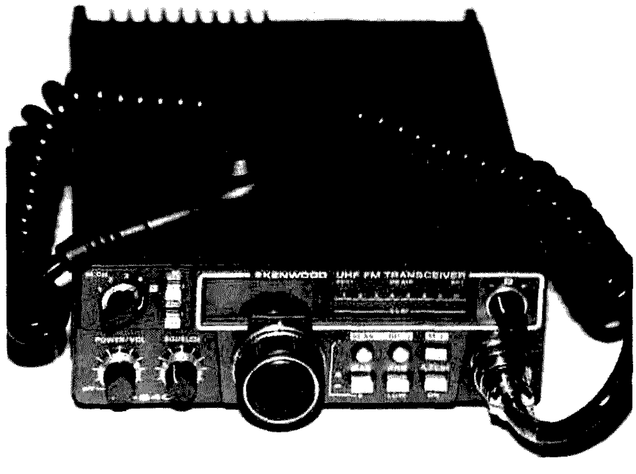
I saw the QF-1A for the first time about 3 years ago as an SWL. After a demonstration, I told myself I had to have one. When mine came in July, 1983, I tried it out first on an SWL communications receiver. SWL fans should note: The QF-1A is a very valuable tool for cleaning up faded, choppy, or interfered-with signals. SWLs should seriously consider the unit for making their hobby more enjoyable.

The Autek QF-1A beats any other unit (as far as I can determine) in function, performance, and price. It would make a nice addition to any ham/SWL station where cleaning up a bad received signal is a concern. (I believe that covers just about everyone.) I am pleased with my unit.

Charles W. Cotterman KA8OQF
Dayton OH

KENWOOD TR-8400

Those new, smaller, more-fuel-efficient cars really put the pressure on amateur manufacturers for new, smaller, more-space-efficient mobile rigs. (I often wonder what car dealers think when the first thing I do in their showroom is survey under the dash for space availability and ease of wiring in that new prospective car.) Well, if you're into 440-MHz FM, the folks at Kenwood have sure made life easier. The TR-8400 is downright tiny. Measuring just 2" high by 5-3/4" wide by 8" deep, the radio will easily fit into even the smallest car.



The Kenwood TR-8400.

But don't let the small size fool you. The 8400 is a microprocessor-controlled 10-Watt rig with memories, scanning, and all those niceties that state-of-the-art computer technology provides.

Features

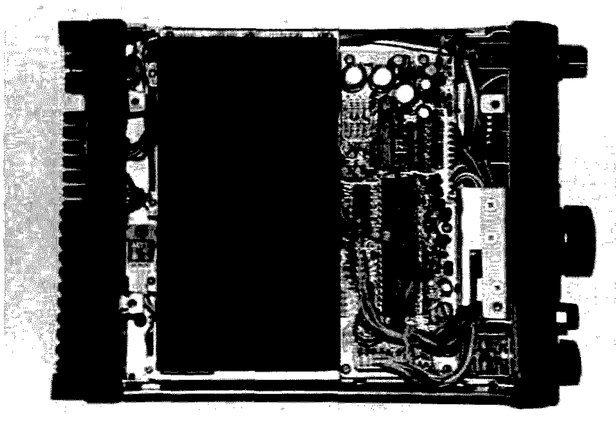
Two vfo's designated "A" and "B" step in 25-kHz increments, which is compatible with the US and Candian band plans. Five memory channels can be stored and recalled with either a five-position switch or with the scanning function. Memory 5 can be used for operation of repeaters with other than 5-MHz frequency splits. On this channel, the transmit and receive channels are memorized separately. Channels 1-4 as well as the vfo's are preset to provide a plus or minus 5-MHz split. In addition, simplex operation can be selected.

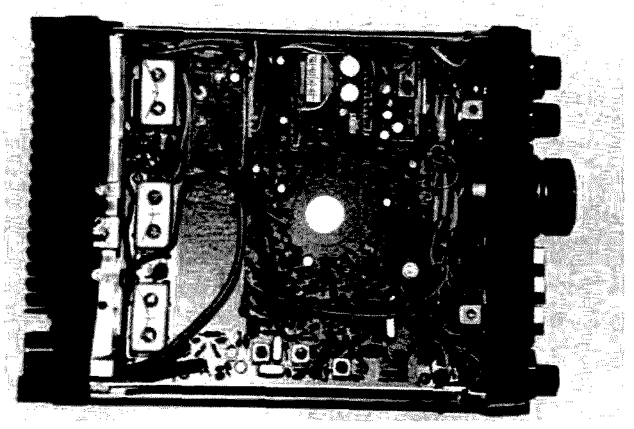
Two types of scanning are provided, memory scanning and band scanning. In the memory-scan mode, each of the five channels is scanned at a rate of 1 channel per second. Band scanning is at a much faster rate, described in the manual as 120 ms per channel (about a tenth of a second). This may seem fast, but when you are considering that the entire 10-MHz-wide band is being scanned, this rate is fine. Scanning the entire band takes only 50 seconds. If the squelch is opened by a signal, then scanning stops until the signal disappears, then scanning resumes from that frequency. If you want to listen further to that conversation, you must disable the scan function with the front-panel switch or by momentarily depressing the push-to-talk button on the mike.

A tone switch is provided on the front panel to enable or disable either a subaudible tone or tone burst for repeaters that use this feature. It should be noted that Kenwood does not offer the actual tone module that is required, but the radio is compatible with standard products available from a number of sources; the manual even describes the installation procedure. Similarly, the TR-8400 includes an input for a separate autopatch touchtone™ pad.

The rf power output is 10 Watts with a lower power level of 1 Watt.

One of the best features of the 8400 for me was the microphone with up/down tuning buttons. Each push of the button ad-


Top view.


Bottom view.

vanced the tuning one step, which was indicated not only by the display changing, but also by a built-in beeper. Holding down the appropriate button doubles the scan rate and is indicated by a continuous tone.

Controls, Displays, Connections

Despite the small area available on the front panel, the controls are well laid out and are easy to use. As shown in the photo, the memory-channel-selection switch appears in the upper left corner with the memory-programming and memory-recall buttons to the immediate right. The memory-recall button switches between the vfo's and the memory channels. Below are the volume and squelch controls. The main tuning knob dominates the front panel and clicks off channels in 25-kHz steps. Each revolution moves you 1.25 MHz up or down so you can move quite rapidly between band edges. When you reach the edge, the microprocessor automatically starts you at the other end of the band. With a little forethought, you quickly start to think of the band as a circle. Any frequency can be reached by tuning up or down once you know the shortest route.

To the right of the main tuning knob is a cluster of six buttons in two rows. The top row controls scanning. The SCAN and HOLD buttons start and stop the scan function, and the M.S. (Memory Scan) selects either vfo scanning or memory scanning as described earlier. On the bottom row is the vfo-select button ("A" or "B"). An LED lights to indicate when vfo "B" has been selected. A high/low power switch and the tone activation switch are also included. Above the microphone connection is a three-position rotary switch for selecting the transmit frequency shift, plus or minus, or simplex operation. A five-digit red LED numeric readout indicates frequency down to the whole kilohertz (example: 449.275 is shown as 9.275).

An LED light bar shows both rf power output and relative received signal strength. Individual LEDs indicate busy channels, transit mode, and repeater operations.

Rear-panel connections are provided for an external speaker, a tone-pad input, dc power, and an antenna.

On-the-Air Operation

I'm sure that in the design of any radio there are certain trade-offs to be considered, especially when so much is packed into such a small space. However, if there were trade-offs here, they did not affect the performance of the radio. Even the receiver-audio output was in abundance and the speaker could be driven loudly and still produce a crisp sound. Transmitted-audio reports were also excellent, and no operational problems of any sort were experienced with the radio. By far my favorite feature was the microphone with its up and down frequency buttons. Talk about being addicted to video games! After a few hours with readouts flashing and beeper beeping, I could land on a channel at will practically with my eyes closed.

I did manage to come up with a few ideas for possible future refinements. I am personally a bit partial to the use of type N antenna connectors at these frequencies and the one provided was a so-called UHF type. The digital readout is a bit difficult to see in direct sunlight, as are many others. The readout does not indicate the transmit frequency, but only the received frequency, even in the transmit mode.

Manual

The manual is very understandable with numerous pictorial diagrams. All functions and features are fully described. A block diagram and schematic are included, but there is little information regarding the circuitry. A separate service manual is available which contains this information.

Summary

The TR-8400 is both enjoyable and reliable. The features are well thought out to provide plenty of utility without a lot of complexity. This is an important consideration when selecting any mobile radio.

For more information, contact *Trio-Kenwood Communications, 1111 West Walnut Street, Compton CA 90220.*

Dave Mackey K1KA
Amherst NH

THE SUPER SANTECS

A short time ago, while discussing the no-code license proposal on a local repeater, a user with views different than mine accused me of not even knowing what time it was. He had failed to reckon with the fact that I was using a Santec ST-440/uP. By merely throwing a front-panel switch on the radio, I was able to hold my own in the conversation, as the Santec instantly displayed the correct time.

In addition to their timekeeping abilities, the Santec ST-/uP handie-talkies are lightweight, relatively compact radios with a number of innovative features. The 144- and 440-MHz versions have been in production for some time. The importer, Encomm, Inc., introduced the ST-220/uP, the world's first scanning 220-MHz handie-talkie, at the 1983 Dayton Hamvention.

Several particularly good features of these radios involve their receive sections. The radios wake up on whatever receive frequency is stored in the first memory. Each radio remembers ten receive channels, complete with transmit offsets. Santec says the tenth memory, which also serves as the upper scan limit when scanning a band, won't retain a transmit offset after the radio is switched off, but in fact it will retain simplex or negative split (transmit 600 kHz below the receive frequency), while the first nine will retain simplex, positive, and negative splits and non-standard offsets. Non-standard splits are handled by the ability to program memory channels 2-9 to receive on a designated frequency and transmit on the frequency stored in the first memory. In memory mode, the stored offset overrides the front-panel offset switches, so you know that when you select a memory channel, you are still ready to go on channel without checking switch settings.

In the squelched receive condition, if no signal has been received for about 90 seconds, the radios go into an idle mode. Current drain decreases to about 3 mA. Every 1.5 seconds, the radios sample the receive frequency for about 250 ms. Absent a signal, the idle mode continues. Pressing the PTT bar or receiving a signal during the sampling period restores the receiver to normal. Over time, this feature results in an average receive drain (in the idle mode) of 8-10 mA, which is comparable to many non-synthesized radios.

The receivers also feature an S-curve detector, which senses discriminator output voltage. When scanning, this feature causes scanning to stop whenever the discriminator voltage goes to zero, which means right on channel instead of 5 kHz high or low. The more usual squelch detector stops scanning as soon as enough signal is received to open the squelch, which may or may not happen exactly at the desired frequency. Also, the S-curve detector makes it possible to scan with the radio unsquelched, a useful feature for detecting weak signals.

On the ST-144 and the ST-220, the scanning interval can be set anywhere between 5 and 100 kHz, in 5-kHz increments. On the ST-440, the choice of intervals is 25, 50, 75, or 100 kHz. All offer four scanning modes: *Scan*, in which the radio stops for a short interval on each received signal and then automatically restarts; *Search*, in which scan must be restarted manually after stopping on a busy channel; *Open*, in which scan stops on the first vacant channel and requires manual restarting; and *Manual*, in which scan moves one interval up or down at the press of a keyboard button or runs continuously if the button is held for about 1.5 seconds. All this applies whether the scan is of an entire band, a designated portion of a band, or the ten memory channels. Scanning the ten memories in the Scan mode activates a priority feature; channel 1 is scanned first after each stop for a received signal on any other channel.

The receivers are quite sensitive, as the receiver specifications in Table I demonstrate. 12-dB SINAD occurs between 0.23 and 0.31 uV input, depending on the radio. The receiver sensitivity measurements were made on a Motorola R2001 communications system analyzer, courtesy of Eastern Communications Ltd., of Long Island City, New York. None of the radios exhibits any receive birdies, although the ST-144 and ST-440 each had one initially. See the comments on Santec service at the end of the article.

Transmitter-power output and current consumption are also shown in Table I. The medium- and low-power levels are fully adjustable; I set mine for approximate 6-dB steps near the band centers, 146, 223.5, and 445 MHz, giving one-fourth and one-sixteenth of full power. As Table I demonstrates, output at the medium-power setting tends to increase somewhat with frequency.

All three radios are powered by a battery of 8 AA nickel-cadmium cells rated at 500 mAh. A three-pin socket wired to the battery mates with a plug inside the radio. A fifteen-hour wall charger is supplied with the radio and plugs into its underside; a small PC-board external charge adapter is an available accessory which accepts the charger plug and the battery socket, allowing a second battery to be charged outside the radio. I found another use for the charge adapter, described later. A 5-hour rapid charger/power supply is also available.

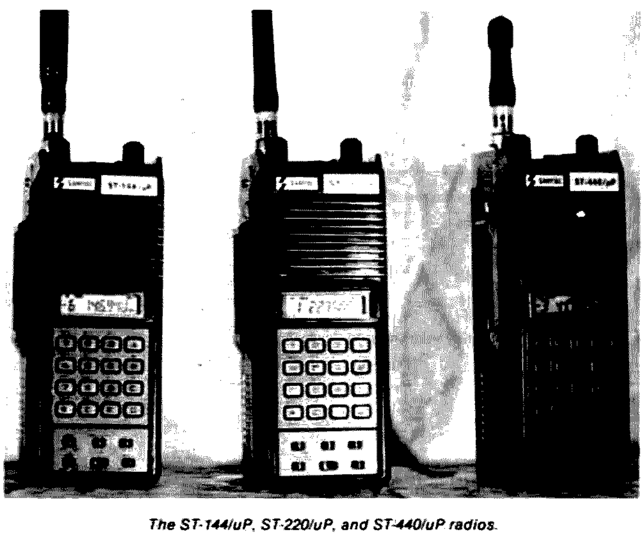
The radios all have the 24-hour clock feature that gave me such a ready retort on the repeater and an LCD frequency display with a night viewing light. The latter contains quite a wealth of information. First, all six digits of the receive or transmit frequency in use appear on the screen instead of the more typical 4 digits. (Frequency entry on the keyboard is the usual 4-digit process, e.g., 6125 for 146.125 or 446.125 MHz, except that trailing zeros needn't be entered, so 4 gets you 144.000, 224.000, or 444.000 MHz, depending on the radio). The display also shows: channel number (if you are on a memory channel) scan mode, and transmit offset as +, −, or 1 (for "transmit on the frequency in memory 1"). In memory mode, the offset programmed for each channel is displayed on the screen; in normal mode, the screen displays the offset for which the front-panel switches are set. There's a great deal of information in a small space.

The ST-144 receives from 142.000 to 149.995 MHz and transmits in all but the highest Megahertz. The ST-220 transmits and receives from 220.000 to 224.995 MHz, and the ST-440 transmits and receives from 440.000 to 449.975 MHz.

Negative comments? Only that the clock feature disables the memory mode. That is, if you are on a channel in memory, and you switch to the time display, when you return to the frequency display, you will be on the same receive frequency, but your transmit frequency will suddenly have become dependent on where your front-panel offset switches are set. Worse, every so often the switch into time display puts you back on the frequency in the first memory (as though you had turned the radio off and on again). This is rare, but it's mildly annoying when it happens.

Service on Santec radios is excellent. My ST-144 and ST-440 each had a single moderately strong receive birdie. Encomm responded to my telephone calls and asked me to send the radios back for repair. In each case, I received a postcard confirming receipt almost at once, and I had the radio back in seven days, with a work sheet showing what had been done to it. The Encomm warranty covers everything for 90 days and covers all semiconductors (excluding the output transistor) for two years; the replacement semiconductor is free, and there is a maximum labor charge of one hour at current shop rates.

I could go on to describe the installation of a memory back-up battery, a subminiature relay to disable the Santec's in-



The ST-144/uP, ST-220/uP, and ST-440/uP radios.

	ST-144/uP				ST-220/uP				ST-440/uP			
	144.0 MHz		147.5 MHz		222.0 MHz		224.5 MHz		441.0 MHz		449.0 MHz	
Transmitter power output @ 10.4 V	W	mA	W	mA	W	mA	W	mA	W	mA	W	mA
H	4.10	970	3.90	970	3.50	960	3.50	970	2.50	850	2.45	850
M	1.25	570	1.90	700	0.75	460	1.15	550	0.65	460	1.10	540
L	0.45	400	0.40	380	0.20	290	0.18	260	0.30	350	0.22	320
Receiver @ 10.4 V												
Sensitivity (1 kHz tone @ 4 kHz deviation)												
Squelch opens (minimum setting)	0.17 uV		0.17 uV		0.20 uV		0.23 uV		0.29 uV		0.23 uV	
12-dB SINAD	0.23		0.23		0.26		0.28		0.31		0.25	
Current Consumption:												
idle (radio squelched; no signal received for at least 90 sec.)	8 mA*				8 mA*				10 mA*			
Squelched	34				34				42			
1Squelch Open (noise)												
minimum volume	54				55				52			
½ volume	77				80				77			
full volume	163				200				153			
Radio Off clock on	513 uA				570 uA				455 uA			
clock off	238 uA				250 uA				175 uA			

* In the idle mode, both radios draw approximately 3 mA; every 1.5 seconds current increases to the squelched value for about 250 ms as the radio listens briefly before returning to the idle state. The idle currents above are averaged over time, based on a 5/6 low, 1/6 high duty cycle.

Table 1. Specifications.

ternal speaker when the external speaker-mike is used, and the construction of a simple device to maintain peak battery life. On all three of my radios (and on one of someone else's), I have installed a PL™ encoder-decoder with switch-selectable tones. The description of that procedure takes 25 double-spaced typed pages and 10 photographs!

For more information, contact *Encomm, Inc., 2000 Avenue G, Suite 800, Plano TX 75074.* Reader Service number 485.

Robinson Markel W2IVS
New York NY

MFJ'S ECONO TUNER

In the era of media hype—when every new rig has more memories, knobs, and LEDs—it is refreshing to find a plain vanilla product. The MFJ-900, dubbed the "Econo Tuner," fits that description.

MFJ produced the Econo Tuner to fill out the low end of its line of tuners, which range up to 2-kW capability with built-in swr meter. The 900 doesn't have a meter and is restricted to a maximum of 200 W. It does, generally speaking, match your antenna to your transmitter, which is the point of these gadgets anyway.

The only controls on the 900 are the transmitter, antenna, and inductance knobs. Tune-up is simple: Load your transmitter into a dummy load, tune it up, then switch to the tuner. With the receiver on, switch the coil knob until you find the point at which signals are their loudest, then start transmitting and play with the other two controls until your swr drops to an acceptable level. Of course, transmitter and antenna controls are interactive, which can make tuning up similar to flying a helicopter for the first time, but that is a condition inherent to antenna tuners.

The inductance control is a 12-position switch connected to taps on a coil. This technique has two advantages over the use of a rolling coil. The taps allow rapid access to the coil's extremes (for when you go from 10 meters to 80 meters) and it is a cheaper method to provide a range of inductances. A roller coil forces you to rotate the tap through the entire coil to get from one end to the other.

The coil and two variable capacitors are arranged in the classic T-circuit matching network. The coil taps are evenly spaced until they reach the high end of the coil. The last two taps are spread out, to give more even control of short antennas.

Two Flavors

The 900 comes in two flavors: with a coax connector and without. The latter is most useful for mobile or portable operations or when you are stuck in an apartment with an unforgiving landlord and your antenna doubles as bedsprings. Without the PL-259 connector, you need make only two rear-pannel connections to get the Econo Tuner operational. The antenna goes to one post and a good ground goes to the other.

The good ground is a necessity, regardless of the better radiation it offers. If too much rf is allowed to float around in the tuner, the signal may arc across the plates of the capacitors—which is precisely what happened in my shack the first time I hooked up the 900.

Previous to that, I had been using a tuner with a much greater power-handling capability (although I was running low power) and this tuner passed off the loose rf without arcing. But the zapping of the Econo Tuner was a needed indication of the poor state of my ground. The sturdily-built Econo Tuner suffered this indignity without damage and performed as advertised once I had rearranged my ground.

I found that the tuner is adaptable to a variety of operating environments. It has been used on three antennas, from a random-wire to a closely-cut multiband dipole, and I have inevitably been able to find the sweet spot on my swr meter.

One of the advantages of this tuner is its small size. It measures a scant 6 × 2½ × 5¼ inches—appropriate for a limited-space shack such as mine. The case is beige with wood-grain sides, and the terminals project less than an inch from the rear panel. Although I used it at my QTH, I can easily see the MFJ-900 on the move. If you intend to stow your rig in a backpack for a little backcountry hilltopping, I would think the 900 would be your tuner of choice.

It also comes with MFJ's unusual 12-month warranty. The 12 months is not by itself of interest, but MFJ does not void the warranty for fix-it-yourselfers. If your Econo Tuner stops working and you want to dig in and repair it yourself, you may do so with MFJ's blessing. And you can take advantage of the company's technical hotline if you find yourself in too deep.

The MFJ-900 sells for $49.95. For more information, contact *MFJ Enterprises, Inc., 921A Louisville Road, Starkville MS 39759.* Reader Service number 486.

Avery L. Jenkins WB8JLG
73 Staff

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

FCC

Referring to the docket which eliminated logging requirements (PR Docket No. 82-726), the *Federal Register* published the following correction for Section 97.85(g)(4).

Erratum

In the Matter of Elimination of Logging Requirements in the Amateur Radio Service; PR Docket No. 82-726.

Released: June 20, 1983.

On June 8, 1983 (FCC 83-249), the Commission released a Report and Order in the above captioned proceeding. This document corrects certain typographical errors in the Appendix to that Report and Order published June 9, 1983, at 48 FR 26606. Section 97.85(g)(4) is corrected to read: "(4) The maximum transmitter output power which occurs during operation;".

GHOST FIGHTERS' CONSUMER GUIDE TO SATELLITE TELEVISION

Contrary to popular belief, satellite television isn't just another flash-in-the-pan fad. True, the excitement that accompanied the early days of the industry has diminished, but so have the entrance requirements. Prices are still declining, not only for antennas and receivers, but also for information. *Ghost Fighters' Consumer Guide to Satellite Television* is a good example of this trend towards economy. It provides 76 pages of information for $8.95, a far cry from the $25 price tag that many early TVRO books sported.

The Ghost Fighters manual is meant to bring you up to speed quickly on just what satellite television is and how you as a consumer can make a wise buying decision. For schematics or detailed technical data, choose another source (perhaps back issues of *73*), since this book stresses TVRO at its module rather than component level. With just a few exceptions, references to specific brands or manufacturers are avoided. Yet the book is surprisingly up to date, mentioning innovations that are in keeping with its 1983 publication date.

Most of the guide is devoted to the fundamentals of operation behind each link in a satellite receiving system. Given the author's background in antenna design, it isn't surprising that antenna selection receives heavy treatment. Other topics include the future of satellite television (including direct broadcasting) and the whys and wherefores behind three-foot dishes. Rounding out the book is an appendix that includes a listing of the 4-GHz television satellites as of early 1983 and a comprehensive glossary.

This consumer guide carries a home-brew appearance, yet features sound, conservative advice. It doesn't tell you what to buy as much as it tells you what not to buy. For all but the most novice madder, it will probably be old hat. But if you are starting out, the advice that this book offers could make the difference between buying a marginal system and a quality one.

For more information, contact the author, *James Anderson, Route 2, Box 136-B, Stevensville MT 59870.* Reader Service number 487.

Timothy Daniel N8RK
Oxford OH

LETTERS

TEENAGE JEWELS

Why do kids lose interest in ham radio here and not in Japan? So queried many of your editorials. Of course they lose interest, even after acquiring a license... unless we *involve* them. Kids need, more than anything, to be needed... to be acknowledged as creative, contributing human beings.

So, in Santa Cruz, California, we have a growing mob of teenagers wading into every facet of the ham-radio diamond, including through "each one teach one" classes. Our radio club has elected a teenager to take over prexy duties next year, which helps entice more young people to our meetings, and we make a point of inviting them and extending helping hands to them. When young Novices are introduced, the club enthusiastically applauds them.

We have bestowed used but usable radio stations upon two local junior high schools, assembled antennas, nurtured the responsive kids, etc. Now Del Mar Junior High is gradually focusing their whole curriculum around ham radio, school computers, and "Planetary Citizenship." A social studies teacher offers credit for study of the countries contacted through QSOs. English teachers help the kids write letters along with QSLing, and there is now a science elective for which the Novice and/or General exam is the final exam.

Kids mastering these demanding skills are rewarded by free sailing lessons and cruises on a sloop dedicated to world friendship by ham radio which cruises into foreign ports everywhere on behalf of everyone. On board, ham radio gives fun and games, stimulating ever more intense skill-mastering. For instance: You can play a lot of games with code. No one gets breakfast without asking for it in CW. (As we near Mexico, you have to ask for *huevos* in code instead of "eggs," of course.) You can stay stranded atop the mast all day unless you know how to ask in code to be cranked down. But the most motivating device is to start telling jokes about the CW laggard in code. He/she can't stand hearing others snicker mysteriously about him, so he gets code-wiser faster!

When we sail into different ports, we always get invited into schools. Our kids interview students and tape-record their ideas about whatever they are doing and plan to do about making the world work better. (We don't pretend to be gurus, knowing that real education asks more questions than are answered.)

As the word gets out and more kids realize that electronic communications via radio and computers empower them to climb right out on the cutting edge of the culture regardless of their age and rank, well... move over world, here they come!

Young people are just as hungry as ever to "put their highest powers to their highest use." Most of all, having generous, supportive older hams reach out to them encourages them to discipline themselves for skill-mastery. Then, having a school radio station or access to member stations keeps them at fever pitch.

If every ham club in this fractionating world were to sponsor a school club and see the kids through, and then turn over real responsibilities to them, such as sending traffic, field day, emergency services, etc., our ranks would solidify with youthful talent. I feel one of the reasons western culture is limping along is because we have not set a suitable stage for the creative energies of two or three whole generations. Helping our kids NOW to acquire these skills helps them to play in a major league of the World Game after their minor-league encounters with Pac-Man. I mean this letter to be a challenge!

Mary Duffield WA6KFA
Santa Cruz CA

Mary, the program sounds great, even if you answered a question I've never asked... about why kids lose interest in amateur radio. I've never known kids to lose the interest—only to not be exposed to it. Once it takes, it usually takes for life. You're exposing kids to the virulent virus of amateur radio and that's what we need. I'd sure like to see more clubs tackling local high schools and exposing the students to the best thing that can happen to them: ham radio.—Wayne.

KEEP STANDARDS HIGH

I feel that your editorial is right on the money when you talk about people with no knowledge of radio practice. But, there always were a few individuals that knew *nothing* about ham radio and were General-class licensees.

In the early 1960s, a lot of hams thought that the Technicians were mostly licensed by "friends" giving the test and "helping" them pass. There *was a* radio club that would *give* (literally) each new member the Technician exam; naturally, a knowledge of code or theory was *not* required. This went on until the FCC cut out the mail-order Techs.

I knew General-class operators that didn't know how to hook up a power amplifier to their rig without blowing out the receiver! Another General took the test *thirteen* times, each time memorizing a different part of the test.

The Bash material: Unless the FCC is composed of total morons, they have probably changed the code test twenty times since the Bash tapes reared their ugly heads. It is so easy for the FCC to make a different test for each examination date; they just use one of those computer Morse generators to type out the five-minute QSO. Having taken both the General and Advanced tests two and three weeks ago, I feel that the FCC theory test cannot be passed by memorizing. The only book that I used was a plain O & A and some of the ARRL publications to bone up on some of the rules and regulations. In all fairness, I have to admit that I also hold a commercial radiotelephone license and have been employed in the electronics industry. My amateur days go back over twenty years, being originally licensed in 1960.

Having passed both the General and Advanced tests, I feel that the best way to pass any amateur test is to have a solid radio knowledge. With all the money they are willing to spend on the Bash materials, they could buy some parts at their local electronics store and get "hands-on" experience using diodes, resistors, LEDs, and other devices. Basic parts are cheaper than ever, and there are many breadboarding kits for experimenters. I "mastered" the code with a $150 receiver (new) and several legal pads and about two months of one hour each day. With the $150 and the $50 worth of parts, one can have three things: a lot of fun, knowledge, and a ham ticket. They can keep the receiver as a gift for a job "well done." I feel this old-fashioned way builds amateur radio *operators*, not appliance users or high-powered CBers.

Let's keep ham radio standards high and attract the type of people that this hobby deserves.

Bobby J. Levow WB2MQK
Flushing NY

SOUTHWEST SNOBS?

First of all, I'd like to commend you on your efforts to further the cause of amateur radio through the pages of *73*.

I am the recipient of a few back issues from a friend who, like myself, is not a ham—which brings me to the root of my problem.

I want very much to be a ham, but I cannot find anyone in this area to give me some assistance with learning some of the things that are required to obtain a license. I've talked with several hams in the area; I also wrote to the League, only to receive the name of a gentleman who is no longer able to be an Elmer. I've even gone so far as to get on 2 meters illegally to find some help. I talked with WB5MLZ and told him eyeball to eyeball what was going on; after several inquiries, I could obtain no adequate help. But I did get chewed out for being on the air, so I promptly got off. What's wrong with the hams in the Albuquerque area? Are they totally ignorant of the many-faceted purpose of amateur radio? Are they only interested in making DX contacts in the HF region to faraway places? What about their own community?

I have some knowledge of electronics; I've been a technician for over 7 years. I also have a copy of a publication from the illustrious Mr. Bash, but who learns anything that way? (It's not mine; I was told by another ham to study it!) I've just recently gotten an Icom 2AT HT and an Icom 22S (which doesn't work yet) and I'd like to be able to use them legally.

There are supposedly two radio clubs in the Albuquerque area. One is the Albuquerque Radio Caravan Club, an erstwhile group whose claims to fame are the 147.060 repeater on Sandia Peak and the fact that they sponsor the amateur station at the VA hospital. The other group is the Upper Rio Grande Valley VHF Society which sponsors repeaters on 146.64 and 146.97 (They are lovingly referred to on the .06 machine as the Upper Rio Grande Valley Snob Society.) From all that I've heard while monitoring all three of these repeaters and others around here, it seems that the pet name applies to most of the hams in the area.

I have an extreme interest in becoming a ham and will work hard to do it soon, even if it means having to go to Denver for the test. I am also interested in meeting new friends, sharing ideas, and being the best ham I can, and I won't hesitate to help someone else become a ham if he's interested. I wouldn't want anyone to receive the reception that I got.

I do agree with you, Mr. Green, that amateur radio does need new blood and I'm all for the individual radio clubs handling licensing (but let's do it honestly—no $100 favors). But I disagree on dropping the code requirement. To do that would, in my opinion, open the doors to some pretty poor operators on the bands. We've got to have something to separate the wheat from the chaff. I do agree on lowering the code speed for the General license to 10 wpm and raising the Tech qualifications to 7 wpm. I myself would like to get up to 20-25 wpm before I get my General.

I also have en interest in computers and their relationship to ham radio, and I'm also an avid builder of many projects. By the way, my wife is also interested in becoming a ham.

Anyway, the whole point of my dissertation to you is that I need some help and can't find any willing people to give it.

Maybe I won't make many friends in the Albuquerque area by this letter, but maybe it will scare some serious hams out of the woodwork around here. At any rate, I'll monitor the HF bands on my general-coverage receiver and VHF on the HT until someone cares enough to give me a call. My number is (505)-881-2166.

Keep up the fantastic work, Wayne.

Leo Francis Fearon II
2933 San Mateo NE
Albuquerque NM 87110

Getting to the license, I really don't understand what the big deal is. If you get our code tapes, you'll learn the code just as have a hundred thousand other hams. If you get our Novice Study Guide, you'll learn enough theory to pass the written exam. So what do you need more than that? You might want to trade in your HT for a low-band rig since it's likely that your welcome on two meters in Albuquerque may be less than enthusiastic. One thing you should understand about repeater groups: The chaps who were open and friendly and talked with anyone were years ago pushed off the repeaters and are, for the most part, a dead species. They were replaced by a surprisingly small contingent of endless talkers who talk only to each other and tune a deaf ear to casual visitors to the repeater or to newcomers. A recent survey of New England repeaters showed that of the 437 known repeaters in the area, only eight are active—and they are domineered by seventeen hams. The other 26,000 licensed New England hams account for less than 1% of the repeater use. But even in the heyday of repeaters, when there were thousands of users, unlicensed visitors were not appreciated, no matter how good the intentions. "You say your house is on fire and you and the family are trapped on the third floor? Well, that's okay, but I missed your call. Please identify yourself. You know it's illegal to use a ham rig without a license."—Wayne.

95 DAYS TO CHRISTMAS

The 1982 Christmas Mail Call was the most successful ever. The staff of Armed Forces Mail Call expresses its appreciation to those who sent Christmas mail for distribution to the young men and women of our armed forces, both across the US and around the world. American Legion Auxiliary #49, Orange, Texas, was the leading group taking part, and Maudie Hensley, a member of that group, was the top individual participant. (Wilkins School in Amherst ranked number one in New Hampshire, Wayne!)

For eight years, Mail Call has received Christmas cards filled with newsy and friendly letters from individuals and groups all over the country. These Christmas greetings are then separated into some one hundred different bundles and sent by first-class air mail to various facilities of the Department of Defense (hospitals, chaplains, individual units, etc.), of

the Army, Navy, Marines, Air Force, to remote Coast Guard stations, and to Armed Services YMCAs, USOs, servicemen's centers, etc.

One letter we received, read: "The members of the -th Maint. Co. would like to express their gratitude for all the mail received under the Christmas Mail Call program. Many of our young soldiers received very little mail during the past holiday season. They were very pleased to go to the mailroom and find...mail from across the United States."

The 9th Annual Christmas Mail Call is now underway. This is an ideal project for individuals as well as families and groups and is an exceptional opportunity for letting our young military people know that we have not forgotten them, that we are thinking of them—especially at Christmas when many will not be able to be with their families but will be on duty at bases and posts across the US and around the world. (Mail was sent last year to the Marines in Lebanon as well as to the US peace-keeping forces in the Sinai.)

For information on how you, your family, or your organization may have a part in this unique program, please send a self-addressed, stamped envelope (business-size, if possible) to: Armed Forces Mail Call, Box Q, Holloman Air Force Base NM 88330 (and mention that you read about Mail Call in *73*). Thank you!

Lee Spencer
Holloman AFB NM

SURGE PROTECTION

Several letters and calls have been received from hams who have had trouble finding surge protectors in their local electrical supply houses. My article in the February issue of *73* describes these devices; however, not wanting to endorse any manufacturer, I did not mention any trade names. For those who may have trouble finding one locally, here are some catalog numbers:

- Square D Company—J 9200-10 Secondary Surge Protector.
- General Electric Company—TLP-175 Lightning Protector.
- Delta Company—LA-302 Lightning Arrestor.

With these numbers, one should be able to locate one in any of the larger cities.

Robert R. McKay N8ADA
Dayton OH

HISTORIC THROWBACK?

After reading your last editorial (July, 1983), I really hope that the status-quo code proponents are not winning. I have been watching the emergence of the no-code license with considerable interest over the years and feel that it is long overdue—but then, I felt that way when I got my license 20 years ago. Even back then the rationale for why an aspirant must demonstrate a manual skill at one archaic form of communications never made much sense. After all, one did not have to demonstrate the ability to use proper grammar to be able to use phone, take a typing test for teletype, or even a screen test to use television. Code always seemed to me to be a throwback in history—"I/we had to suffer through it, and so do you." Somehow, that mentality has miraculously been allowed to survive. I deeply feel this stone-age philosophy is *the* tragedy for ham radio.

Speaking personally—which is hard not to do on such an emotional subject—I'll list my personal observations and those of some people close to me who are not hams. To me, ham radio has probably been one of the strongest driving influences in my life. I can trace practically every major thing I have done back to it in some way.

I got my first license as a teenager in junior high school. A Technician license—to me there was no greater gateway to the exploration of the world of electronics than that license. From the start, I was fascinated by UHF and microwaves, so the lack of HF privileges has never meant much to me—at least with the Extra code-speed test. This has been true for all these years, so that first license I earned at the tender age of 14 is still the one I hold now, although I since have earned commercial-class radiotelephone licenses. I remember that ham license as my passport to learning in high school. While others were busy with sports, I was designing UHF transverters and dreaming of college.

I went to college and have never really left. I earned several undergraduate and graduate degrees in the hard and social sciences and medicine and am now in my third year of dental school. I sometimes wonder what I would have done if I'd not had ham radio as an outlet to explore science as a younger person. In the meantime, between schooling, I've worked as an engineer for a large university, designing microwave meteorological sounding devices, as an archeologist in Central America, and as a scientist at a medical school—to name a few jobs.

I've also been a day laborer more times than I can remember, always supporting myself by the sweat of my brow. And somehow, I've managed to travel the world.

The point of all of this is that I have had a chance to meet a great cross section of people from varied and diffuse backgrounds. Whenever the subject of ham radio is brought up, it nevers fails to excite an interest. When CB was big, everyone thought the two were the same. I was always explaining the difference, and with that difference, the excitement I felt about ham radio. Now, with few exceptions, these were interesting, intelligent, mature people, people that would be a charming asset to any organization. I see in them all the ability to bring to a group an enlivening vitality that few could not help but feel would make a positive contribution to any field—especially ham radio. I have never understood why, to be a real ham, you must be interested only in ham radio. So much better is the ham with a broad background who can bring these outside interests into ham radio.

But time and again, after detailing the positive aspects of my hobby, they would ask about the license requirements, and time and again the code was the turn-off. I never ran into anyone objecting to the technical exam; they could understand its need and felt sure they could master that aspect of the license. But they always asked me "why do I have to learn the Morse code?" I couldn't and still can't answer. Another asset is lost.

Others who are still determined to experiment with radio, I steer to FCC Part 5 on Class A CB. It is possible to do plenty of experimenting and radioing outside hamdom—but what a loss to our hobby!

I strongly feel that unless we can get people into ham radio at a level that is less than "perfection" and can grow within the hobby, that we will witness the decline and eventual death of ham radio before too long. There are too many people interested in our frequency bands and too many other outlets for young, probing scientific minds.

It is infuriating how time and time again that initial spark that could grow into a valuable addition to ham radio is squashed by that infernal code. Over and over, they have told me "I have better things to do with my time than learn Morse code."

Sure, we have a simple entry-level license: Novice class, and it is a joke. They are allocated slivers of bandwidths in high-QRM bands and forced to read code. Code! When the whole world speaks through computers, over satellites, and through goodness knows what other wonders, someone is honestly expecting to interest an intelligent, inquiring mind in an entry-level license for the exciting (?) world of ham radio where they have to chirp out a conversation over radio Moscow on 40 meters?! Until this all changes, ham radio is in trouble.

Wayne, please keep up the fight. You are right, like you were about FM and are about computers. I just wanted to let you know some of us do indeed agree with you and appreciate your foresight and efforts.

Larry Jack KL7GLK
Annapolis MD

UNFAIR REVIEW?

The July, 1983, issue of *73*, Mr. Jenkins, carried your review of our Radio School beginner tape course. I would like to discuss this review with you for further edification about our code-training program. Your opinionated review contains several misstatements which I would like to correct. Your review also does great disservice to anyone attempting to bring more young people into the ranks of amateur radio.

First of all, get my callsign correct. It is WB6NOA.

Your statement that the character speed per individual letter is slower than 10 or 15 wpm for our beginner tapes is not correct. Our tapes were generated by the same computer specifications that the Federal Communications Commission outlined in their CCITT Recommendation R.140. Our beginner 5-word-per-minute characters are sent at exactly 13 words per minute with longer spaces in between each character to slow down the speed to 5 wpm. We agree with you that students should learn the characters at an initial higher (13 wpm) character speed so that they do not need to relearn the letters while tackling the General-class license.

Your purely personal statements about random letters versus sentences should not have entered into an objective review about the code-learning process. Our tapes specifically train students to learn how to send and receive code over the air, and to pass typical over-the-air FCC-type QSOs. Although random letters certainly are harder to memorize, our tape courses are designed so that the students should have to only play each individual cassette three or four times before going on to the next one. When the student is beginning to memorize one cassette, that's a signal to go on to the next one. This is precisely why we have four individual cassettes, each 1½ hours long, as opposed to a single tape cassette, in learning the code.

Our code-teaching techniques have been tried and proven to over 4,000 graduates of our college classes here on the West Coast. We watch the students progress through the tapes and monitor their progress carefully. Your personal observations are obviously not based on actual classroom instruction.

As a fellow journalist, I would caution you from taking the high and mighty approach to objective product evaluation. Unless you are an acclaimed code-teaching expert, your opinions and observations in print are only one man's view of a product. Did you try it in a classroom situation? Did you give the tapes to the kid down the street who had been struggling with the code, and did you follow up to see whether or not these tapes kept his interest? Are you aware of the popularity of stereo cassette players that kids take with them everywhere? Have you actually tried listening to the tapes while going to work to fully appreciate the second-track narrated channel?

Your review should never have been printed because it is purely a personal evaluation of a code-learning concept that you, as an old-timer, might not like. I would remind you that your publisher (if you really are on the staff of *73*) has long preached the need for getting more kids into ham radio. This fresh new approach of code learning is indeed working in getting kids to listen to the tapes.

After all, one of the hardest parts of learning the code is simply keeping an interest in practicing every day. You missed that one completely in your personal review of our product—you failed to mention that these tapes were indeed "different" than other tapes and that they do keep a person's interest to continue playing them on a daily basis.

Mr. Jenkins, as a journalist, you are a discredit to the art of properly evaluating a product in print. I have probably logged thousands of words more than you in print, and I would hope that you would take some friendly advice and know what the hell you are talking about before sitting down at your typewriter and tearing down a proven code-learning method that could very well lure more kids and adults into ham radio.

You obviously didn't even get to the last tape—it specifically prepares students to pass their FCC Novice-class test by duplicating the exact tone and dit-dah ratio, and using similar type format material to that which the FCC uses. If the Novice applicant chooses to be tested by a fellow amateur radio examiner, there are several messages that meet FCC-published specifications that the examiner might draw upon. You also failed to mention that we have complete code courses for the new volunteer examiner that meet published FCC specifications for all levels of licensure.

Any time you are out here on the West Coast, please don't hesitate to stop by one of our evening college classes. Here you will see the new generation of amateur radio operators. These are positive-thinking people that get the best out of any product offered. Rather than sitting back and taking pop shots at equipment or magazines or writers that they might not care for, each of our students concentrates on the positive and gets the best out of what amateur radio writers, manufacturers, and instructors have to offer.

You should sit in on one of our classes—you very well could learn something and also a fresh approach to a positive outlook on anything that will assist more people into joining the ranks of amateur radio.

Gordon West WB6NOA
Costa Mesa CA

I appreciate your comments and would like to assure you that there was no intent to belittle you or your product in my review. Although you seem to have focused on the negative comments, I did applaud the production and organizational features of your tapes, which I felt were done very well.—Avery Jenkins WB8JLG.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

MALPELO ISLAND

Off the west coast of South America, in the general direction of the Galapagos Islands, the tiny island of Malpelo rears from the Pacific. This uninhabited rock is far enough from the coast of Colombia to qualify as a separate "country" under DXCC rules. So Malpelo attracts an occasional DXpedition. Such a trip is scheduled for this month.

The island of Malpelo has been steadily moving up the list of the most-wanted DXCC countries, since the last DXpedition several years ago. Malpelo even entered the Top Ten in 1983. But Colombia restricts access to Malpelo, so they won't have to rescue stranded DXpeditioners off the rock. A fortuitous combination of circumstances opened the door to Malpelo this year.

The national amateur radio society of Colombia, the Liga Colombiana de Radioaficionados (LCRA), is celebrating its 50th anniversary this year. And a high government official, who happens to be a ham-radio operator, has secured the assistance of the Colombian Navy for transportation and logistical support.

This assistance should facilitate a long-time goal of Malpelo DXpeditioners: a radio station on the top of the island. The only landing area on the entire island is a small "beach" on the southeastern corner. High cliffs surround this "beach," which actually is a steeply sloping pile of loose rocks. Even climbing to the top of the island is a formidable task. Carrying radio equipment, antennas, generators, and fuel is out of the question. So previous DXpeditions have operated from the beach, much to the chagrin of West Coast and Japanese DXers. For the enormous bulk of the island blocks the beach radio communications to the north and northwest: W8 and 7 and JA.

The magnitude of this problem can be seen from the "most-wanted" statistics from *The DX Bulletin* (306 Vernon Avenue, Vernon CT 06066). In 1982, Malpelo was the 11th most-wanted country overall. However, many more West Coast and JA DXers need HK0. Malpelo ranks as 4th most wanted in W6, 2nd in JA, and 1st in W7, ahead even of China! On the other hand, Malpelo ranks only 16th among W4 DXers. A station on top of the island, without enormous cliffs in the way, would be a godsend to the Pacific DXers.

The LCRA is taking precautions in case the Navy helicopters are unable to set up a station on the top (see why having the Navy on your side helps?). The LCRA operators have been soliciting propagation information, schedules, and frequencies for those parts of the world which especially need a Malpelo QSL card. DX clubs and individuals have sent suggested operating schedules and bands to make the best use of the 5 planned days of operation. With careful planning and cooperation from other amateurs, the LCRA group could handle much of the demand for Malpelo even from the beach.

The details: The DXpedition is sponsored by the Liga Colombiana de Radioaficionados in coordination with the Colombian Navy. The amateurs will all be LCRA members, all HK licensees. The callsign will be HK0TU, QSL via HK3DDD. Projected frequencies are CW—1825, 3505, 7005, 14025, 21025, and 28025; SSB—1825, 3795, 7085, 14185, 21295, and 28595. Satellite and 2-meter gear will be along as well.

The Colombian amateurs are keeping busy during the 50th anniversary of their national society. In addition to their Malpelo DXpedition, LCRA is sponsoring a special certificate to amateurs who work Colombian stations with 5K and 5J prefixes in 1983. Work any 8 5K or any 8 5J prefixes (they can't be mixed) and send copies of the QSLs to LCRA, PO Box 584, Bogota, Colombia, for the free certificate.

Our thanks to Fred Laun K3ZO (see photo) for this information.

SPRATLY CONTINUED

The rescue of Baldur DJ6SI (see this column, last month) and the other survivors of his ill-fated DXpedition did not end the story of Spratly, 1983. First, there were the mysterious CW signals, without callsign, saying that Baldur's group had been picked up by a Russian submarine. Some Southeast Asian amateurs fear a radio hoax, one with the element of fun removed. More serious, however, was the reaction of the German press to the disaster.

The sudden, unexplained disappearance of a government counterespionage agent (for such was Baldur) attracted the attention of the press quickly, enough so that Baldur's wife is afraid to go outdoors. But the problem multiplied when the survivors were finally pulled from the sea.

German "experts" said the group could not have survived almost ten days in the uncovered dinghy, because of the high temperatures and the lack of water, food, and clothing. These experts noted the remarkably good physical condition of the four survivors and suggested that they had had something to eat in the past ten days.

The rumors of cannibalism coupled with the strange-sounding mission of this counterspy whipped the German press into a frenzy, and Baldur and his family were hounded at every turn. The rumors are, of course, nonsense.

"Experts" might suggest the survival time of an "average" citizen in similar conditions, but they cannot state that the party could not have survived. Thousands of survivors of torpedo attacks in the North Atlantic will attest that survival at sea in a small boat is more a matter of mental attitude and common sense than the dictates of experts.

And Baldur's group took great care to increase their chances of survival. Knowing that dehydration was the most serious problem, the group poured seawater over their bodies, to reduce their temperatures and decrease the body water lost through sweating. They carefully avoided drinking any seawater, which actually dehydrates the body and can be fatal if taken in the late stages of dehydration. The members of the DXpedition avoided unnecessary talking and kept their lips pressed together, to reduce water loss through the mouth. They conserved their energies, not wasting effort in rowing, flag waving, or other emotionally satisfying but unproductive activities.

In short, they did exactly what they had to do to survive: conserved their slender resources as long as possible. Four of the five who entered their dinghy survived the ordeal, and Gero DJ6EI, who didn't make it, was the least physically fit in the group.

Nevertheless, the nonsense continued, much to the chargrin of Baldur and his family. And he is still out the cost of all the equipment, without a word out of the Vietnamese government, not to mention the tragic loss of life.

The "Other" Spratly DXpedition

Meanwhile, while the controversy surrounding the DJ6SI DXpedition rages, another amateur group made an assault on Spratly, somewhat more successfully. In early May, Chito Kintanar DU1CK hitched a ride with the Philippine government to a Philippine-controlled island in the Spratly group, Thitu. This island is under the claimed and actual control of the Philippine government, as indicated by the well-maintained airstrip. Because Thitu is so close to the main group of Philippine islands, any amateur radio operation from Thitu would count for DU-Philippines, not Spratly.

But Chito didn't operate from Thitu. He pushed off in inflatable rubber rafts with a pack of scientists and motored to an island off Panata Cay. The stated purpose of the trip was the establishment of a wildlife preserve, especially for undersea life. Chito went along to provide emergency communications from the remote cay—and to make an occasional DX contact in the absence of an emergency.

Chito did indeed get radios and antennas to the island in the Spratly group and did make some radio contacts from the island. Limited antennas and generator problems restricted the operation to list-style, often controlled by DU9RG. A couple thousand amateurs, mostly in Asia, worked 1S1CK.

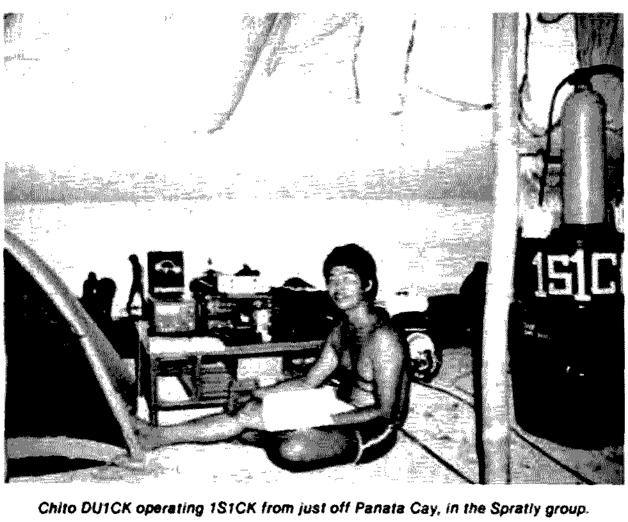
Some amateurs feel the operation should count only for the Philippines, as the Philippine government provided the transportation and "protection" of the party from start to finish. While the island where Chito operated was technically "unadministered," it was clearly under the control of the Philippine government while Chito operated, and thus should not be considered Spratly.

On the other hand, the Philippine government declined to issue a DU license or callsign for the island, citing "international repercussions." On this basis, Chito claims the use of the unofficial "1S" prefix and hopes his DXpedition will count for Spratly, not the Philippines.

Whatever the outcome of the debate as to which DXCC "country" Chito was in, Chito says he will be back again before the end of 1963, World Communications Year. A few more lucky amateurs might be able to put a 1S1CK QSL card on their wall (see card).

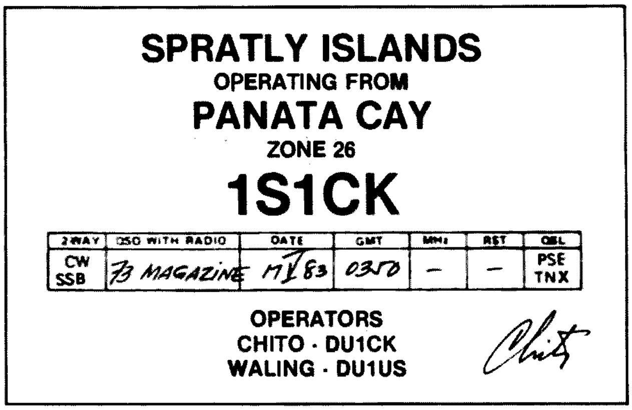
Meanwhile, all is not quiet on the home

Fred Laun K3ZO (left) with Harvey W2IYX, editor of the Long Island DX Bulletin. *Fred announced the Malpelo DXpedition this month.*



Chito DU1CK operating 1S1CK from just off Panata Cay, in the Spratly group.

Some of the survey team examining the potential for a wildlife preserve in the Spratly group. DU1CK provided emergency communications.



SPRATLY ISLANDS
OPERATING FROM
PANATA CAY
ZONE 26
1S1CK

2WAY	QSO WITH RADIO	DATE	GMT	MHz	RST	QSL
CW SSB	73 MAGAZINE	MY 83	0350	—	—	PSE TNX

OPERATORS
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A few lucky amateurs "got on the list" and worked 1S1CK this May. Will it count for DXCC credit for Spratly?

front. In the wake of the disastrous Spratly Island trip by Baldur DJ6SI, several prominent DXers began calling for the deletion of DXCC credit for the Spratly Islands. Deletion of DXCC credit for the Spratly Islands would eliminate any incentive for amateurs to operate from the islands.

Reaction to the proposed deletion of credit for Spratly was as expected: those amateurs who had a Spratly card on the wall were totally against the idea; those amateurs who still had Spratly on their "wanted" list would be pleased to see the credit deleted. The latter group would have one less country to work, should credit for Spratly be eliminated. In fact, an amateur could actually get on the Honor Roll as a result of such an action, without working anyone!

Here's how it works. In the summer of 1983, the DXCC country count stood at 315. To be on the Honor Roll, an amateur must have at least 306 confirmed DXCC credits. The elimination of Spratly would lower the current country count to 314, and the Honor Roll cutoff to 305. An amateur who had 305 countries confirmed (but not Spratly) would gain Honor Roll status through the back door, without even entering his shack! Such are the absurdities of the ARRL DXCC Honor Roll!

Why delete credit for Spratly? Many members of the DX community were shocked by the deaths of the two West Germans during the DXpedition attempt, shocked enough to suggest removing the major incentive for amateurs to visit that corner of the South China Sea.

On the other hand, those who wanted Spratly retained (including many Californians, with Spratly cards on the wall) argued that DXCC credit should not be withheld simply because radio operation there was dangerous, or because of transportation difficulties. After all, amateurs have met and surmounted such obstacles to DX for years, and the deaths of two amateurs, although regrettable, was no reason for deletion.

The pro-deletion amateurs, unable to use their real reason, fell back on deletion for reason of "significant change in administration." In other words, Spratly, which used to be a scattered assembly of worthless islands, should not now be a DXCC credit because the surrounding countries have taken a sudden interest in possible oil deposits under the island group.

The pro-delete amateurs, including those who have worked Spratly, and thus have nothing to gain, do have a point. The Spratly of Don Miller's day is a far cry from the heavily armed and vigorously protected islands today. But if we were to delete every country which has undergone a "significant change in administration," we would have to delete dozens of DXCC countries.

Whatever the outcome of the decision, for or against deletion, Spratly will remain a very special place for radio amateurs. The Spratly group has been the site of more trouble and controversy than any other such archipelago. Yet there is no question that any signal with a 1S prefix will command attention on the DX bands.

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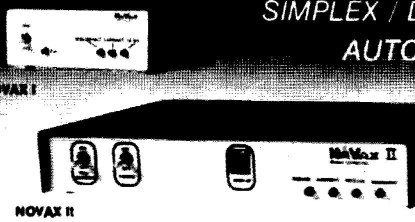

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• LED Digital Display	NO	YES
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FCC

Calling the current regulations "archaic" and "unsuitable," the FCC changed the rules defining amateur transmitting power and how it is measured. Instead of input power, the new regulations call for the measurement of power output. Maximum power out is restricted to 1500 Watts.

Parts 2 and 97 of the Commission's Rules and Regulations, 47 CFR Parts 2 and 97, are amended as follows:

PART 2—[AMENDED]

§ 2.106 [Amended]

1. In § 2.106, under the heading "NG FOOTNOTES," the heading of the table in Footnote NG 15, paragraph (a)(4) is revised from "Maximum DC plate input power in watts" to read "Maximum transmitter peak envelope power output in watts".

2. In § 2.106, under the heading "U.S. FOOTNOTES," Footnote US7, the introductory paragraph is revised to read as follows:

US7 In the band 420–450 MHz and within the following areas, the peak envelope power output of a transmitter used in the Amateur Radio Service shall not exceed 50 watts, unless expressly authorized by the Commission after mutual agreement, on a case-by-case basis, between the Federal Communications Commission Engineer-in-Charge at the applicable District Office and the Military Area Frequency Coordinator at the applicable military base:

* * * * *

PART 97—[AMENDED]

3. In § 97.3, paragraph (t) is revised to read as follows:

§ 97.3 Definitions.

* * * * *

(t) *Transmitting power.* The radio frequency (RF) power generated by operations of an amateur radio station, including the following:

(1) *Transmitter power.* The peak envelope power (output) present at the antenna terminals (where the antenna feedline, or if no feedline is used, the antenna, would be connected) of the transmitter. The term "transmitter" includes any external radio frequency power amplifier which may be used. Peak envelope power is defined as the average power during one radio frequency cycle at the crest of the modulation envelope, taken under normal operating conditions.

(2) *Effective radiated power.* The product of the transmitter (peak envelope) power, expressed in watts, delivered to an antenna, and the relative gain of the antenna over that of a half-wave dipole antenna.

* * * * *

4. Paragraph (b)(2) and the introductory paragraph of (b)(7) of § 97.61 are revised to read:

§ 97.61 Authorized frequencies and emissions.

* * * * *

(b) * * *

(2) Operation shall be limited to:

Areas	Maximum transmitter peak envelope power output in watts			
	1900 to 1925 kHz, day/night	1925 to 1950 kHz, day/night	1950 to 1975 kHz, day/night	1975 to 2000 kHz, day/night
Maine, Massachusetts, New Hampshire, Rhode Island	150/35	0	0	150/35
Connecticut, Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, Vermont	300/75	0	0	300/75
Kentucky, North Carolina, Ohio, South Carolina, Tennessee, Virginia, West Virginia	750/150	0	0	750/150
Florida, Georgia, Illinois, Indiana, Michigan, Wisconsin	750/150	150/35	150/35	750/150
Alabama, Arkansas, Iowa, Minnesota, Mississippi, Missouri	1500/300	300/75	300/75	1500/300
The remainder of the States and Territories	1500/300	1500/300	1500/300	1500/300

* * * * *

(7) In the following areas, the peak envelope power output of a transmitter used in the Amateur Radio Service shall not exceed 50 watts, except when authorized by the appropriate Commission Engineer-in-Charge and the appropriate Military Area Frequency Coordinator:

* * * * *

5. In § 97.67, the section heading and paragraphs (a), (b) and (d) are revised, and paragraph (f) is added, to read as follows:

§ 97.67 Maximum authorized transmitting power.

(a) Notwithstanding other limitations of this section, amateur radio stations shall use the minimum transmitting power necessary to carry out the desired communications.

(b) Each amateur radio transmitter may be operated with a peak envelope power output (transmitter power) not exceeding 1500 watts, except as provided in paragraph (e) of this section. Other limitations of this section and § 97.61 also apply.

* * * * *

(d) The peak envelope power output (transmitter power) of each amateur radio transmitter shall not exceed 200 watts when transmitting in any of the following frequency bands:

(1) 3700–3750 kHz;

(2) 7100–7150 kHz (7050–7075 kHz when the terrestrial location of the station is within Region 1 or 3);

(3) 21100–21200 kHz;

(4) 28100–28200 kHz.

* * * * *

(f) An amateur radio station may transmit A3 emissions on or before June 1, 1990 with a transmitter power exceeding that authorized by paragraph (b) of this section, provided that the power input (both radio frequency and direct current) to the final amplifying stage supplying radio frequency power to the antenna feedline does not exceed 1000 watts, exclusive of power for heating the cathodes of vacuum tubes. Limitations of paragraphs (a), (c) and (d) of this section and limitations of § 97.61 still apply.

6. Paragraph (d)(6)(ii) of § 97.77 is revised as follows:

§ 97.77 Standards for type acceptance of external radio frequency (RF) power amplifiers and external radio frequency power amplifier kits.

* * * * *

(d) * * *

(6) * * *

(ii) No amplifier shall be capable of amplifying the input RF driving signal by more than 15 decibels. (This gain limitation is determined by the ratio of the input RF driving signal to the RF output power of the amplifier where both signals are expressed in peak envelope power or mean power.) If the amplifier has a designed peak envelope power output of less than 1,500 watts, the gain allowance is reduced accordingly. For example, an amplifier with a designed peak envelope output power of 500 watts shall not be capable of amplifying the input RF driving signal by more than 10 decibels.

In an attempt to clarify the rules covering business communications in amateur radio, the FCC amended portions of Part 97. According to the Commission, the prohibition against business use was implied in the rules, but limits were not explicitly defined. The FCC's modification, as it appeared in the *Federal Register*, is reprinted below.

PART 97—[AMENDED]

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. In § 97.3, a new paragraph (bb) is added, after paragraph (aa), as follows:

§ 97.3 Definitions.

* * * * *

(bb) *Business communications.* Any transmission or communication the purpose of which is to facilitate the regular business or commercial affairs of any party.

2. In Subpart E of Part 97, entitled Prohibited Practices and Administrative Sanctions, a new § 97.110 is added, prior to § 97.112, as follows:

§ 97.110 Business communications prohibited.

The transmission of business communications by an amateur radio station is prohibited, except for emergency communications as defined in this part.

3. In Subpart E of Part 97, entitled Prohibited Practices and Administrative Sanctions, a new § 97.111 is added, between new Section 97.110 and present § 97.112, as follows:

§ 97.111 Limitations on international communications.

Transmissions between amateur radio stations of different countries, when permitted, must be limited to messages of a technical nature relating to tests, and, to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecommunications service is not justified.

4. Section 97.114(c) is amended by deleting the second sentence thereof. As amended, § 97.114(c) reads, as follows:

§ 97.114 Third party traffic.

* * * * *

(c) Except for emergency communications as defined in this part, third party traffic consisting of business communications on behalf of any party.

As of August 31, 1983, the mail-back procedure for Novice examinations was eliminated by the FCC. The Commission's Final Order was adopted June 29, 1983, and amends the amateur regulations as follows:

Appendix A

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. The heading and paragraph (b) (1), (2) and (3) of § 97.28 are revised to read, as follows:

§ 97.28 Examination administration.

* * * * *

(b) Unless otherwise prescribed by the Commission, each examination for the Novice Class operator license shall be administered by a volunteer examiner. Each written test for the Novice Class operator license shall be prepared by the examiner from PR Bulletin 1035A (latest date of issue), entitled *Questions for the Element 2 Amateur Radio Operator License Examination.*

(1) When the applicant successfully completes examination Elements 1(A) and 2, he/she shall submit an application (FCC Form 610) to the Commission's office in Gettysburg, Pennsylvania 17325. The application shall include:

(i) The name and mailing address of the volunteer examiner administering the examination;

(ii) A description of the volunteer examiner's qualifications to administer the examination;

(iii) The volunteer examiner's certification that the applicant has passed telegraphy Element 1(A) and written test Element 2;

(iv) The signature of the volunteer examiner administering the examination.

(2) Each volunteer examiner must:

(i) Hold a current General, Advanced or Amateur Extra Class operator license issued by the Commission;

(ii) Be at least 18 years of age;

(iii) Not be related to the applicant;

(iv) Not be in an employer-employee, or employee-employer, relationship with the applicant; and

(v) Not own a significant interest in, or be an employee of, any company or other entity which is engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparing for obtaining amateur station operator licenses.

(3) The volunteer examiner administering the Novice examination shall be responsible for the necessary supervision of the examination. A copy of the applicant's written examination papers must be retained in the volunteer examiner's station records for one year from the date the examination is administered.

* * * * *

2. Section 97.31(b) is revised to read as follows:

§ 97.31 Grading of examinations.

* * * * *

(b) Seventy-four percent (74%) is the passing grade for written examinations. Each element required for a particular license will be graded separately. Commission personnel will grade the written examinations, except the Novice Class Element 2 written examination, which will be graded by the volunteer examiner administering the examination.

Appendix B

Until FCC Form 610 is revised to include the certifications required by Section 97.28(b)(1), the statement on the current edition of Form 610 (December, 1981) must be modified. This should be done by writing in the appropriate underlined words as shown below:

Certification

I Certify That:

1. I am unrelated to the applicant (i.e. not a spouse, parent, child, stepchild, sister, brother, aunt, uncle, niece, nephew, grandparent, grandchild, in-law, stepbrother, stepsister, stepmother, stepfather.)

2. I am at least 18 years of age.

(3.) *I have examined the applicant and he/she has passed Element 2.*

(Check One)

☐ I have examined the applicant within the past 10 days and he/she has passed the five words per minute telegraphy examination.

☐ I have examined the applicant *in Element 1(A),* since he/she claims telegraphy test credit. The original FCC Form 845, Code Credit Certificate, is attached.

☐ I have not examined the applicant *in Element 1(A),* since he/she claims telegraphy test credit. Applicant's statement is attached giving the license number, expiration date, and class of commercial radiotelegraph operator license which qualifies him/her for credit.

73 INTERNATIONAL

from page 76

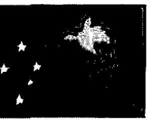
ing. Be certain that your car is in top-notch condition, especially the brakes, and that you have a quality spare tire. Even though the NAF (Norwegian Automobile Forrening) has its emergency patrols on all major roads, offering a high degree of technical assistance, it could save you a good deal of trouble and money. Check your insurance policy so that it will cover expenses if you should be unlucky enough to have an accident. Norwegians are very helpful, and most of them speak or understand English, German, and maybe one or two other languages.

The reason for mentioning these things is, of course, that they are so very easy to forget. Remember that some of the roads you will be driving on will be quite steep and narrow, and in places the road is cut straight into the mountainside, leaving the driver and passengers with a splendid view of the abrupt mountainside both below and above. It's amazing where you will find farms and houses. You will wonder, as we do, how they get there!

Now, what about mobile radio in Norway? After the description of what kind of landscape will greet you, you will also understand the lack of sufficient repeaters on 2 meters and 70 cm. However, those repeaters we do have cover quite a long range, some as far as 100 to 250 km because they are placed on mountaintops at altitudes up to 1 or 2 km. Repeaters are mostly concentrated around the densely populated areas and cover the main highways, so if you are planning to visit the western or northern part, bring your HF rig with you. It could be of great value and a good companion.

Standard voltage in Norway is 220 V ac, 50 Hz. The 2-meter band goes from 144.000 to 146.000 MHz. Repeater frequencies are from 145.600 to 145.825, with receive −600 kHz, and they use 1750-Hz tone-burst access. The callsign is sent in CW, and a complete repeater list and frequency list will be given to you when your license is issued.

I really hope that this information is of assistance to you, and on behalf of all Norwegian amateurs, I wish you a hearty welcome to Norway; we really hope you will enjoy your stay here. Have a good vacation.



PAPUA NEW GUINEA

Siegi Freymadl P29NSF
PO Box 165
Rabaul, Papua New Guinea

Rabaul is one of the most strikingly situated towns in the world. It has been built inside a still-active volcano. The magnificent harbor, Rabaul's reason for existence, resulted from successive large eruptions and the eventual collapse of large volcanoes which were formerly located there. The hole remaining after this event, 12 by 8 kilometers across and up to 500 meters deep, contains the harbor and the main part of the town. It is in fact a volcanic caldera. Because of that, it is a potential site for future eruptions and a center of seismic activity.

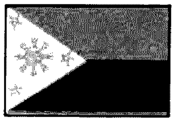
Because of the publicity given in recent months to the possible destruction of Rabaul by a volcanic event, I have decided to devote this month's column to emergency services agencies in the area.

1) The National Emergency Services were formerly under the control of the Post and Telegraph Department, but approximately two years ago it was put under Defense Force control. One officer is looking after the headquarters at Rabaul, situated in a picturesque location on top of Namanula Hill, overlooking Rabaul. An emergency net between NES Rabaul and 29 stations throughout the New Guinea Islands is operated on a twice-daily fixed schedule at 0715 and 1915 local time on 3732 MHz. One of the stations checking into the net is P22DQ, the base station at the Volcanological Observatory Rabaul. Equipment used are Codan 7515 SSB sets, and the antenna at NES Headquarters in Rabaul is a dipole. Rabaul keeps a continuous watch from 0700 until the end of the last radio schedule at 1915. In case of an emergency, the officer is on 24-hour standby. He also provides a phone patch when needed. Operations Center is Defense Force Headquarters in Port Moresby; other NES bases are at Lae, Madang, Wewak, and Manus. The Rabaul officer was trained as communications officer by the Defense Force. He hopes for bigger communications sets with more crystals and better antennas in the near future. It is also to be hoped that the lone officer maintaining vigil at NES Rabaul will receive additional staff to assist him.

2) Since independence, the national government has instituted a decentralization program to hand over more and more authority to the various provinces. One of the newly created departments is the Disaster Planning Unit under the East New Britain Provincial Government, which has been in existence for just over three months. A coordinator is at the head of the department and plans are still being drawn up to cover volcanic emergencies and tsunamis, earthquakes, erosion, floods, and drought. For communications, Philips 2m SSB sets are in use at the office and in cars. At this stage, the Disaster Planning Unit is still "finding its feet."

3) The Central Observatory in Rabaul is situated up on North Daughter, a dormant volcano, and there all the sophisticated monitoring devices for seismic and volcanic activities are housed. Also operated from there is the volcanological net on 6815 MHz at 0800 and 1400 local time, seven days a week. Stations at Manam, Karkar, Langiia, Talasea, Ulamona, and Esaia are on the network using SSB voice and P22 prefixes. An additional callsign, P22CF, is assigned for mobile use. NES has access to this net and the Central Observatory in turn has access to the NES frequency. Rabaul Central Observatory, Karkar, Manam, and Esala use 100-W Codan sets with cut dipole antennas. The rest are equipped with 25-W portable Codan sets using longwire antennas. All stations, except Central Observatory Rabaul, are powered by batteries, which are charged by one 12-V, 2.4-Amp Arco solar panel. A portable seismograph is also powered by solar energy. Installed at the residence of the senior volcanologist is a Kenwood 930S and a dipole antenna, and he uses this set to conduct the volcanological net on weekends. A four-stage emergency plan has been drawn up, the last stage being implemented when an event is imminent within a few days or as little as a few hours.

These are the agencies in Rabaul looking after emergencies. Strangely enough, no effort has been made to enlist the help of any radio amateurs in the area. It seems to me that amateurs could render valuable services in times of emergency. This was pointed out to the Coordinator of the Disaster Planning Unit and the Officer-in-Charge at National Emergency Services, Rabaul.



PHILIPPINES

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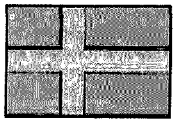
The amateur-radio scene in the Philippines is about the same as in any of the Third-World countries around the world. The growth is in the upswing because of the availability of VHF/FM hand-helds, so there are more VHFers than HFers. The hobby is now under scrutiny because of illegal users of 2m FM rigs.

The regulatory body in the Republic of the Philippines is the NTC (National Telecommunication Commission) under the Ministry of Transportation and Communication. At present, the amateur license structures are as follows: Class A—full privilege, 2000 Watts PEP; Class B—same privilege as Class A except 20-meter phone privilege (14.275 and up only), 1000 Watts PEP only; Class C—Novice class, phone privilege on 40 meters and 2 meters only, CW also both bands, 25 Watts only PEP.

The Philippine amateur scene covers most aspects of the hobby. There are DXers, RTTY and OSCAR enthusiasts, VHF/UHF aficionados, and of course good "old-fashioned" CW buffs. Last April, Manila Hamfest '83 was one of the highlights of amateur radio in the country. It was sponsored by the Ham Radio Philippines Ham Club. This active organization put on a tremendous show by inviting all or most of the different clubs and organizations in the Philippines. A plenary session was held to map out the future of amateur radio in the Philippines.

For prospective visitors to the country, a reciprocal license is easily obtainable, provided the visitor's country of origin has a reciprocal agreement with the Republic of the Philippines. All you need is a photocopy of your license, three passport-size pictures, and the necessary paperwork. Processing is from one to two days. Most American "recips" (most of them are stationed either at Clark Air Base or Subic Naval Base) can have their reciprocal license mailed to their local or APO/FPO address. In my case, it was mailed to both!

More information can be acquired through the Philippine Amateur Radio Association, PO Box 4083, 17th Floor, Philippine Communication Center Building, Ortigas Avenue, Pasig Metro-Manila, Philippines. Or if you are an American serviceman, contact the Central Luzon Amateur Radio Club (CLARC) located at the old Carmelite Hospital, Angeles City, just outside Clark Air Base, or call telephone number 55228 inside Clark and ask for Jerry McCracken or Leo Almazan for more information.



SWEDEN

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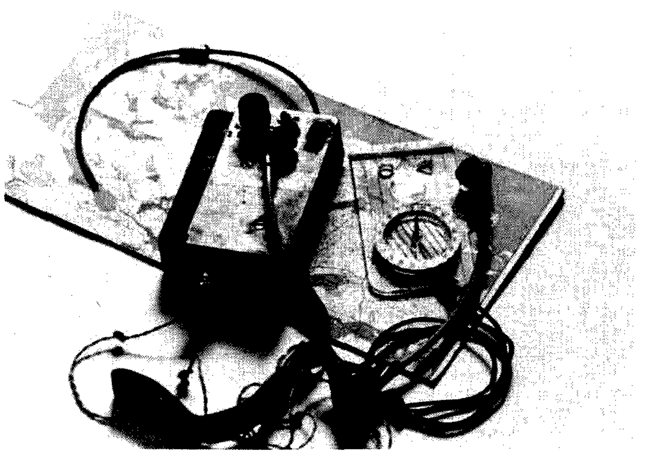
The Swedish television devoted a full hour program to ham radio a few months ago. Mr. Erik Bergsten SM6DGR has for many years produced a very popular program called "Technical Magazine." A recent series of programs has been about the development of radio and television from the very beginning up to today's satellite TV. Amateur radio got its full share of this. Erik brought up specialized communications modes like moonbounce (EME), meteor-scatter, SSTV, RTTY, contesting, etc., and also amateur-radio direction-finding (ARDF), popularly called fox-hunting.

Fox-hunting, European style, brings the ham operator out from the shack into the fresh air. Radio direction-finding as a sport among hams started in Sweden in 1947 and spread quickly within Europe in the 50s. The first Swedish Championships were held in 1952 by Vasteras Radio Club, SK5AA, a club celebrating its 40th anniversary this year.

Swedish hams SM5IQ, SM5AVC, and



The fox-hunter's weapon—receiver and compass. Photo by SM0EJY.

SM5CRD went on their first "missionary" trip to Norway in 1952 to spread the idea of fox-hunting. The first unofficial European Championships were held in Sarajevo, Yugoslavia, in 1958 and this sport has become very popular in East Europe. The World Championships are usually arranged by an East European country.

US Variety

In the US, direction-finding on two-meter FM has a growing popularity. For this, two-meter hand-held equipment with HB9CV antennas is used. I saw this demonstrated at a Minuteman Repeater Association meeting in Boston, Massachusetts, about a year ago. In the US, fox-hunting is of course (!) done by automobile.

Orienteering

ARDF is very similar to the so-called orienteering, which is a sport in which you run in the forest trying to find checkpoints that are marked on a very detailed map. You also have a compass to help you. This Swedish sport is spreading all over the world. The New England Orienteering Club in Massachusetts has been very successful in the US. In fox-hunting, the checkpoints are well hidden and you have to try to find them (usually five) by the means of a map, a compass, and a small direction-finding receiver about the size of a king-size cigarette pack. Frequencies used are between 3,500 and 3,600 kHz. The transmitters used are low powered, just 2 Watts or less, and the antenna is a short vertical wire hung up in a tree. Each fox transmits a series of dashes — — — — — i.e., M O; the longer the dashes, the easier it is to determine direction. The five foxes transmit two minutes each, one at a time. No. 1 fox starts by sending a series of M O E M O E for two minutes. The letter E, i.e., one dit, identifies the first fox. No. 2 fox follows by sending M O I M O I, etc. After ten minutes, you have one bearing to each transmitter. You then quickly (by running) change position and take the cross-bearing during the next ten minutes. It is not as easy as it may sound.

No Code Proficiency Needed

You do not have to be a ham to participate in fox-hunting and knowledge of Morse code is of course not necessary. You can identify the fox by the number of dits transmitted.

The development of automatic fox transmitters has facilitated the arrangements for a hunt. The old system required a minimum of five operators hiding in the woods and getting eaten up by the mosquitoes. These new automatic transmitters also give the successful hunter a slip on which the ID of the fox and the check-in time is printed. The hunter having proof of finding all five foxes in the shortest period of time is the winner. It sure is not always the fastest runner that wins. You must be accurate when you take the bearings.

Championships

In the Swedish as well as the Nordic, European, and World Championships in ARDF, the score is a combination of the results from both the day and the night hunt. The Swedish Championships this year took place in Eskilstuna, 90 kilometers west of Stockholm, in August.

The World Championships 1982 were going to be held in Bulgaria (LZ), but were postponed due to difficulties caused by the hosting country. The International Amateur Radio Union (IARU) Region 1 has developed international rules for amateur-radio direction-finding. ARDF is a very nice club activity, involving building and constructing the equipment and arranging the outdoor activities. Why don't you start this in your club? For further information, feel free to write to me (SASE or SAE + IRC, please). It is just a matter of getting started.

Claes SM0CTU taking bearings. Photo by SM0EJY.

TAIWAN

Tim Chen BV2A/BV2B
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Republic of China

I feel quite honored to have had many visitors this year. A common question often raised by visitors is "Why is there only one station—BV2A/BV2B—on Taiwan?"

For security reasons, ham activity has been restricted to a certain extent in the past. However, I feel the situation has gradually improved, and the future looks bright.

Amateur-radio operation is governed by the so-called "Special Telecommunications Regulations," which was revised on October 9, 1972. The regulations stipulate that a Chinese national must pass an MOC (Ministry of Communications) examination or possess a professional radio license to receive a ham ticket. Hams were at first allowed to operate only on 14 and 28 MHz, but since December, 1981, the 21-MHz band has been open. At present, there are still three operative bands available; other HF and VHF bands for hams are not likely to be opened in the near future. I found that some bootleggers had deliberately used my calls on 40 and 80 meters and had caused a lot of confusion.

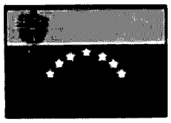
The examination consists of a test on fundamental electricity, radio principles, telecommunications regulations, and international radio regulations relevant to amateur-radio operation. A 13-wpm code-proficiency test is also required.

Obviously, the ruling is too simple to meet with the fast development of amateur-radio activities worldwide. I am given to understand that revision of the regulations is under way.

BV2A was first established in 1959 to operate on 20-meter CW only. In 1974, the ex-INDXA (International DX Association) of Maryland offered me a Heathkit 32A monoband transceiver to initiate 20-meter SSB operation with the callsign of BV2B. Later, W9ZNY lent me a hand and air-shipped a set of 203BA antennas from Chicago, which, in conjunction with the HW32A, has greatly improved my signal. I would like to thank those contributors for their assistance.

Although there is only one ham station on this island, I am sure that a great many young men like the unique hobby and they will come into hamland as soon as the restriction is lifted.

Many times, Chinese authorities have rejected requests for visitors' licenses, since we have no reciprocal agreements with any other countries. Recently, a group of Italian hams—I2DMK, I2BVS, I2PKF, and I2JQ of the Associazone Radiotecnica Italiana—applied for permission to operate their rigs for ten days in commemoration of World Telecommunications Year. This request is now under favorable consideration by Chinese authorities. If the official approval can be obtained, it not only will enhance closer friendship between hams of the world, but also will create a good beginning for radio amateurs on this island.



VENEZUELA

Luis E. Suarez OA4KO/YV5
Apartado 66994
Caracas 1061-A
Venezuela

I sent an article on parabolic antennas to *73* as a contribution to help fellow amateurs in understanding the techniques that we'll be using during this new wave of radio communications. I'm convinced that with the advent of OSCAR 10 and other satellites that will follow, the use of frequencies above 2 meters along with new modes of operation will pervade the radio-amateur interest in the near future. Certainly parabolics at lower prices and of better materials will be bargains very soon. Just wait for the Direct-Broadcast Satellites which are practically standing in the launch pad. Anyhow, be prepared to handle at least a three-meter-diameter parabolic. In comparison with the most commonly used of today's HF antennas, the one-meter parabolic will be like a dipole and the three-meter parabolic will be like a three-element triband beam, so to speak. The worst thing is that the parabolic should be rotatable both in azimuth and elevation unless geostationary satellites were placed in orbit. For those liking fancy rigs and Molniya-orbit satellites, the bigger parabolics would be installed along with big rotators.

For us in Venezuela, having a parabolic on your own roof was prohibited because the communications authorities found out that some people were doing business with TVRO and video recorders. Anyway, since the present Minister of Communications (Francisco Lara YV5CBB) intends to perfect the present regulations, no doubt something will be done regarding this topic.

While writing on these matters, I tried to imagine how those great daring men in the world's history managed to explore, conquer, survive, or fight against men and nature to get freedom and liberty. I'm talking about David Crockett, Colon, Napoleon, Bolivar, etc. Can you imagine those men who, without electronic aids, went across the world in search of their dreams and fates?

A Venezuelan, Simon Bolivar, did it to liberalize Bolivia, Colombia, Ecuador, Panama, Peru, and Venezuela. For us Americans, it is easy to imagine how it was done, but let me tell you that South America is several times the size of Europe and that the Andes Mountains' altitudes are 5000 meters in Venezuela and up to 7000 meters in Bolivia. Can you imagine those resolute men crossing the Andes on foot, with horses and mules carrying weapons and food? Really not an easy task, and they did it not just once, but many times.

The Venezuelan territory offers infinite varieties in landscapes and in climate. All along her shores there are kilometers upon endless kilometers of sandy beaches. Temperature is high on the coast and on the plain. Being a Caribbean country, it is

easy to imagine how high the temperature is. Nevertheless, due to trade winds, the weather is not too rigorous in the northeast. The northwest is far warmer, and you may expect temperatures as high as 41 degrees centigrade at sea level and on the plains.

Toward the west and northwest, the Andes Mountains with the treeless plateaus lead you from the warmth of the coast to the coldness of the altitudes. The highest mountain in Venezuela is Pico Bolivar (Bolivar Peak) in Merida State with an altitude of 5007 meters (16,000 feet). About 36,000 square kilometers of the territory are crossed by the Andes. That's why there are so many VHF repeaters in this country. More than 60 have been licensed on 2 meters and 70 cm covering half the nation.

Toward the south is the Orinoco River with a host of wide and lazy tributaries. They snake through the ever-green, dense, warm jungle. The river is 2,140 kilometers long with a maximum width of 20 kilometers near Ciudad Bolivar, capital city of Bolivar State. The river depth varies from 80 meters to 100 meters during the rainy season from July to November. One of the most important branches of the Orinoco is the Caroni river in Bolivar (YV6). On a tributary of this river, the Churun, is the highest waterfall in the world, the Salto Angel (Angel Fall). Plunging 1500 meters, this fall was discovered in 1937 by an American pilot named James C. Angel. In my opinion, it is located in the most beautiful landscape in South America—which also is one of the oldest in the world (Precambrian—600 million years ago).

The territory south of the Orinoco is sparsely populated, with some small towns, several thousand aborigines, and only two cities with more than 150,000 inhabitants: San Felix and Ciudad Bolivar. That's why there are only three repeaters in the southern territory.

Some advice is in order: Do not expect to meet feathered indians or loincloth-wearing people when you arrive in this country. If you like to see indians, be prepared for a long trip toward the south. This country has the typical occidental style both in look and way of life. Caracas, the capital city, is a modern metropolis and one of the most beautiful places in South America. I will try to depict in future columns how the country is, by call areas.

REPEATERS

A list of the already-working VHF repeaters is shown in the box. With all those repeaters and links, you may travel across the country by car, rag-chewing hour after hour using HTs.

The topography surrounding Caracas is mountainous with altitudes as high as 2,300 meters. Near here is where the Andes end, after a long line of mountains that begin in the southernmost part of South America. The highest repeater sites in the Caribbean are, no doubt, in Venezuela. There are two such repeaters channeled at 147.000 (−600) and 147.180 (−600) MHz bringing DX possibilities from time to time. Today (June 24) I heard WD4EXH/KP2 (Mike) from Saint Thomas and HI8AEA from the Dominican Republic. Not very often, but yet not uncommon, it is possible to hear Curacao, Aruba, Puerto Rico, Colombia, Dominican Republic, Panama, etc., due to anomalous propagation—you know, ducting and similar things. Fortunately, the abnormal propagation sometimes lasts several days. Some very slow fading is expected, so should the signal be lost, just wait a while and try again after some minutes. I have heard also that somebody made contact through the 147.000-MHz repeater with a mobile traveling from Tulsa, Oklahoma, to Orlando, Florida. This kind of DX through 2-meter repeaters is not new. During 1976, I made contact with Juan PJ3JAV and I remember his signal was solid for several days. So, Caribbean DXers, aim your 2m antennas to Caracas and push the mike button, and if you hear the kerchunk, give us a call.

VHF REPEATERS IN VENEZUELA

147.240	Barcelona	146.700	Maracaibo
146.910	Barcelona	146.850	Maracaibo
146.610	Barquisimeto	147.030	Maracaibo
146.970	Barquisimeto	147.060	Maracaibo
146.700	Barinas	147.180	Maracaibo
146.940	Bocono	146.850	Maracaibo
146.820	Caracas	146.700	Maracay
146.730	Caracas	146.880	Margarita
147.000	Caracas	147.300	Maturin
147.180	Caracas	146.010	Maturin
146.790	Carupano	146.610	Merida
146.700	Ciudad Bolivar	146.820	Merida
146.760	Ciudad Ojeda	146.940	Merida
145.925	Ciudad Ojeda	147.270	Merida
146.790	Coro	147.120	Metropolitan Airport
147.090	Coro	146.760	Platillon
147.190	Coro	146.940	Puerto Ordaz
146.700	Cumana	148.610	San Cristobal
146.610	Eastern	146.730	San Cristobal
146.880	El Guri	146.740	San Cristobal
146.970	El Hatillo	146.880	San Cristobal
147.180	El Junquito	146.940	San Cristobal
147.790	El Tigre	147.730	San Cristobal
147.390	El Vigia	146.760	Upata
146.940	La Guaira	146.820	Valencia
145.340	La Victoria	146.850	Valancia
147.210	La Victoria	146.940	Valancia
146.970	Machiques	147.840	Valancia
146.640	Maracaibo	147.970	Western

I have investigated the ham population and it seems to be 20,500 strong instead of 16,000 as I wrote previously. Up to this moment, 30,664 ham licenses have been issued. Thus, more than 10,600 were cancelled or lost due to several causes, including silent keys. There are around 3,000 active hams using all bands from 160 to 23 cm and all modes including SSB, RTTY, SSTV, etc. There also is some activity with current satellites although just a handful of Venezuelan hams are registered AMSAT members. They are Manuel YV5LW, Jose YV4CB, Wolfram YV4WT, Asvaldo YV6ASU, Jorge YV5FNG, Hector YV5BQO, Jose YV5GDX, Efrain YV4CLV, Edgar YV5ZZ, Augusto YV5AW, Gustavo YV5DRM, Coisme Gomez, Sven SM5CGA/YV5, Jaime HK9ASC/YV5, and this writer.

The foreign amateurs to operate from Venezuela number around 20. Some of them are Erwin OA4AJU/YV5, Mirella OA4ANS/YV5, Alfonso OA4APQ/YV5, Maria Isabel OA4CRK/YV5, James WD8AMY/YV6, Henry W8PLV/YV5, Rainer DL2GG/YV5, Sven SM4CGA/YV5, Claudio TI4CAM/YV5, Claudio LU5DND/YV5, and this writer.

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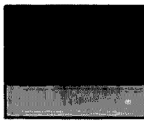
Silver Endorsement Award

Application: No QSL cards but a log of contacts with ten different Venezuelan stations plus one contact with radio club station YV5AJ. The application must be accompanied with a sworn declaration of rules fulfillment.

Time period: May 1, 1983, 0001 GMT to January 30, 1984, 2400 GMT; bands: 160, 80, 40, 20, 15, 10; modes: either SSB or CW or both; closing date: logs should be mailed before and no later than March 1st, 1984.

Award fee is four IRCs for postage and handling. Send to Radio Club Venezolano, PO Box 2285, Caracas 1010-A, Venezuela.



Guenter Schwarzbeck DL1BU in his test shack. About a third of his test equipment is shown. (Photo by Kurt Goldberger)

WEST GERMANY

Ralph Beyer DJ3NW
Opferkamp 14
3300 Braunschweig
Federal Republic of Germany

GUENTER SCHWARZBECK DL1BU

Everybody knows the symptoms of deciding on a new piece of equipment: self-conviction that something new has to be acquired, enthusiasm afterwards about the number of choices on hand, study of the manufacturer's specifications, consultations with friends, and maybe a hands-on test. But, irresistibly, uncertainty about the right decision develops during this process and one realizes how much subjective data and how little objective data one has for the decision to be made. And, in fact, can one really expect that the manufacturer will tell us about the birdies in his new transceiver, the effect of the switch-selectable preamplifier on the 3rd order intercept point, or the difference of antenna gains for competitive products under identical test conditions? And the statement, "Gain and F/B ratio cannot be published in *QST*," adds to the confusion of consumers rather than stimulating the publication of objective and comparable performance data.

It was most fortunate, therefore, that Guenter Schwarzbeck DL1BU began a series of test reports on radio equipment and antennas in the German *CQ-DL* magazine about 8 years ago. Since that time, he has gained a reputation for his test reports, and not only in Germany. Being a professional in electrical engineering and an avid ham for more than 45 years, he has set up a laboratory with a whole range of test and measurement instruments for this purpose (see photo). The framework of his test procedures and a thorough discussion of his measuring methods were published monthly in the *CQ-DL* magazines July through October, 1976, and in June, 1977. In the past, test reports appeared on (among other things) the Astro 150, IC-730, FT-ONE, TS-930S transceivers, the Datong FL2 filter, coaxial switches and relays, a comparison of the QSK features of Ten-Tec, Cubic, and Drake equipment, and the TH6DXX, TH3MK3, KT34, KT34X, FB33, and FB53 antennas.

In the beginning, Guenter wrote a number of articles about the physics of ham radio and equipment and propagation, too. But since then, more and more emphasis has been placed on the new transceivers and antennas appearing on the market. Today he is practically drowning in equipment offered to him for testing. And he considers it a challenging task not only to produce unambiguous measurements, but also to publish them in a way that is understandable and meaningful for

the average reader. The toughest job, however, he thinks, is the evaluation of HF antennas. Not because of the physics involved, but due to the sometimes misleading information given by some manufacturers and the nonobjective, emotional attitudes expressed towards certain types of antennas.

Most of his publications are written in German, but casual translations, for example in the British *RadCom* magazine, are spreading the word around. Due to the growing interest in his work on the international level, Guenter is looking for opportunities to publish his reports more regularly in an English-language magazine. In order to leave him some time for his other hobbies—like high-speed CW, including contests (most of which he wins), discussing technical topics, and rag-chewing with friends—a more regular cooperation with a technical translator and fellow ham probably would serve the needs of his international audience best.

If you are interested, you may contact him by mail (6901 Schoenau-Altneudorf, Federal Republic of Germany) or meet him on 14317 kHz Sundays around 0800 hours UTC in the DL/VK net. Although he is a high-speed CW man, he can be heard there quite often now ... since he got a mike a few years ago.

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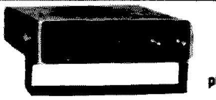

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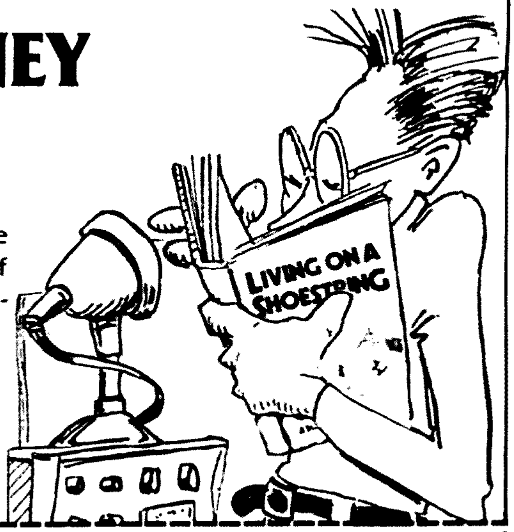

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U. S. S. R.	7	7	3A	3A	7	7	14	21A	21A	14	7B	7
WEST COAST	14A	14	7	7	7	7	7	14	21	21A	21A	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	7	7	7	7	3A	7	14	14A	14A	21
ARGENTINA	21	14	7	7	7	7	7A	21A	21A	21A	21A	21A
AUSTRALIA	21A	14	7B	7B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	14A	14	7	7	7	7	7A	14A	21	21A	21A	21
ENGLAND	7	7	3A	3A	7	7	14	14A	21A	21	14	7
HAWAII	21A	14A	7	7B	7	7	7	7	14	21	21	21A
INDIA	14B	14B	7B	7B	7B	7B	7B	14	14	14B	14B	7B
JAPAN	14A	14	7B	7B	7B	7	7	7	7B	7B	14	21
MEXICO	14A	7A	7	7	7	7	7	14	21	21	21	21
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7B	14B	14	14	21
PUERTO RICO	14A	14	7	7	7	7	14	21	21	21A	21A	21
SOUTH AFRICA	14	14	7	7B	7B	7B	14	21	21	21A	21A	14A
U. S. S. R.	7B	7	3A	3A	7	7B	7B	14	21	14	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	7	7	7	7	3A	7	7A	14	14A	21
ARGENTINA	21A	14	7	7	7	7	7B	14A	21A	21A	21A	21A
AUSTRALIA	21A	21A	14A	14	14B	7B	7B	7B	14	14	21	21A
CANAL ZONE	14A	14	7	7	7	7	7	14A	21	21A	21A	21A
ENGLAND	7B	7	3A	3A	7	7	7B	14B	14	21	14	7B
HAWAII	21A	21	14	14	7	7	7	7	14	21	21	21A
INDIA	14	14	7B	7B	7B	7B	7B	7B	14	14B	14B	14B
JAPAN	21A	21	14	7B	7B	7	7	7	7	7B	14	21A
MEXICO	14A	14	7	7	7	7	7	14	21	21	21A	21A
PHILIPPINES	21A	21	14	7B	7B	7B	7	7	14	14	14	21
PUERTO RICO	21	14	7	7	7	7	7A	21	21A	21A	21A	21A
SOUTH AFRICA	14	14	7	7B	7B	7B	7B	14	21	21A	21A	14A
U. S. S. R.	7B	7B	3A	3A	7B	7B	7B	14B	14	14B	7B	7B
EAST COAST	14A	14	7	7	7	7	7	14	21	21A	21A	21

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

OCTOBER

SUN	MON	TUE	WED	THU	FRI	SAT
						1 F/G
2 F/G	3 F/G	4 F/F	5 F/F	6 G/G	7 G/G	8 G/G*
9 F/F*	10 P/P#	11 P/F	12 F/G	13 G/G	14 G/G	15 G/G
16 G/G	17 F/G	18 F/G	19 F/F	20 G/G	21 G/G	22 G/G
23 F/F 30 P/P#	24 P/F 31 P/P#	25 F/F	26 G/G	27 G/G	28 F/G	29 F/G*

International Edition

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Issue #278

73®

Amateur Radio's Technical Journal

A Wayne Green Publication

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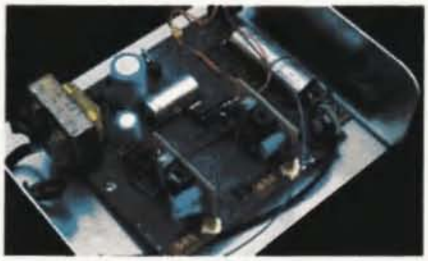

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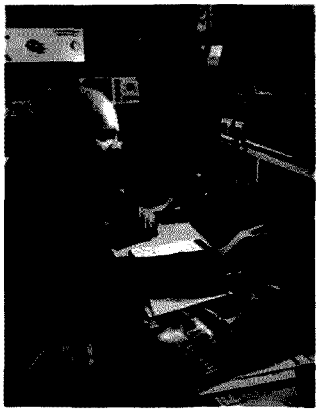


W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

WHAT'S GREEN REALLY UP TO?

A few years ago, I wrote in my editorials in *73* my prediction that microcomputers would one day grow to the size of the car industry. I also pointed out that this growth was a golden opportunity for those interested in getting rich.

Based on that concept, I first started *Byte* magazine as a vehicle to help that industry to speed up its growth (*Byte* was the largest consumer magazine in America last year) and then *80 Micro* to help entrepreneurs get a piece of the action (the third largest consumer magazine in America last year).

The computer field is still in its early growth stages, so there are lots of opportunities yet to make fortunes there. You'll see me starting even more magazines to help it grow and deal entrepreneurs in on the action.

One of the benefits to me of amateur radio has been the interest I've gained in travel. Talking with hams in virtually every country of the world has interested me in getting to personally see their countries and meet them in person. And in each country I visit, I can't help but *compare their* quality of life with that we enjoy in America.

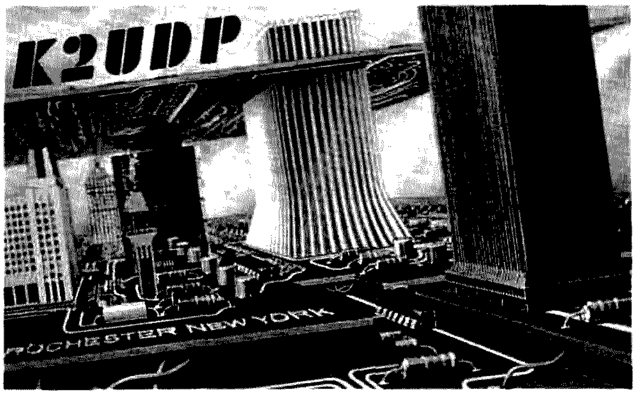
Most of the Third-World countries have it pretty tough. They are prisoners of poverty, ignorance, and, as a result, tyrannical governments. We've tried throwing money at these countries, but that is divided up among the tyrants, providing little for the people. The answer, of course, is to provide them with education. In the long run, this will change the patterns of poverty.

That, my friends, is Green's Goal. It is my intention to provide the entire world with a high-quality, low-cost education, using high-technology techniques. I'll make this prediction: Education is going to be a marketable product and the industry manufacturing and selling this product is not only going to be larger than the car industry, but also larger than OPEC.

Being one of the early ones to see what is coming, I'm in a position both to help this come about and also to profit from it, as I did with computers. Indeed, I think several thousand brainwashed ARRL members were pretty surprised when they heard that I'd sold my magazines for $60 million. That didn't tie in very well with the League theory that I'm a blundering idiot who is destroying amateur radio.

You know, I got started in hamming 45 years ago and it is depressing to me to get on the air and see how little things have changed in all that time. About the only significant changes are sideband and repeaters (both of which I helped make happen with my magazines). It's getting time for some major changes to bring amateur radio into our high-tech age. Perhaps, from that viewpoint, it is time to "destroy" amateur radio—and that seems to be the ARRL position. I want hamming to progress, to be able to provide the quality of communications modern technology allows, and not be stuck fifty years in the past, held to our ancient Morse-code traditions inflexibly.

Continued on page 108



QSL OF THE MONTH

The high-tech city: That's Rochester, New York, and this winning QSL card from the Rochester Amateur Radio Association reflects Rochester's claim to fame. According to the Department of Commerce, this city leads the nation in high-technology exports, and RARA is proud of amateur radio's contributions to the community. There is no doubt that the scene makes for a striking QSL card. It represents the way an area can be linked, not only by streets and sidewalks, but also by the communications network provided by ham radio.

To enter your QSL card in *73*'s QSL of the Month contest, put it in an envelope with your choice of books from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be considered.

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Construct the Callsign Power Supply

KA1QZ put together aesthetics and electronics to produce a power supply that gives you more than good regulation.

Limited funds along with the hassles of apartment living and QRO hamming forced me to explore QRPp operation as a last-ditch attempt to preserve some form of my ham radio hobby. A friend's donation of a Ten-Tec PM-3 5-Watt CW transceiver and a spare 12-V battery put me on the air while keeping QRM from my neighbors to a minimum. Eventually the battery expired, and I made the decision to dust off the soldering iron and build a small power supply rather than spend precious allowance for expensive batteries. I also wanted to have a power supply that would provide the necessary power for an Argonaut which I eventually hope to acquire.

Visions of state-of-the-art ham equipment with its fancy lights and whistles inspired me to construct something similar in terms of a functional conversation piece for my QRP station. Apart from a power supply to power the rig, few ham shacks can be found without a clock, so a digital-clock module seemed the ideal complement for the supply. Much to my delight, I found that the clock chips currently on the market were inexpensive enough to allow me to purchase a pair: one a 12-hour format and the other a 24-hour format. Thus, I could have the 12-hour clock set to local time and the other to UTC. Finally, a late-night flash of inspiration led me to complete the power supply/clock console with a callsign that lights up when the supply is on. Combining all into a Ten-Tec-style enclosure resulted in a real conversation piece as well as a multi-functional addition to the QRP station. Most important, the whole project did not bankrupt me and required only a few evenings worth of time.

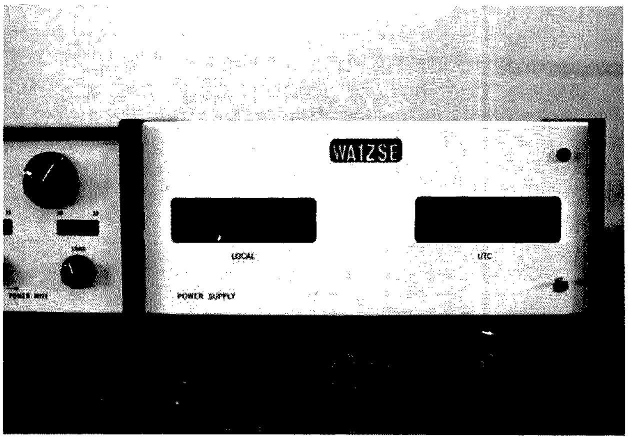

Photo A.

The Power Supply

The power supply was designed to provide an adequate amount of power at minimum cost for QRPp rigs in the 5-to-6-Watt class with some reserve for 12-V station accessories. The PM-3 requires 480 mA in the transmit mode, but the Argonaut draws 1 Amp in the transmit mode. The ac power supply available for the Argonaut delivers 13 V ± 0.5 V at 1.2 A. I decided that a 13-V supply capable of delivering 1.5 A to 2.0 A output current would be desirable.

The next step was to select an IC regulator. I ruled out the 78XX series of fixed-voltage regulators. Even though these regulators can be used for current output in excess of their guaranteed 1-A rating, it is not recommended operating these regulators at or above their maximum current rating for extended periods of time.

To my knowledge, there are no readily-obtainable 2-A IC regulators. Going to the 3-Amp and above class of regulators was more money than I was willing to part with, especially when that much current capacity wasn't really needed. To utilize the full current capacity of these large regulators would also require a larger, more expensive transformer. A good compromise for this project was reached by using the LM317 variable-voltage regulator.

The LM317 is a 3-terminal positive voltage regulator with a guaranteed current output of 1.5 A. The output voltage is variable from 1.2 V to 37 V. Two external resistors are used to set the output voltage (see Fig. 1). The regulator output voltage is given by the equation: $V_{out} = V_{ref}(1 + R2/R1) + I_{adj}R2$.

Vref refers to the 1.25-V reference voltage generated between the output and the adjustment terminal (terminal 2). The constant voltage across R1 causes a constant current to flow through output resistor R2, giving the desired output voltage. For most purposes, the last term in the equation can be ignored since the Iadj term has units

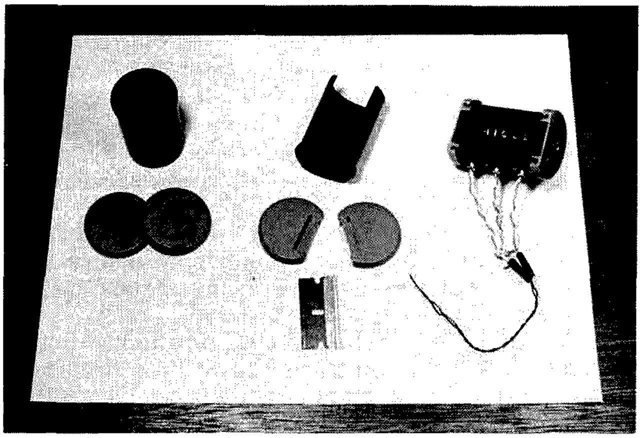

Photo B. Construction of callsign housing using 35mm plastic film cans. Completed unit is shown on the right. (My call then was WA1ZSE.)

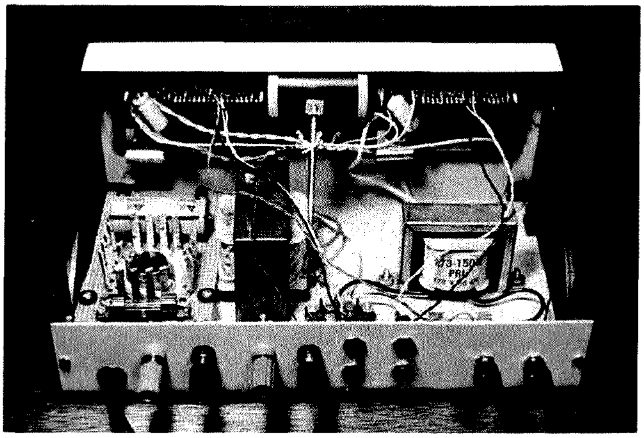

Photo C. Assembly of components into enclosure. Transformer on right powers both clock chips. QRP power supply is on the left. Two sets of binding posts allow for connection of QRP rig and an additional 12-V station accessory. Knobs at far right on the back panel are clock-dimmer pots (optional). The callsign housing in the center background is held in position by a 4″ × ⅛″-diameter machine screw anchored to the bottom of the enclosure. An L-shaped bracket attaches the callsign housing to the mounting screw.

of microamps making the entire term insignificantly small.[1] The equation can be arranged to allow for easier calculation of the R2 value, given a desired output voltage and assuming R1 = 220 Ohms—an arbitrary but common value: R2 = (Vo − 1.25)220/1.25.

For a 13-V output in my supply, R2 = 2068 Ohms. A slightly higher value of R2 (say an additional 100 Ohms) may be necessary to offset the tolerance error of the resistors if an exact output of 13 V is desired. However, none of these values is critical as long as Vo lies within the 12-14-V range required by most "12-V" rigs.

Although I used the more expensive TO-3 version of this regulator, the TO-220 package would work equally well provided it is mounted to an adequate heat sink.

The complete power supply circuit is shown in Fig. 1. Regulator circuit protection is provided by the current-limiting feature of the LM317. Overvoltage protection of the load is provided by the "crowbar" circuit.

Since direct-conversion receivers like the one in the PM-3 are prone to picking up hum from an ac power supply, 0.01-μF capacitors were inserted parallel to each rectifier diode. The addition of these capacitors to the rectifying portion of the supply eliminated virtually all ac hum from the audio output of the PM-3.[2]

Parts List

T1	25.2 V ct 2 A (RS 273-1512)
D1,D2	3 A, 50 piv (RS 276-1141)
C1, C2	0.01 uF (RS 272-1051)
C3	4700 uF 35 V dc (CS 20TM907)
U1	LM317K (CS LM317K)
R1	220 Ohm, ½ W (RS 271-015)
R2	2.2k, ½ W (RS 271-027)
F1	1 A Fast-blow (RS 270-1273)
CR1	1N4744 1 W, 14 V (CS 1N4744A)
CR2	2N6236 30 V, 4 A (CS 2N6236)
R3	220 Ohm, ½ W (RS 271-015)
R4	47 Ohm, ½ W (RS 271-009)

Heat sink (RS 276-1364)
Heat sink compound (RS 276-1372)
Mounting hardware
Fuse holder

Note: RS = Radio Shack; CS = Circuit Specialists, PO Box 3047, Scottsdale AZ 85257.

The Clocks

The digital-clock circuits used in this project were the MA1008A (National MM5385 12-hour-format chip) and the MA1008D (National MM5386 24-hour-format chip). Both clock chips were purchased new (close-out specials from Digital Research Parts) for under ten dollars for the pair. They came ready to use and required only a 12-V, 1.2-A transformer (which powered both chips) and momentary SPST switches (for setting the clocks) to be put into operation.

These chips were purchased in 1980, so their current availability and price may be different. However, there are a number of other parts-supply sources offering similar clock chips at very reasonable prices.[3] Flea markets and ham conventions are other possible sources.

The Callsign

The basic idea for the callsign came from the Heathkit SB-104 I once owned back in the pre-neighbor days. The lighted callsign in that rig consists of peel-and-stick letter blocks mounted on a transparent panel behind a red plexiglas™ filter. Each block has a black opaque background except for the outline of the letter which is clear to allow light to pass through when the panel light is turned on. It's a nice effect, and to my knowledge is a feature found only on the SB-104.

A 2″ × 1/2″ piece of window glass was obtained from the local hardware store as scrap. A dry transfer press-on letter set (#M12

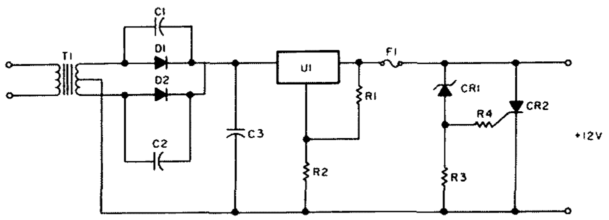

Fig. 1. Power supply schematic.

made by the C-Thru Ruler Co., Bloomfield, Connecticut, obtainable from stationery or art supply stores) was used to apply the call letters to the glass. The call letters were centered in both directions on the glass strip. Black enamel paint (obtainable at hobby stores selling modeling supplies) was applied to the glass surface using a fine-tipped brush. All of the glass surface surrounding the outlines of the letters was painted black. Two or three coats were necessary to ensure that no light could pass through the glass except through the letter outlines. By holding the glass up to a strong light after each coat of paint had dried, it was possible to see if a sufficient amount of paint had been applied to block out stray light.

A plastic 35mm film canister was used as the callsign housing. The end of the plastic film can was removed with a razor blade. A circumferential strip of about ¾ inch was removed lengthwise from the plastic can creating an incomplete cylinder. The end cap from this can and the end cap from another film can were fitted to the tube. The caps were then cut flush with tube edges.

Next, slits were cut in the end caps corresponding to the width and thickness of the glass strip. Illumination of the callsign was achieved by three 12-V bulbs (Radio Shack 272-1141) which were mounted equally spaced along the bottom surface of the tube. Holes were punched in the tube and the bulbs were snug-fitted. (Three small bulbs were used rather than a single, larger bulb in order to ensure even illumination of the callsign and to ensure that the bulbs remained hidden from view.)

A small piece of white poster paper was cut and wrapped along the inside wall of the tube. This white background served as a reflector to aid in achieving even illumination. The whole assembly was put together by sliding the glass strip through the slit in one end cap, snapping the end cap/glass strip into one end of the plastic tube and then fitting the other end cap to the tube. Photo B illustrates the stages in constructing the callsign housing.

The Enclosure

The enclosure used in this project was a Ten-Tec Model MG-10 ($4\frac{3}{16}$"H × $9\frac{15}{16}$"W × $6\frac{5}{16}$"D) obtained at a flea market. Any type of metal cabinet with similar dimensions would do equally as well. The cutouts for the clocks and the callsign light were done using square Greenlee tools. The edges of the resulting holes were rounded with a file. In order to eliminate unsightly clock-chip mounting screws from protruding on the front panel, flathead machine screws were epoxied to the inside surface of the cabinet. Finally, press-on lettering was used for the various labels. Photo C shows how the clocks, power supply, and callsign were mounted in the enclosure.

The finished product proved to be a handsome and useful addition to the station. Low cost and construction simplicity are two of the most attractive features of this project. ■

References

1. National Semiconductor *Voltage Regulator Handbook*, 1980.
2. Anderson, J. R., "Direct Conversion Receiver Hum," in "Hints and Kinks," *QST*, August, 1981.
3. Other sources for the clock chips include: Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002 and Circuit Specialists, PO Box 3047, Scottsdale AZ 85257.

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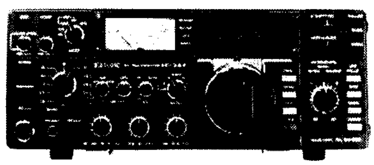

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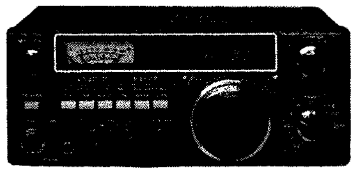

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The Magical Audio Filter

A variable-frequency notch filter plus a peaking circuit will do wonders for your reception. And this project will almost build itself.

Audio filtering is a well-known process for improving receiver selectivity and many articles have been written on the subject. Because I have been in the process of building a direct-conversion receiver, I have been most interested in the subject. However, in order to further improve the receiver, I wanted more than the usual passband type of filter. Since one of the receiver modes is CW, I wanted a notch filter with a variable frequency and a variable-frequency peaking circuit. The notch filter could also be used on SSB reception to reject heterodynes from AM stations. Some of the requirements that I wanted for the notch filter were:

- a high Q (so the bandwidth at the 3-dB point of the notch frequency was approximately 200 Hz with a rejection of greater than 20 dB)
- the capability of shifting the notch frequency from 500 to 3 kHz
- a minimum number of parts.

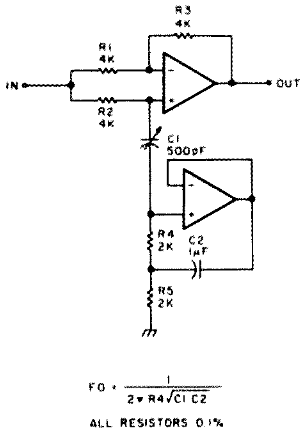

Fig. 1. Original circuit.

The Frequency-Notching Circuit

Most articles I'd seen on this subject showed at least three or four operational amplifiers plus a multitude of resistors and capacitors and therefore did not satisfy my third requirement.

One day, I accidentally ran across a number of circuits in a *National Semiconductor Linear Applications Manual.*[1] The circuit that interested me the most was the one providing variable frequency-notching using a variable capacitor. This circuit was constructed on a proto board and performed quite well, but the frequency range was limited by the maximum value of the capacitor. The basic circuit is shown in Fig. 1. The major drawback of this circuit was the large physical size of the capacitor as compared with the rest of the circuit.

Looking at the formula for the notch frequency (Fig. 1), one can see that the frequency is a function of R4, C1, and C2. The frequency varies directly as R4 and by the square root of C1 and

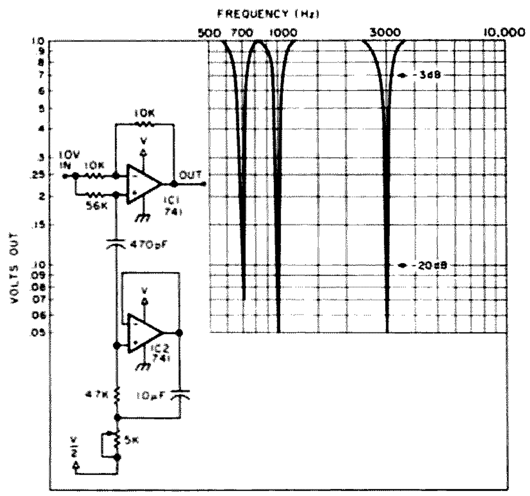

Fig. 2. Notch circuit.

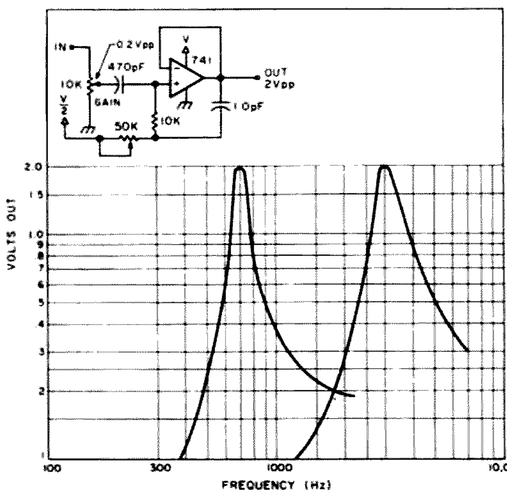

Fig. 3. Peaking circuit.

C2. Thus, if the resistor is doubled in value, the frequency doubles. Doubling the capacitors only gives 1.4 times the change. I decided to build the circuit with R4 variable and again results were very good. The frequency-range requirements were met and the rejection was greater than 20 dB. It did have one problem that was also experienced with the variable-capacitor circuit. In order to achieve maximum rejection at the high end vs. the low end, R3 had to be varied. Experimenting further, I found that if R5 were varied and R3 and R4 were properly chosen, only one control was necessary. Almost equal rejection could then be achieved across the whole range. A typical response is shown in Fig. 2.

The Peaking Circuit

Since the above circuit was rather novel (there is no signal inversion from input to output at the off null point), I started to look at voltages at various points with an oscilloscope. To my amazement, I found that when the output was going to null on IC1, the output was peaking on IC2. Eureka!—Here was the second circuit I was looking for. To accomplish peaking, only IC2 was needed. This circuit was constructed and the results are shown in Fig. 3. R_{in} is necessary to prevent saturation of the amplifier. The gain of this stage is about 10—therefore the input must be less than 0.5 volts. The power supply used was plus and minus 8 volts to be equivalent to the supply to be used in the final construction.

It will be noticed that there is an additional resistor that can be switched in or out in the final circuit. When the resistor is in, the peak is broadened and the circuit can be used on AM or SSB to modify the speech characteristics of the transmitted signal being received. It can reduce the low frequencies and accentuate the frequencies that transmit the spectrum that contains the most intelligence. It also reduces higher frequencies, thereby reducing background noise.

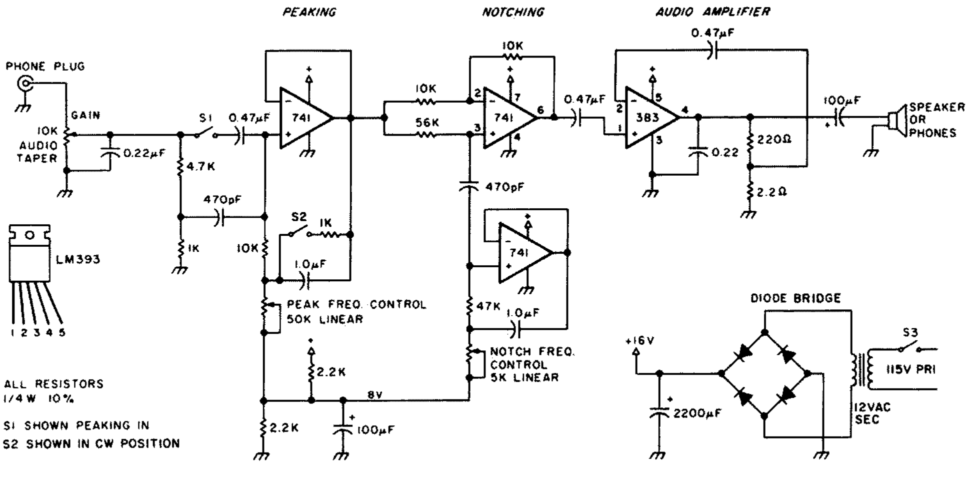

Fig. 4.

Combination Notch and Peaking Circuit

Fig. 4 shows the final circuit combining the two circuits. The circuit was constructed on a perfboard using wire-wrap sockets. The perfboard is mounted in a Radio Shack box with 1-inch spacers. Both the LM383 and the transformer are mounted to the box. One note of caution—the 0.22-uF capacitor on the output to ground on the LM383 should be mounted on the device terminals. The input cable, the output jack, and the 115-V-ac input all come in on one end of the box and the potentiometers mount on top.

For some reason, not many articles ever use perfboards and wire-wrap sockets. PC boards should be used for rf work, but the perfboard does very well for audio frequencies. The nice thing about wire-wrap circuits is that if you make a mistake, it can be corrected or modified easily. The following are some hints on building with a perfboard and wire-wrap sockets.

Parts List

Quantity	Part	R. S. part#
3	LM741	276-007
1	LM383	276-703
1	Phone plug	274-1536
1	Phone jack	274-252
1	50k linear pot	271-1716
1	10k audio taper pot	271-1723
1	5k linear pot	271-1714
2	470-pF capacitors	272-125
3	1.0-uF capacitors	272-996
2	100-uF capacitors	272-1016
2	0.22-uF capacitors	272-1070
1	2200-uF capacitor	272-1020
1	12-V-ac transformer	273-1505
3	8-pin DIP w-w sockets	276-1988
1	SPST switch pwr	275-602
2	SPST switches	271-612
1	Chassis box	270-238
1	Line cord	278-1255
3	Knobs	Your choice
1	Perfboard	276-1395
1 pkg	Push-in terminals	270-1392
1	Wire-wrap tool	276-1570
3	10k ¼-W resistors	
2	2.2k ¼-W resistors	
1	56k ¼-W resistor	
1	47k ¼-W resistor	
1	4.7k ¼-W resistor	
2	1k ¼-W resistors	
1	220-Ohm ¼-W resistor	
1	2.2-Ohm ¼-W resistor	
1	Bridge rectifier	276-1151
	Wire-wrap wire	Your choice of colors
	Misc. hardware	

1. Make a Xerox® copy of the schematic; every time you put in a wire, mark it down. This is especially helpful should you put the project away and come back to it later.

2. Using a marking pen on the wire side of the board, indicate which pin is #1 for the IC sockets. Remember that the numbering on the wire side is opposite to that on top.

3. I use model-airplane cement to hold the IC sockets in place. If you want to reuse the perfboard, this type of glue allows the socket to be easily removed.

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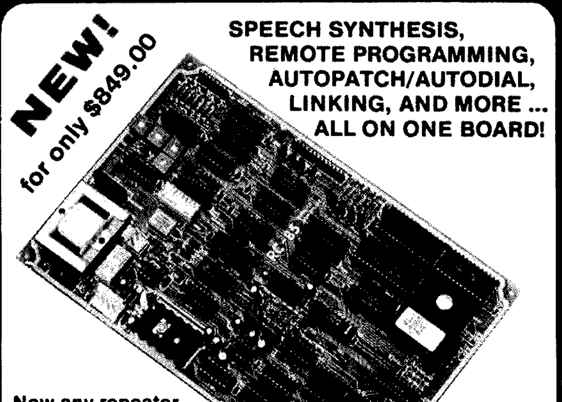

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Clean the board with acetone when the sockets are removed.

4. It is also helpful to use different colors of wire for different parts of the circuitry.

5. Push-in teminals (Radio Shack #270-1392) are used to mount the resistors and capacitors. The wire-wrap wires are soldered to these terminals on the wire side of the board. (A special tool is available to insert these terminals but is not available from Radio Shack. Long-nose pliers can be used but are nowhere near as satisfactory as the tool.)

6. Mount the components when the push-in terminals are in place so as not to lose track of which terminal goes with which component.

7. Wire-wrapping is done with a manual tool to conveniently allow interchanging of wire colors. If you have never used a wire-wrap tool, the operation is very simple. In learning, the best way is to measure the distance between the two points to be wired and add 1¼ inch if wire-wrap to wire-wrap, add 7/8 inch for wire-wrap to teminal, and add ½ inch for terminal to terminal. For good measure, add on about ½ inch so the wire will not be too tight. Strip both ends 5/8 inch for wire-wrapping and ¼ inch for terminals. Stripping is done with a special tool provided with the wire-wrap tool. The bare wire is inserted into the end of the wire-wrap tool with the wire entering the smallest hole on the end of the tool. Place the tool over the terminal post to be wrapped and rotate the tool in a clockwise direction for about ten turns. The connection is now made. If you make a mistake, a tool is available to rotate in the opposite direction to remove the wire.

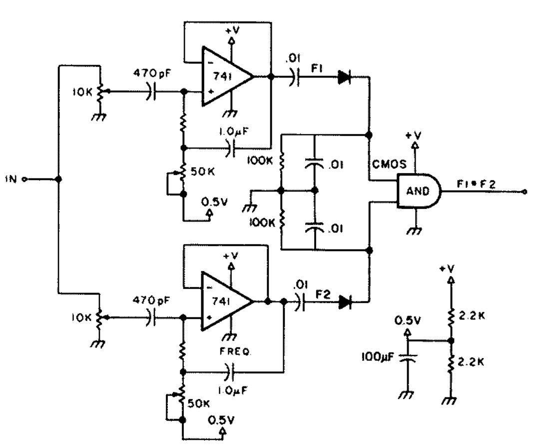

Fig. 5. Another application for peaking-circuit decoder.

Circuit Operation

When the project is finished, the input cable can be plugged into the phone jack of any receiver and the output to either a speaker or headphones. Set S1, the peaking-circuit switch, to OUT. Tune in a CW signal and adjust the signal frequency to give about an 800-Hz tone. Throw S1 to IN and turn the peaking control to a point where the maximum audio is heard. The first thing you will notice with the peaking switch in is the reduction in noise. As you approach the peaking point, the signal will increase greatly in volume. Of course, if some other frequency suits you better than 800 Hz, that is the listener's choice.

The next thing to check is the notch filter. With the 800-Hz signal coming in, adjust the notch control to a point where the signal drops in volume. On some CW signals with key clicks and thumps, the 800-Hz signal will drop out but the clicks and thumps will still be there. I have found that it is easier to remove a heterodyne with the peaking circuit out; then bring in the peaking circuit, producing an even greater reduction in the interfering signal. When the notch circuit is not used, the pot should be set to the low-frequency end.

Frequency-Selection Circuit

Another circuit is shown in Fig. 5. Although I have not tried this circuit, it could be of interest. I have tried LM567s in frequency-selective circuits, but noise spikes seem to get through, creating an unwanted output signal. A case in point is my garage-door opener. This unit had a vibrating-reed type of frequency detector and I replaced it with a pair of LM567s. Every once in awhile the door will open without a command due to noise. After I finish this project, reworking the opener will be my next project.

Conclusion

The peaking/notching circuit should be a worthwhile addition to any receiver for a parts cost of about $35 excluding the wire-wrap tool and wire that can be used on many other projects. It is a simple but effective way to gain a bit more selectivity that should improve any old receiver and maybe some of the newer ones.

A list of parts is given with all but one being available from Radio Shack. Of course, most hams will have many of these parts available in their junk boxes, bringing the overall cost down. ■

References

1. *National Semiconductor Linear Applications Manual*, January, 1972, page AN 31-14.

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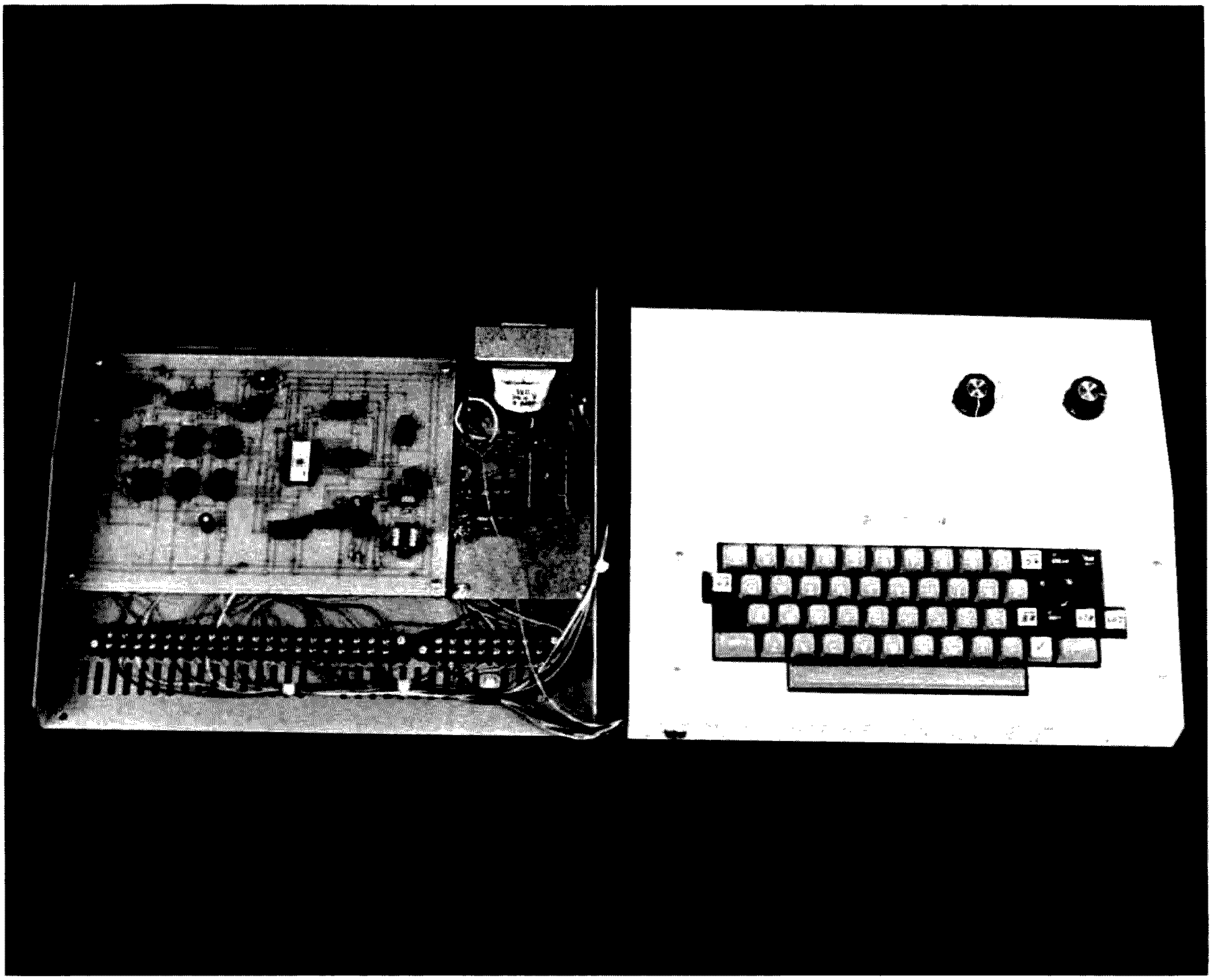
Keyboard Your Way to Happiness

If happiness is perfect Morse, then this project is pure heaven. Special construction tips make putting it together as much fun as using it.



Sending Morse code accurately and at relatively high speeds has been made possible with the advent of the Morse keyboard. Perfect Morse code with perfect spacing is possible with a Morse keyboard with a buffer memory. Many of the physical limitations that are encountered while using other manual keying methods have been overcome by the Morse keyboard. The Morse keyboard has become a valuable instrument for sending Morse code and will continue to play an important role in communications.

This article will describe a Morse keyboard with a 192-character buffer memory. It will send perfect Morse code with perfect spacing as long as the operator stays ahead of the outgoing code. If the Morse-code operator tends to fall behind, the spacing may become erratic, but the Morse code itself will not be affected.

The Morse keyboard is made up of an ASCII communications keyboard, a buffer memory, and an ASCII6-to-Morse converter. The 192-character buffer memory allows the operator to type as many as 192 characters and word spaces ahead of the outgoing Morse code. An experienced operator may type ahead and then take time out to fill out the log book while the Morse code is being sent out.

The Morse keyboard may also be used as a code-practice device, allowing a person who does not already know the Morse code to send perfect code to a student who is learning the code.

I have been using the Morse keyboard at speeds of up to 40 words per minute on the ham bands and have checked the Morse-code waveforms on an oscilloscope at much higher speeds. The waveforms indicate that the Morse keyboard is working satisfactorily at speeds well over 80 words per minute.

ASCII Keyboard

The ASCII keyboard is an ASR-33, 53-key, data-communications type of keyboard. There are several manufacturers who make this type of keyboard. A microcomputer may also be used as an ASCII signal source.

I am using 26 letters, 10 numbers, 4 punctuation marks, and the special Morse-code characters AS (wait), BK (break), AR (end of message), and SK (end of transmission) for a total of 44 Morse-code characters. All of the characters for this particular Morse keyboard are arranged for the lowercase position on the keyboard and some of the keytops have been rearranged so that all of the characters are readily available without having to use the keyboard shift keys. The question mark, which is normally an uppercase character, has been moved to a lowercase position on the keyboard. Some of the special Morse-code characters do not have an ASCII equivalent, but have been substituted for other unused characters.

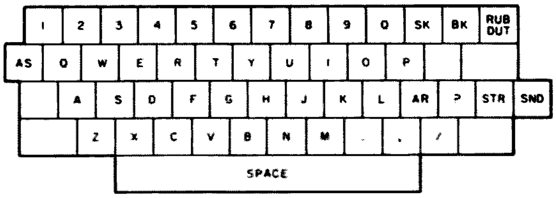


Fig. 1. The N7AGK ASR-33 Morse keyboard layout

A strobe or keypunch pulse is supplied by the ASCII keyboard each time a character key is pressed and is used to enter data into the buffer memory. This arrangement allows the operator to type at an uneven rate and to enter data into the buffer memory whenever a key is pressed.

Fig. 1 shows the keyboard layout for the Morse keyboard. Most ASCII keyboards have been designed so that the keytops may be easily removed and placed in a different location on the keyboard. Keytops are available that have special titles.

Buffer Memory

Fig. 2 is a schematic of the buffer memory. The buffer memory is a type of digital storage system which allows the Morse-keyboard operator to enter data at different rates or to store data in the buffer memory until needed. Data will remain stored in the buffer memory as long as power to the buffer memory is not interrupted.

The 192-character buffer memory is made up of 3 pairs of 3341 first-in/first-out shift registers. Each pair will handle 64 ASCII6 characters. (The Morse keyboard uses only 6 bits of the ASCII data from the ASCII keyboard.) Each 3341 FIFO shift register handles 4 bits of information in a 64-by-4 configuration. The buffer memory accepts parallel

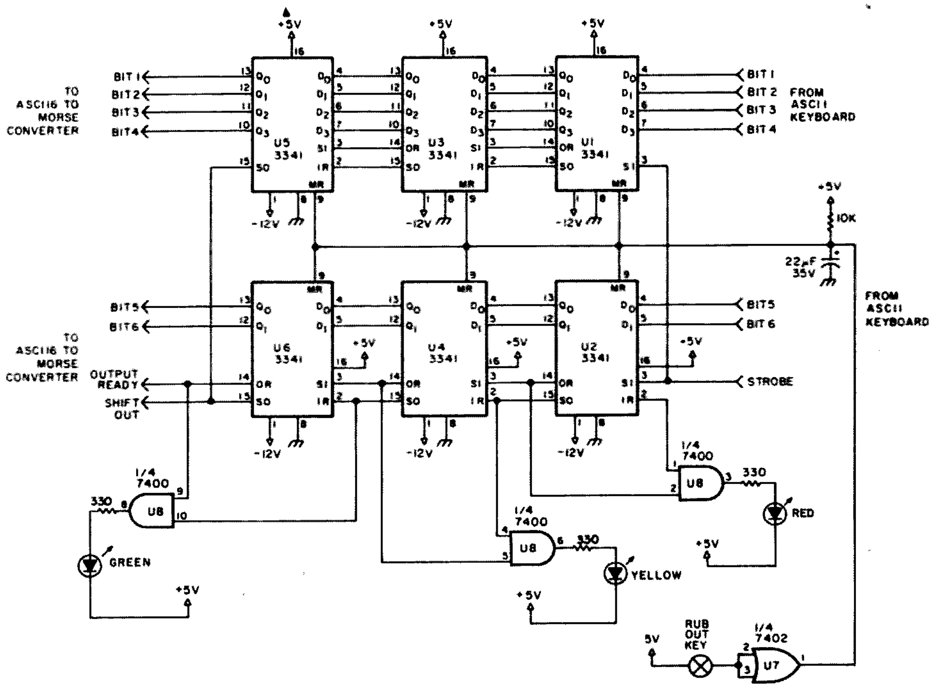


Fig. 2. 192-character buffer memory.

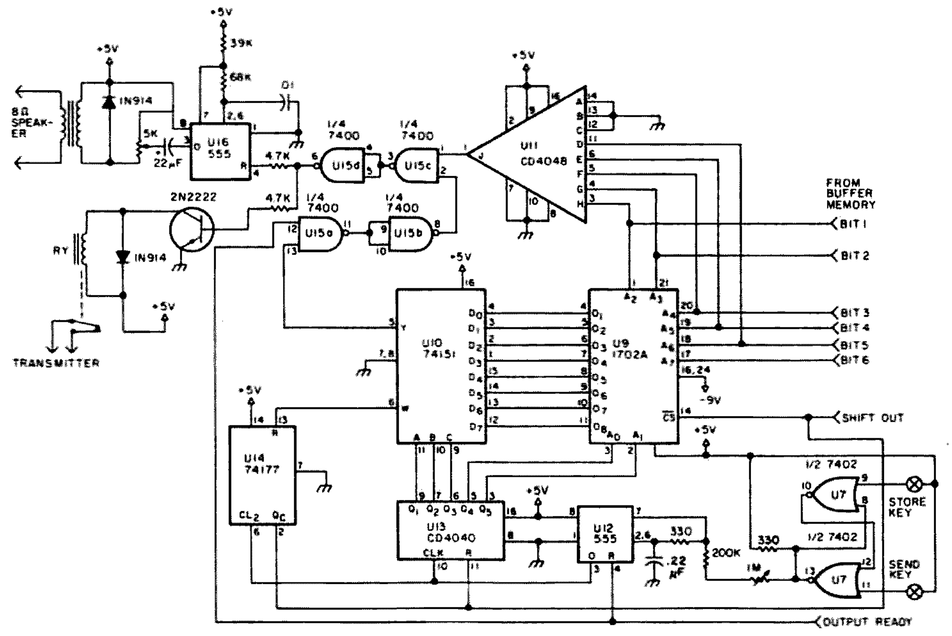


Fig. 3. ASCII6-to-Morse converter.

data only from the ASCII keyboard.

The 3341 FIFO has separate input and output data terminals and has separate input and output clock circuits that can operate at different clock rates. The input clock pulse is called a shift-in pulse and the output clock pulse is called a shift-out pulse. The shift-in pulse is the ASCII keyboard strobe or keypunch pulse which allows data to be entered into the buffer memory whenever a key is pressed. The shift-out pulse is supplied by a Morse-code character-space circuit in the ASCII6-to-Morse converter and will be described in detail later in the article.

The buffer memory may be thought of as a pipe which will hold up to 192 marbles. The shift-in rate is the rate at which marbles are placed in the pipe. The shift-out rate is the rate at which marbles are removed from the pipe. If marbles are not added to the pipe, but are removed, the pipe will become empty after a period of time. If marbles are entered and removed from the pipe at the same time and at the correct rates, a continual supply of marbles will be present in the pipe.

Too short a buffer memory may require a Morse-code operator to stop and wait during an inconvenient part of the Morse-code transmission or may cause the operator to stop and wait in the middle of a sentence, thereby interrupting his chain of thought. A large buffer memory will allow the Morse-code operator to type in a larger portion of a message without having to stop and wait as often.

The buffer memory has 3 functions available which are controlled by 3 function keys on the ASCII keyboard. A Store key allows the operator to enter data into the buffer memory without data being removed. A Send key allows the operator to remove data from the buffer memory. Data may be removed from the buffer memory while data is being entered. A Rub Out key is used as a master reset for the buffer memory and erases any information stored in the buffer memory when pressed.

The function keys supply +5 V when pressed and supply zero or ground potential when not pressed. The Send key and Store key supply signals to a simple flip-flop circuit which ensures that either one or the other function is operating at any given time, but that they are not operating simultaneously. The simple flip-flop circuit is half of U7 or 2 NOR gates of a quad 7402 NOR gate. When the Store function is operating, the ASCII6-to-Morse converter clock generator, U12, is shut off. During this function, data is prevented from leaving the buffer memory.

During the Send mode, the clock generator is allowed to operate, thus allowing data to be shifted out of the buffer memory.

There is an LED indicator light for each pair of 3341 FIFO shift registers. These indicator lights are used as warning or indicator lights for the convenience of the Morse-keyboard operator. I chose a green LED for the first pair of 3341s, a yellow LED for the second pair, and a red LED for the third pair. The red LED blinks whenever a character is typed and acts as a warning that the buffer memory is close to being full. The green LED is lit when there are between one and 64 characters in the buffer memory. The yellow LED is lit when there are between 64 and 128 characters in the buffer memory. The red LED is lit when there are between 128 and 192 characters in the buffer memory. If the buffer memory is empty, none of the LED indicator lights will be lit. The LED indicator lights are positioned on the Morse keyboard so that they may be easily observed by the Morse-keyboard operator.

ASCII Keyboard	Buffer Memory ASCII6 Characters					1702A Memory Circuit			74151 Demultiplexer	
	3	Z	8	E	B	Address	Output		Input	Output
Bit 6	1	0	1	0	0	A7	01	1	A	W
5	1	1	1	0	0	A6	02	1	B	
4	0	1	1	0	0	A5	03	1	C	
3	0	0	0	1	0	A4	04	0	D	⟶
2	1	1	0	0	1	A3	05	1	E	00011101
1	1	0	0	1	0	A2	06	0	F	Letter A
	Parallel ASCII6 Data						07	0	G	Serial
	Flow of Data						08	0	H	Morse
	⟶						Letter N			Code
							Parallel			
							Morse Code			

Fig. 4. Flow of data from the ASCII keyboard to the 74151 demultiplexer output.

The Rub Out key is a function of the ASCII keyboard and is used when the Morse-keyboard operator desires to erase all of the information that is in the buffer memory. One-fourth of a quad 7402 NOR gate is used as an inverter. The master-reset voltage is zero. The master-reset line is held at +5 V by a 10k resistor and will not reset until a zero-volt level is received from the 7402 NOR gate inverter.

A 22-microfarad electrolytic capacitor from the master-reset line to ground ensures that the master reset has reset the buffer memory when the Morse keyboard is first turned on. If the capacitor was not there, the buffer memory could contain some unwanted information when the power is first turned on.

ASCII6-to-Morse Converter

The ASCII6-to-Morse converter portion of the Morse keyboard (Fig. 3) is made up of circuitry that converts the ASCII6 data from the buffer memory to usable Morse code. The ASCII6-to-Morse converter contains a memory circuit that is used as a code converter, a space-bar-operated word-space circuit, an automatic character-space circuit, a clock generator, a divider circuit, a sidetone generator, and output circuitry for operating the keying relay.

1702A Memory Circuit

A 1702A EPROM (erasable programmable memory), U9, is used as an ASCII6-to-Morse converter and converts the data from the buffer memory to Morse code. The 1702A has a total of 2048 storage locations and has an overall configuration of 256 by 8. This means that there are 256 address locations with 8 parallel outputs for each address location.

Signal source		Address Inputs	
	Q1	A	74151
CD4040	Q2	B	Demultiplexer
Address	Q3	C	
Divider	Q4	A0	
	Q5	A1	
	Bit 1	A2	
ASCII6	2	A3	1702A
From	3	A4	Memory circuit
Buffer	4	A5	
Memory	5	A6	
	6	A7	

Table 1. Address and divider information.

I have chosen 4 groups of 8 outputs for a total of 32 storage locations for each Morse-code character. This arrangement allows room for up to 62 Morse-code characters and a word space in the 1702A memory circuit.

The ASCII6 data addresses the 1702A for the desired Morse-code character. (The ASCII keyboard will supply 8 bits of information for each character, but with the Morse keyboard, only the ASCII6 or bits 1 through 6 are used.) The ASCII6 data addresses the 1702A memory circuit so that a respective 32-baud storage section of the memory circuit is selected for the desired character.

The 1702A memory circuit is programmed so that each storage location is equivalent to one baud. The Morse-code characters are broken down so that a dot is one baud in length and is programmed into the memory circuit as a 1; a dash is 3 bauds in length and is programmed as 3 ones in a row. A character space is 3 zeroes in a row. A space between dots and dashes is 1 zero. A word space is 7 zeroes in a row and will be handled in a special way in the ASCII6-to-Morse converter circuitry. (The 1702A memory circuit normally contains all zeroes until programmed.)

None of the Morse-code characters uses all of the 32 bauds or 32 storage locations assigned to them. The shortest Morse-code character, the letter E, uses 1 baud for the code character plus 3 bauds for the character space for a total of 4 bauds. The longest Morse-code character used in the Morse keyboard is the number zero. It uses 19 bauds or storage locations for the Morse-code character plus 3 bauds for the character space for a total of 22 bauds or storage locations in the memory circuit.

74151 Demultiplexer

The output of the 1702A memory circuit is in an 8-bit parallel form and must be converted to a serial form in order to key a transmitter properly. The parallel information from the 1702A memory circuit is converted to serial information with a 74151 demultiplexer integrated circuit, U10. The 74151 demultiplexer uses 3 binary address signals to assist in converting from the 8 parallel inputs to the serial outputs. Output Y is inverted.

Fig. 4 shows a flow of the data from the ASCII keyboard to the output of the 74151 demultiplexer. Some examples of code characters are shown in the buffer memory and at the output of the 1702A and 74151.

Character-Space and Shift-Out-Pulse Circuit

The ASCII6-to-Morse converter circuitry is designed so that it will accept the Morse-code information for each Morse-code character plus 3 zeroes at the end of the character for a character space. If there are more than 3 zeroes at the end of a character, the character-space circuitry will accept the first 3 zeroes and then proceed to the next Morse-code character, ignoring the remaining zeroes. In the memory circuit, a letter E, for example, will be followed by 31 zeroes, but the character-space circuitry will accept only the first 3 and ignore the remaining 28 zeroes.

The 74177 character-space-divider circuit, U14, is connected so that it will accept 3 zeroes in a row and then supply a very short duration shift-out pulse to the buffer memory. The shift-out pulse initiates the start of the next Morse-code character or word space and also resets the 1702A memory circuit and a CD4040 address-divider circuit, U13. When the memory circuit and divider circuit have been reset, the ASCII6-to-Morse converter circuitry is ready to accept the next ASCII6 character from the buffer memory. The reset and shift-out pulse from the 74177 character-space divider is extremely short in duration. It will not interfere with the timing of the first baud of the next Morse-code character.

The character-space divider is reset every time a dot or dash is received from the 74151 demultiplexer. The Morse-keyboard clock-generator signal is fed into the input of the character-space divider. When 3 zeroes in a row are present at the reset input of the character-space circuit, a pulse is then present at the divider output, Qc, which is the buffer-memory shift-out pulse and also the reset pulse for the CD4040 address divider and the 1702A memory circuit. As soon as the shift-out pulse is generated, a new ASCII6 character is shifted out of the buffer memory and presented to the 1702A memory cir-

	Address	Output
A	00000100	10111000
B	00001000	11101010
	00001001	10000000
C	00001100	11101011
	00001101	10100000
D	00010000	11101010
E	00010100	10000000
F	00011000	10101110
	00011001	10000000
G	00011100	11101110
	00011101	10000000
H	00100000	10101010
I	00100100	10100000
J	00101000	10111011
	00101001	10111000
K	00101100	11101011
	00101101	10000000
L	00110000	10111010
	00110001	10000000
M	00110100	11101110
N	00111000	11101000
O	00111100	11101110
	00111101	11100000
P	01000000	10111011
	01000001	10100000
Q	01000100	11101110
	01000101	10111000
R	01001000	10111010
S	01001100	10101000
T	01010000	11100000
U	01010100	10101110
V	01011000	10101011
	01011001	10000000
W	01011100	10111011
	01011101	10000000
X	01100000	11101010
	01100001	11100000
Y	01100100	11101011
	01100101	10111000
Z	01101000	11101110
	01101001	10100000
AS	01101100	10111010
	01101101	10100000
,	10110000	11101110
	10110001	10101110
	10110010	11100000
BK	10110100	11101010
	10110101	10111010
	10110110	11100000
.	10111000	10111010
	10111001	11101011
	10111010	10000000
/	10111100	11101010
	10111101	11101000
Word Space		
	10000000	10000000
0	11000000	11101110
	11000001	11101110
	11000010	11100000
1	11000100	10111011
	11000101	10111011
	11000110	10000000
2	11001000	10101110
	11001001	11101110
3	11001100	10101011
	11001101	10111000
4	11010000	10101010
	11010001	11100000
5	11010100	10101010
	11010101	10000000
6	11011000	11101010
	11011001	10100000
7	11011100	11101110
	11011101	10101000
8	11100000	11101110
	11100001	11101010
9	11100100	11101110
	11100101	11101110
	11100110	10000000
SK	11101000	10101011
	11101001	10101110
AR	11101100	10111010
	11101101	11101000
?	11111100	10101110
	11111101	11101010

Table 2. 1702A programming truth table.

cuit which in turn is routed through the 74151 as a Morse-code character and resets the 74177 character-space divider. The 74177 character-space divider does not have a chance to generate a very long duration pulse because of the quick action of the 1702A memory circuit and the 74151 demultiplexer.

Clock Generator and Address Divider

The ASCII6-to-Morse converter uses a 555 timer as a clock generator (U12). The clock generator operates at 2 times the bit rate of the Morse code. The clock generator is varied in frequency in order to vary the speed of the outgoing Morse code. The clock-generator signal is fed to the 74177 character-space divider and a CD4040 binary address divider, U13.

The ASCII6 data from the buffer memory addresses the 1702A memory circuit for the respective 32-baud storage section assigned the Morse-code character. However, additional addressing is needed to break down the Morse-code signals to the 8 parallel outputs of the 1702A memory circuit and to further break down the signal to a serial form in the 74151 demultiplexer. The additional binary addressing is supplied by the CD4040 divider circuit. Table 1 shows a breakdown of the signal sources and address locations. Q1, Q2, and Q3 are binary signals used to address the 74151 demultiplexer; U10 and Q4 and Q5 outputs are address signals for the 1702A memory circuit.

1702A Programming Information

Table 2 is the truth table for programming the 1702A EPROM. The address and output information for the 1702A memory circuit is shown in binary form for simplicity. There are 8 address bits. The first 6 address bits are the ASCII6 data and the last 2 bits are needed to break down the information in the 32-baud storage sections into the 8 parallel outputs of the 1702A memory circuit. Of the 8 address bits, the first 6 bits reading from left to right are bit 6, bit 5, bit 4, bit 3, bit 2, and bit 1 of the ASCII6 data. The 7th address bit, reading from left to right, corresponds to the Q5 output of the CD4040 address divider and the 8th bit corresponds to Q4. The address inputs of the 1702A memory circuit, reading from left to right, are A7, A6, A5, A4, A3, A2, A1, and A0.

The address for the letter A will be 00000100. The letter B, which is more than 8 bauds in length, will have 2 addresses. They are 00001000 and 00001001. Note that bit 8 of the address has changed. The output programming of the 1702A memory circuit will be 11101010 and 10000000. Note that the first 3 bauds are a dash. Bauds 5, 7, and 1 of the next group are dots. They make up the dash and 3 dots of the letter B. Longer Morse-code characters such as the number zero will take 3 sets of addresses for the programming of the memory circuit.

The 1702A memory circuit is normally all zeroes before programming. The memory circuit need only be programmed for 1s. A special programmer must be used with the 1702A EPROM and the memory circuit may be erased with ultraviolet light and programmed again if desired.

CD4048 Word-Space Gate

The Morse keyboard uses an ASCII-keyboard space-bar-operated word space that is handled in much the same way as a regular Morse-code character. The one big difference is that it is silent at the output of the Morse keyboard. The word space must be 7 bauds in length and must work correctly with the 74177 character-space divider.

The ASCII6 code for a word space is 100000. It is the only ASCII6 character that has zeroes for bit 5, bit 4, bit 3, bit 2, and bit 1. There is an ASCII6 blank that has all zeroes, but it is not used with the Morse keyboard. The 1702A programming address for the word space is 10000000. An E is programmed into the 1702A for a word space and is shown as 10000000 also.

An 8-input expandable gate is used as the word-space gate and is connected as an 8-input OR gate. 3 of the inputs to the OR gate are grounded and the other 5 inputs are connected to bit 5, bit 4, bit 3, bit 2, and bit 1. If any input of the CD4048 OR gate is receiving a 1, the output will show a 1. If all of the inputs are zero, then the output will be zero. If there is a zero at the output of the CD4048

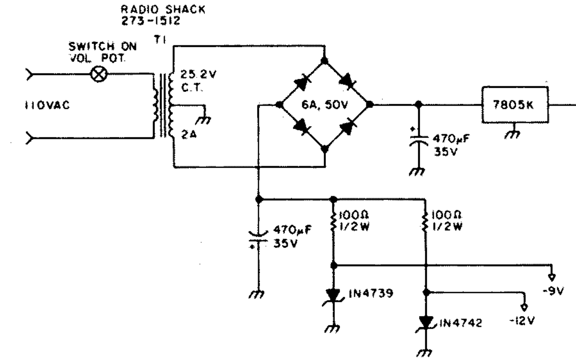


Fig. 5. Power supply schematic.

word-space OR gate, the output circuitry of the ASCII6-to-Morse converter will be silenced. There will be a silent E present at the output of the Morse keyboard which is 4 bauds long. When added to the 3 zeroes of the previous character space, there will be a total of 7 silent bauds, which is the length of a word space. Since the word space is treated much the same as an ASCII6 character, it will be treated like one in the buffer memory.

Output Gates

In the output circuitry of the ASCII6-to-Morse converter, there are 4 NAND gates, designated U15A, U15B, U15C, and U15D. U15B and U15D are connected as inverters.

U15A is connected as a NAND gate and combines the output-ready signal from the buffer memory and the serial-output signal from the 74151 demultiplexer, U10. The output-ready signal also resets the 555 clock generator, U12. The output-ready signal is used to synchronize the buffer-memory output signals and the clock generator. Without the synchronizing of the signals, it would be possible to miss a part of the first baud of the Morse-code character.

U15C is also connected as a NAND gate and combines the output of the word-space gate with the signal from U15B and determines whether the output will be silenced for a word space or enabled for a regular Morse-code character.

U15D is an inverter and a buffer for the output signal.

Sidetone Generator

A 555 timer, U16, is connected as a sidetone generator for monitoring the outgoing Morse code. It generates an audio tone and is keyed by the signal from U15D. The sidetone generator has an output transformer with an output for an 8-Ohm speaker or 8-Ohm headphones. The frequency of the sidetone generator is approximately 800 Hertz. The sidetone generator has a volume control. The volume may be turned up when using a speaker and turned down if headphones are used. The 1N914 diode across the primary of the output transformer furnishes a more pleasant tone at the output of the sidetone generator.

Keying Relay

I am using a Radio Shack #275-215, double-pole double-throw miniature plug-in relay for the transmitter keying relay. It is a 5-volt relay with a 50-Ohm relay coil. I bent the relay contacts closer together to improve the response time of the relay. A 2N2222 transistor amplifier is used as a relay driver. The relay plugs into a regular 16-pin DIP socket.

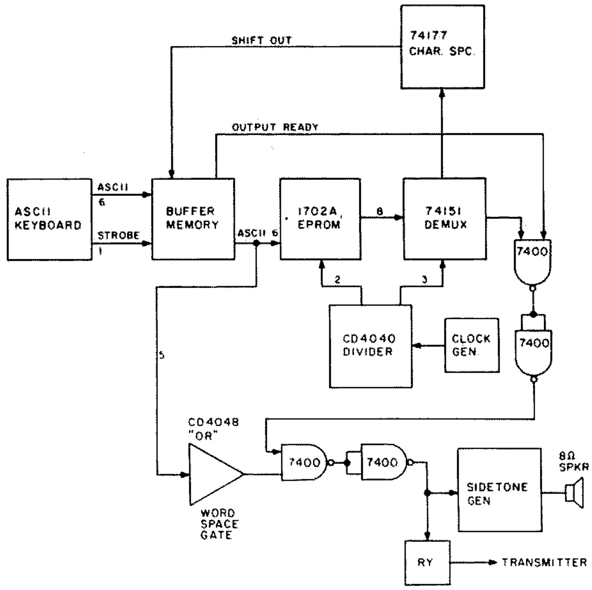


Fig. 6. N7AGK Morse keyboard block diagram.

Power Supply

Fig. 5 is a schematic of the Morse-keyboard power supply. It supplies 5 volts at approximately 1 Ampere, minus 9 volts at approximately 25 milliamperes and minus 12 volts at approximately 25 milliamperes. A Radio Shack #276-1363 power transformer is used for the low-voltage power source. The secondary winding of the transformer supplies 25.2 volts at 2 Amperes. A bridge rectifier is connected so that one side of the rectifier supplies the plus voltage in reference to the transformer center tap and the other side of the rectifier supplies a minus voltage in reference to the center tap. The plus side goes to a 5-volt regulator and the minus 9 volts and the minus 12 volts are taken from zener-diode circuits. The transformer center tap is at ground potential. The 1702A memory circuit uses plus 5 volts and minus 9 volts. The 3341 first-in/first-out shift register uses plus 5 volts and minus 12 volts. All of the other circuits just require plus 5 volts. A good heat sink must be used with the 5-volt regulator to prevent overheating of the regulator.

Operating Instructions

The Morse keyboard has been designed to send perfect Morse code with perfect spacing. It has a buffer memory which allows the Morse-code operator to type up to 192 characters ahead of the outgoing Morse code. The buffer memory will store the characters until they are needed. If the operator presses the Store key, he may store a small message and then send it out when the Send key is pressed. The message will be stored in the buffer memory as long as power is supplied to the Morse keyboard. I have stored a message overnight and then listened to it in the morning when I pressed the Send key.

The buffer memory also allows the Morse-code operator to type at an uneven rate and to stop at certain intervals if desired. If the Morse-code operator pauses too long, he may find that the buffer memory has emptied of information and there will be uneven spacing of the Morse-code characters until he has gained a head start on the outgoing Morse code again.

A message or transmis-

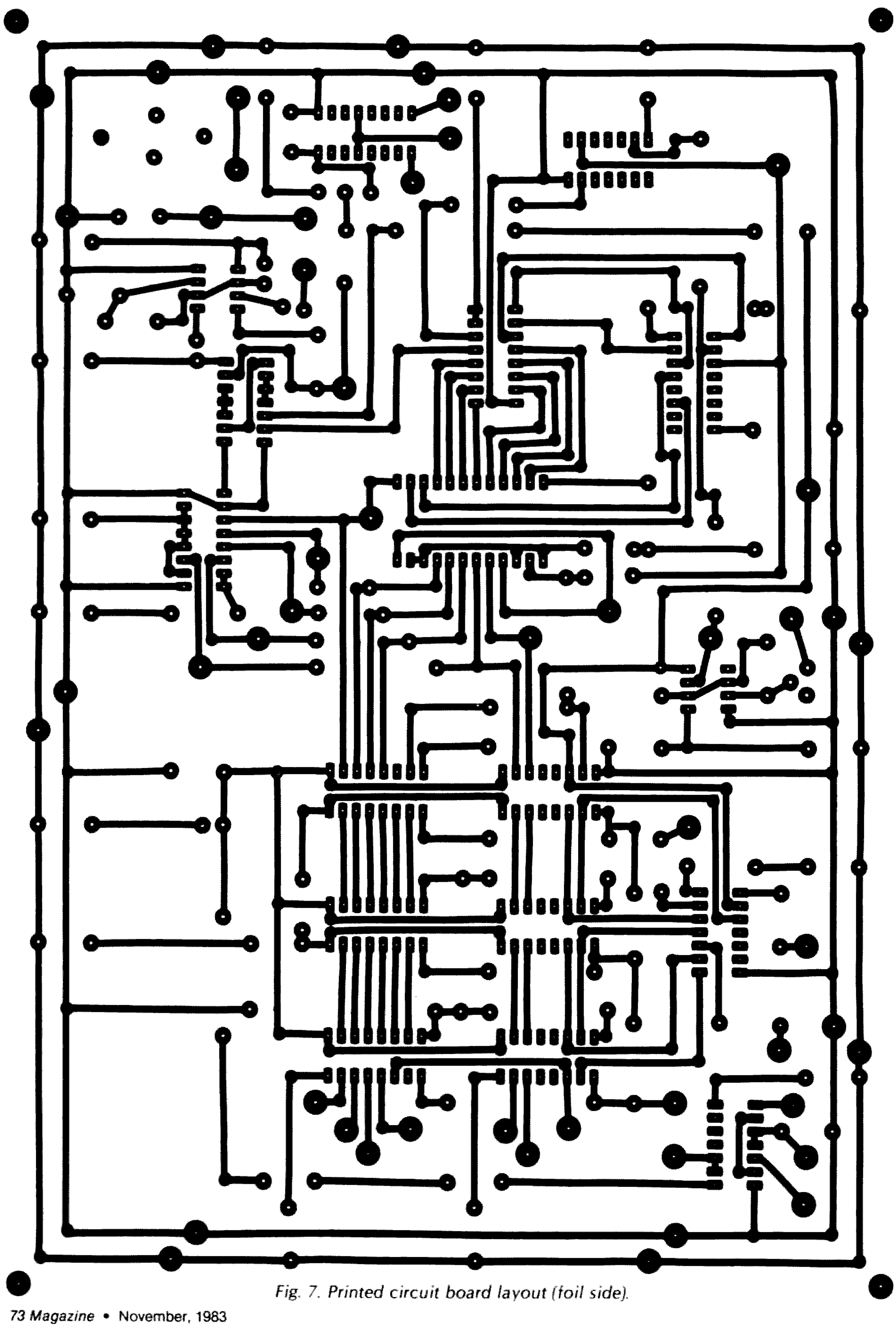


Fig. 7. Printed circuit board layout (foil side).

sion should always be started with at least one word space. If the operator desires to get a good head start on the Morse keyboard, he may need to press several word spaces in rapid succession. If the Morse-code operator desires to store a message, he should start with a word space. If a message is started with a character instead of a word space while in the Store mode, the operator will hear a steady tone. The steady tone may be used to tune the transmitter. To stop the steady tone, press the Rub Out key or the Send key.

Sometimes it is convenient to type part of a message into the buffer memory while receiving Morse code from the other station being worked.

At first, some people may become confused when hearing the Morse code going out after they had previously typed it into the Morse keyboard. The Morse keyboard has a sidetone generator for monitoring the outgoing Morse code, but not for monitoring the code before it enters the buffer memory. It would be almost impossible to monitor the Morse code as it is being typed into the Morse keyboard. It would not be practical to use the extra circuitry that it would require to do it. After a little practice, the Morse-code operator will find that it is very easy to type a message correctly while monitoring

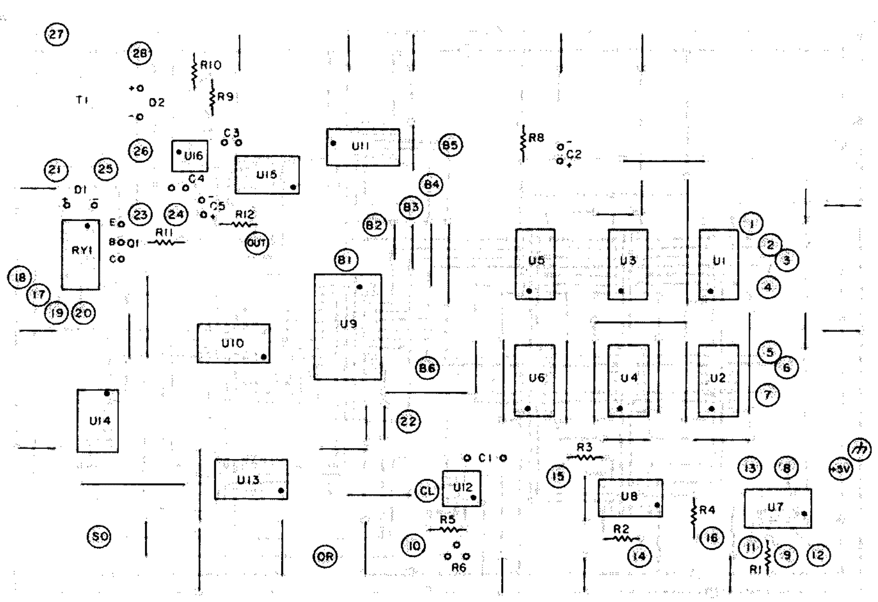


Fig. 8. Component layout.

PRINTED CIRCUIT BOARD ASSEMBLY

The printed circuit for the N7AGK Morse keyboard has been laid out on a 7-inch by 10-inch single-sided printed circuit board. The printed circuit layout has been especially arranged for ease of assembly. All external wiring connections to the printed circuit are made with push-in terminals.

All jumpers, sockets, terminals, and parts are shown on the printed circuit parts drawing. The drawing shows the parts side of the printed circuit board which is opposite the foil side.

The jumpers should be installed and soldered first. The jumper wire is pre-tinned, 24-gauge, copper bus wire. The jumper wires are shown as dark lines on the parts-side printed circuit drawing.

The resistors and diodes should be installed and soldered next.

Sockets are recommended for the integrated circuits and the keying relay. The sockets must be installed so that the notch end corresponds to the black dot on the parts-side printed circuit drawing. Extreme care must be taken when soldering sockets to prevent bridging across of the solder. A low-power solder iron and good quality, small-diameter, rosin-core solder is recommended. Do not overheat the solder connections and do not use excessive amounts of solder for the solder connections.

When installing C2 and C5, be sure to watch for correct polarity.

Install the 2N2222 keying driver transistor with approximately 3/8 inch of the transistor lead remaining between the transistor and the solder connection. Be careful not to use excessive heat when soldering the transistor leads to the printed circuit.

The black lead of T1 is not used. It may be clipped off if desired.

Install the push-in terminals as shown on the printed circuit drawing. Install output transformer T1 and solder the leads to their respective push-in terminals as shown in Printed Circuit Board Terminal Connections for connections 25, 26, 27, and 28.

Install and solder C4, C3, C1, and R6. (This should complete the printed circuit board assembly.)

Check the assembled printed circuit board carefully before attempting to use the circuit board in your Morse keyboard.

PRINTED CIRCUIT BOARD TEST TERMINALS

B1, B2, B3, B4, B5, and B6 are the ASCII information bits coming from the output of the buffer memory and going into the 1702A EPROM, U9, and the CD4048 word-space OR gate, U11.

SO is the shift-out pulse line from the 74177 character-space divider, U14. The shift-out pulse initiates the presentation of the next ASCII6 character from the buffer memory. It may be used as an external sync trigger pulse when viewing the outgoing Morse code on an oscilloscope.

OR is an output-ready signal line from the buffer memory. It resets the clock generator and ensures that the outgoing Morse code is in sync with the clock generator.

CL is the clock-generator output. It has a pulse rate that is 2 times the baud rate of the outgoing Morse code.

OUT is the outgoing Morse-code test point.

The ground and +5-volt connections for the ASCII keyboard may be taken from the extra terminals shown at the right of the parts-side drawing.

PRINTED CIRCUIT BOARD TERMINAL CONNECTIONS

The N7AGK ASCII6-to-Morse converter printed circuit board uses small push-in terminals (Radio Shack 270-1394) for all external connections and test points. They are inserted from the parts side of the printed circuit board and soldered in place. When wiring to the printed circuit board, all connections should be made on the foil side.

Connections 1, 2, 3, 4, 5, and 6 are the ASCII6 bit connections from the ASCII keyboard. Bit 1 is pin 7 on the ASCII keyboard. Bit 2 is pin 6, bit 3 is pin 5, bit 4 is pin 4, bit 5 is pin 11, and bit 6 is pin 10. (See the Keytronic data sheets.)

Connection 7 is a strobe- or keypunch-pulse connection to the ASCII keyboard. It is connected to pin 12 on the ASCII keyboard.

Connection 8 is Rub Out and is connected to the Here Is key, pin K on the ASCII keyboard.

Connection 9 is to the speed potentiometer counterclockwise terminal (looking from the bottom).

Connection 10 is to the center terminal of the speed potentiometer.

Connection 11 is Store and is connected to the Rept key, pin H on the ASCII keyboard.

Connection 12 is Send and is connected to the Break key, pin J on the ASCII keyboard.

Connection 13 is −12 volts and comes from the power supply.

Connection 14 is a connection to the green LED buffer memory indicator light. The connection is made to the negative side or flatted side of the LED. The positive lead of the LED goes to +5 volts.

Connection 15 goes to the negative side of the yellow LED.

Connection 16 goes to the negative side of the red LED.

Connection 17 is +5 volts from the power supply.

Connection 18 is to ground.

Connections 19 and 20 are the relay contacts for keying the transmitter. Connection 19 goes to the ground connection of the keying jack at the rear of the Morse-keyboard cabinet and connection 20 goes to the other connection of the keying jack. The keying jack is a standard phone jack.

Connection 21 goes to the phone or speaker jack on the front of the Morse keyboard. The other connection is grounded.

Connection 22 is −9 volts from the power supply.

Connection 23 is the counterclockwise connection to the volume potentiometer (looking from the bottom).

Connection 24 is the center connection to the volume pot. The remaining connection on the volume pot goes to +5 volts.

Connection 25 is for the red wire from T1. Connection 26 is for the green wire from T1. Connection 27 is for the white wire from T1. Connection 28 is for the blue wire from T1.

the outgoing code. An error in typing is easily recognized by the Morse-code operator and may be corrected by hitting the word-space bar and then sending a question mark and then hitting the word-space bar again and then sending the word or characters again correctly.

The Morse keyboard is an excellent device for learning the Morse code or for increasing one's code speed. A portion of a Morse-code practice transmission may be copied on the Morse keyboard by pressing the Store key and copying the Morse code and then playing the Morse code back at a slower speed by adjusting the speed control and pressing the Send key. The Morse code is played back at a slower speed to check for accuracy of receiving the practice transmission.

Another person who does not know the Morse code himself may type characters into the Morse keyboard and send them at a speed that is comfortable for a person learning the Morse code. The Morse-code speed may be set for a certain speed and the characters spaced for several seconds if desired.

As the Morse-code learner becomes better at receiving the code, the spacing between characters may be gradually decreased until it becomes the normal character spacing. Another method of spacing is to use a word space or two in place of a character space and then add several word spaces in place of a normal word space to distinguish between words or groups of Morse-code characters.

The speed of the Morse keyboard may be set for a range of approximately 5 words per minute to over 70 words per minute. It is easy to stay ahead of the outgoing Morse code when operating at the slower speeds, but at the higher speeds it becomes increasingly more difficult to stay ahead. The Morse-code operator should never send out Morse code at a higher speed than he can copy comfortably unless he is using a video readout for monitoring the transmission. Even with a video readout it can be risky business when external interference prevents the video readout from receiving the Morse code correctly.

Typing will be no problem for the beginning operator as long as he is careful to type according to standard typing procedure. An operator should never type using the "hunt and peck" system because it will hinder him later when he desires to increase his Morse code and typing speed.

Most beginning Morse-code operators will find that it is usually easier to increase one's typing speed than it is to increase one's Morse-code speed. A beginner should endeavor to type faster than he normally can receive the Morse code in order to stay ahead of the outgoing Morse code when using the Morse keyboard. For instance, a Morse-keyboard operator who can send and receive code at 15 words per minute must be able to type faster to stay ahead of the outgoing Morse code. If he cannot type faster than the outgoing Morse code, he may have trouble when short Morse-code characters like E and I, etc., appear frequently in the message.

One of the principal advantages of the Morse keyboard is the ability to send perfect Morse code at higher speeds than is possible otherwise. Many Morse-code operators reach the limit of their code-sending abilities at approximately 30 words per minute. The Morse keyboard extends the range that the Morse-code operator may otherwise attain. The ability to send and receive Morse code more accurately and more easily is a decided advantage for the Morse-code operator.

Construction

The printed circuit board is a single-sided, 7-inch by 10-inch board that has been laid out for easy assembly and soldering. I spaced the layout so that none of the jumper connections or terminal connections is very close to any other one. The closest solder connections are for the integrated-circuit socket connections.

I have used push-in solder terminals for the connections to and from the printed circuit board and for some of the test terminals.

The photograph shows two Jones terminal strips for connections between the printed circuit board and other locations of the

Morse keyboard. These are not absolutely necessary and may be omitted. I have been using them for testing purposes.

The printed circuit board and the metal plate for the power supply are mounted on the bottom of the keyboard cabinet on metal standoffs. The wiring from the printed circuit board to other parts of the Morse keyboard is brought out from the bottom side or the foil side of the board.

Availability of Components

I will supply a drilled and etched printed circuit board for $25.00 postpaid in the US and Canada along with complete instructions for wiring and assembly. I will supply a programmed 1702A EPROM for $10.00 or program a reader-supplied 1702A EPROM for $6.00 postpaid.

I will supply a Keytronic model L1648, 53-key, ASR-33 data-communications ASCII keyboard with the proper keytops for $100 postpaid in either the US or Canada. The ASCII keyboard uses a capacitance-type keyswitch and has over a 100-million-keystroke reliability. The keyboard is fully assembled and has a rigid mounting frame and removable two-shot molded keytops. (A two-shot molded keytop is one that has the character molded within the keytop so that it will not wear off with continued use.) The ASCII keyboard is available with schematic and data sheets.

The Morse-keyboard cabinet is a 14-inch-wide by 11.3-inch-deep sloping panel keyboard cabinet manufactured by Hammond. The bottom portion is #1456 PL3 CBU and the matching top portion is #1456 PL3 PWH. It is the same keyboard cabinet as is shown in the photograph.

If the Morse-keyboard builder already has an ASCII keyboard, he may use it with the Morse keyboard. If the ASCII keyboard is of the same configuration as the one mentioned in the article, he may use it without making any changes to the truth table or the 1702A memory-circuit programming. If the keyboard is different, a new set of truth tables will need to be made and the 1702A memory circuit will need to be programmed for the ASCII keyboard. A layout of the keyboard should be worked out and a list made of the ASCII6 outputs for each of the keys to be used.

Power must be applied to the ASCII keyboard and the voltages read for bits 1 through 6 for each character. A one will usually be plus 5 volts and a zero will be zero volts or ground potential. (Some characters may have the same ASCII6 data as other characters and this must be allowed for in the keyboard layout.)

The 1702A memory circuit does not need to be programmed according to the ASCII6 data but should follow it as closely as possible. There will be no problem with the letters and numbers characters, but some of the punctuation may not follow a strict ASCII6 conformity. None of the special communications characters such as break, wait, end of message, and end of transmission will follow any kind of ASCII pattern. Three function keys should also be selected for the Store, Send, and Rub Out keyboard functions.

Foreign characters may be selected for the Morse keyboard. The keytops will need to be labeled if the keytops are not available. A larger keyboard may be required for alphabets that require a larger number of characters such as the Japanese Kata Kana radio code. None of the foreign characters will be too long for the Morse keyboard, since the number zero is the longest Morse-code character used. All of the other characters are shorter than the number zero.

If more than 62 characters are needed, it would be best to redesign the Morse keyboard, use ASCII7 data, and use a larger capacity memory circuit. A 2704 EPROM would supply as many as 126 characters and a word space if there were that many Morse-code characters available. Both uppercase and lowercase positions would need to be used on the ASCII keyboard. There would be very few requirements for that type of arrangement.

Most of the integrated circuits are readily available at most of the large electronics parts houses. Prices are still coming down for some of the integrated circuits being used in the Morse keyboard. The prices are down quite a bit since I started designing the Morse keyboard.

In the future, I will be selling some assembled printed circuit boards and possibly some completely assembled Morse keyboards.

Summary

I have enjoyed designing the Morse keyboard and have been using it consistently on the ham bands ever since it was a breadboard circuit. Many hams have mentioned that it was easy to copy code from the Morse keyboard. Many have indicated a desire to try out a Morse keyboard for themselves to see how well they work. Some hams who previously showed very little interest in Morse-code operation have found that it is very enjoyable after all. Morse keyboards are catching on and it looks like there will be very many on the ham bands in the future. ■

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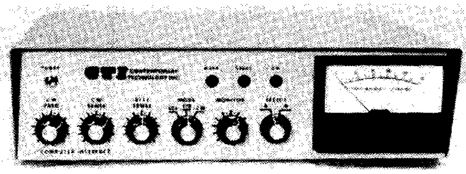

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Terry Conboy N6RY
2631 SW Orchard Hill Place
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Reveal the Receiver Behind the Specs

Here's a program that will make sense out of all those numbers.

Recently, I found myself coming down with a dread disease. I'm sure you've had it, too. It usually starts with a visit to a friend's shack, a hamfest, or the local radio emporium. You begin to experience an itch that can be relieved only by buying a new piece of ham gear.

As the disease progresses, you pore over glossy spec sheets and read equipment reviews in the ham magazines. It doesn't take long to realize that comparing brand K to brand D is almost impossible when it comes to the receiver specifications.

In one spec sheet, receiver sensitivity is given in microvolts for a 10-dB signal-plus-noise-to-noise ratio. For another rig, the measurements in the lab test give the minimum discernible signal. On occasion you may find a mention of the receiver front-end noise figure. And all of these are tested in different bandwidths. How can you cope?

If that's not enough, today's solid-state transceivers are good enough so that the manufacturers are actually beginning to tell us how their equipment is at handling strong nearby signals. Usually they will spec this as the two-tone dynamic range, but sometimes it is given as the third-order intercept. Is there a way to make a direct comparison?

Fortunately, it isn't too hard to make these comparisons. It's especially easy if you use a computer to do all of the math. Before we get to the program that does this, let's refresh our memories about the specifications that I just mentioned.

Sensitivity

For HF receivers, sensitivity is a measure of the noise generated by the amplifier stages and mixers in the signal path between the antenna and the speaker. It has nothing at all to do with the gain or amplification of the receiver. This is a point of confusion with many hams.

The most common way of specifying sensitivity is with the voltage required to give a signal-to-noise ratio of about 10 dB. The test is easy. Just use a calibrated generator to feed a signal to the receiver and watch an audio voltmeter connected to the audio output. Increase the level of the signal at the input until the voltmeter reads 10 dB higher than it did with no signal. By using the calibration of the output level of the generator, the 10-dB S+N/N sensitivity results.

The reason it is called signal-plus-noise to noise is that you can't turn off the noise when the signal is applied because the noise is made by the receiver itself. Notice that there is no absolute reference to the output level of the receiver. Only the change in the output was measured. Two rigs can have the same sensitivity, but one may produce a very high level of received signal in the speaker while the other may hardly produce an audible output. A spec on overall gain would be nice, but I wish you good luck finding it on the glossy spec sheet!

MDS

The minimum discernible signal that can be heard with a receiver is measured in much the same way as the 10-dB S+N/N sensitivity. The only differences are that the generator level is raised until the audio voltmeter goes up 3 dB, and that usually the MDS is given in dBm (dB referred to one milliwatt in 50 Ohms). By measuring in this way, the signal power and the noise power are exactly the same. To put it another way, the signal-to-noise ratio is 0 dB. Converting MDS to μV for 10-dB S+N/N is mostly an exercise in logarithms.

One trap in the sensitivity specs involves the receiver bandwidth that was used when it was measured. An easy way to make the spec look good is to use a narrower i-f filter. Cutting the bandwidth in half cuts the noise power in half. Then the signal power has to be only half as large as before to give the same S/N ratio. It's not that the manufacturers are sneaky, but they do use different receiver bandwidths in their normal SSB position. To make direct comparisons, you have to take the different bandwidths into account.

Noise Figure

On occasion, the sensitivity of a receiver will be specified as a noise figure. To understand noise figure, imagine that you have a receiver which is entirely noiseless. Connect a 50-Ohm resistor to its input and measure the output of the receiver. Surprise! There is noise there! But you knew that all resistors produce just a tiny bit of noise due to the molecular motion of the resistive material. Your noiseless receiver just amplified that tiny noise.

Program listing.

```
10  REM   R C V R S P E C   BY TERRY CONROY, N6RY.
20  REM   COMPARES RECEIVER SPECIFICATIONS FOR SENSITIVITY AND
30  REM   DYNAMIC RANGE IN STANDARD BANDWIDTHS.
40  REM   VIRGIN 1.00 ON 06 JUN 82  ORIG
50  REM   VIRGIN 1.10 ON 18 JUL 82  APPLE
90  REM
99  REM  VARIABLE LIST...
100  REM   B0=KNOWN SENSITIVITY BW
102  REM   B9=KNOWN DYN RANGE BW
104  DIM B(2): REM  =STANDARD BW'S
106  REM   D0=KNOWN 2-TONE DR
108  DIM D(2): REM  =STD 2-TONE DR'S
110  REM   I=INTERCEPT POINT
112  REM   J=LOOP INDEX
114  REM   M0=KNOWN MDS
116  DIM M(2): REM  =STD MDS'S
118  REM   N=NOISE FIGURE
120  REM   P=TYPE OF SENS SPEC KNOWN
122  REM   Q=TYPE OF DR SPEC KNOWN
124  REM   S0=KNOWN 10 DB SENS
130  REM  SET CONSTANTS
140 F = 10 /  LOG (10)
150 B(1) = 500
160 B(2) = 2400
170  HOME
190  REM  INPUT KNOWN SENSITIVITY
200  PRINT "SPECIFY INPUT SENSITIVITY PARAMETER:"
210  PRINT "  1) MINIMUM DISCERNIBLE SIGNAL (DBM)"
220  PRINT "  2) UV FOR 10 DB S+N/N"
230  PRINT "  3) NOISE FIGURE (DB)"
240  INPUT P
290  REM
300  PRINT
310  ON P GOTO 400,500,600
320  GOTO 240
390  REM
400  INPUT "MDS (DBM) ";M0
410  GOSUB 900
420 N = M0 + 174.0 - F *  LOG (B0)
430  GOTO 1000
490  REM
500  INPUT "UV FOR 10 DB S+N/N ";S0
510  GOSUB 900
520 N = 2 * F *  LOG (S0) - F *  LOG (B0) + 57.47
530  GOTO 1000
590  REM
600  INPUT "NOISE FIGURE (DB) ";N
610  GOTO 1000
790  REM
900  INPUT "MEASUREMENT BANDWIDTH (HZ) ";B0
910  RETURN
990  REM  INPUT KNOWN DYNAMIC RANGE
1000  PRINT
1010  PRINT "SPECIFY DYNAMIC RANGE PARAMETER:"
1020  PRINT "  1) TWO-TONE THIRD-ORDER"
1030  PRINT "  2) INPUT INTERCEPT POINT"
1040  INPUT Q
1050  PRINT
1090  REM
1100  ON Q GOTO 1200,1300
1110  GOTO 1040
1190  REM
1200  INPUT "TWO-TONE DYNAMIC RANGE (DB) ";D0
1210  INPUT "MEASUREMENT BANDWIDTH (HZ) ";B9
1220 I = D0 * 3.0 / 2.0 + N - 174.0 + F *  LOG (B9)
1230  GOTO 2000
1290  REM
1300  INPUT "INPUT INTERCEPT POINT (DBM) ";I
1310  GOTO 2000
1390  REM
1990  REM  CALCULATE EQUIVALENT SPECS
2000  FOR J = 1 TO 2
2010 M(J) = N - 174.0 + F *  LOG (B(J))
2020 S(J) = 10.0 ^ ((M(J) + 116.53) / 20.0)
2030 D(J) = (I - M(J)) * 2.0 / 3.0
2040  NEXT J
2090  REM
2990  REM  OUTPUT RESULTS
3000  PRINT : PRINT
3005  PRINT "              500 HZ        2400 HZ"
3007  PRINT "              --------      ---------"
3010  PRINT "MDS"; TAB( 15);M(1); TAB( 29);M(2)
3020  PRINT "10 DB S+N/N"; TAB( 15);S(1); TAB( 29);S(2)
3040  PRINT "NOISE FIGURE"; TAB( 15);N; TAB( 29);N
3050  PRINT
3060  PRINT "TWO-TONE DR"; TAB( 15);D(1); TAB( 29);D(2)
3070  PRINT "INTERCEPT"; TAB( 15);I; TAB( 29);I
3080  PRINT
4000  END
```

Now connect my receiver to your 50-Ohm resistor. Set it for the same gain as your noiseless receiver and connect the voltmeter to the output. The difference in dB of the reading on your perfect receiver and that of my real receiver is the noise figure of my receiver.

Since you can't make a perfectly noiseless receiver, you can't measure the NF that way. Instead, a calibrated source of noise is connected to the input of the rig and the output noise is compared to the output with only an input terminating resistor. With suitable calculation, the NF can be found.

One of the interesting things about NF is that the i-f bandwidth has no effect on the spec. This comes about because we are measuring noise-to-noise ratios. Both the receiver internal noise and the noise from the calibrated noise source go through the same filter. This is convenient for the computer program. Internally, it converts all sensitivity specs to NF for ease of calculation.

Dynamic Range

For the contester in a multi-transmitter operation or for the poor soul with another ham just down the street, having a receiver with good dynamic range can mean the difference between enjoying operating or just giving it up altogether.

Solid-state receivers today can be excellent in handling strong signals while listening to weak ones. There are still lots of rigs around, both tube and transistor, that really don't do this well.

The most common way of specifying dynamic range is in terms of the two-tone, third-order intermodulation test. This involves using two signals of the same level separated by about 20 kHz. These signals are fed to the receiver through a combiner and a variable attenuator. The receiver is tuned 20 kHz away from one of the tones. Then the signal level is raised until an audio voltmeter at the receiver output shows a 3-dB change. The difference between the level of one of the tones and the MDS, in dB, is the two-tone dynamic range.

What happens is that the third-order intermod produced by the receiver came up in level enough to be discernible. Because the distortion signal is being compared to the noise, it is also dependent on the i-f bandwidth.

Intercept Point

With the two-tone test, for every dB that the level of the signals is raised, the intermod product goes up 3 dB. By raising the level of the two signals high enough, the intermod product will, in theory, finally rise enough to catch up with the level of the two tones causing the intermod. In fact, this does not happen, but we can extrapolate measurements that were made at lower levels to find out where it would happen. This imaginary point is called the third-order intermodulation-intercept point. It is specified in dBm.

Because we are comparing test signal amplitudes to

```
SPECIFY INPUT SENSITIVITY PARAMETER:
  1) MINIMUM DISCERNIBLE SIGNAL (DBM)
  2) UV FOR 10 DB S+N/N
  3) NOISE FIGURE (DB)
?2

UV FOR 10 DB S+N/N .25
MEASUREMENT BANDWIDTH (HZ) 2200

SPECIFY DYNAMIC RANGE PARAMETER:
  1) TWO-TONE THIRD-ORDER
  2) INPUT INTERCEPT POINT
?1

TWO-TONE DYNAMIC RANGE (DB) 88
MEASUREMENT BANDWIDTH (HZ) 2200

              500 HZ        2400 HZ
              --------      ---------
MDS           -135.005727   -128.193314
10 DB S+N/N   .119182823    .261116483
NOISE FIGURE  12.0045734    12.0045734

TWO-TONE DR   92.2896846    87.7480763
INTERCEPT     3.42880021    3.42880021
```

Sample run.

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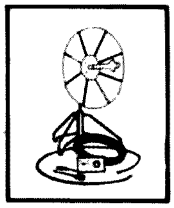

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the amplitude of the intermod product, the i-f bandwidth is not a factor in the measurement. The computer program uses this for internal calculations because of the bandwidth independence.

The Program

Once the formulas for the conversions are derived, the program is really quite simple. It has five sections. The first part takes care of opening stage business by dimensioning the arrays and setting the constant values.

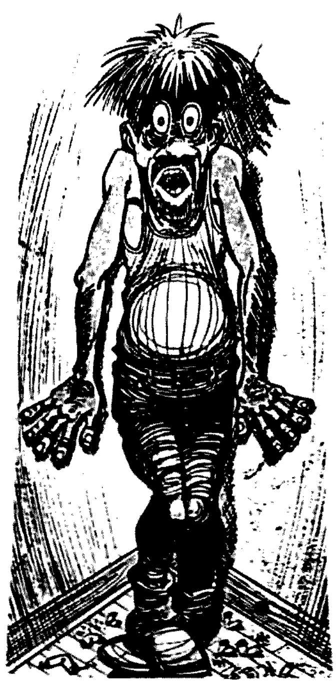
In the second part, the program asks for the sensitivity spec from the glossy sheet or equipment review. The third section takes in the known dynamic-range specification. Then the computer calculates the equivalent specs for "standard" bandwidths of 500 and 2400 Hz. Lastly, the program tells the computer to print these specs.

To help you modify the program for your own use, the variables used in the program are defined in the beginning of the program listing. So that you will know that your CDC Cyber is finding the right answers, a sample run is included as a check. The program listed was on an Apple II, but the syntax is pretty ordinary and shouldn't present much of a problem in translating to other dialects of Basic.

Trivial

Be wary of anyone who tells you that any particular task for a computer is trivial. Usually those trivial tasks take months to accomplish (as my boss reminds me afterward). It did take me a while to reduce this program to the simple form that you see here. After I was done, even the job done by the program seemed trivial ... until I remembered how long it took to punch in the calculations on my scientific calculator.

I hope this short program makes it easy to compare the competing cures for your itch for new gear. ■



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Designing ham gear involves many compromises; unfortunately for those of us who operate 160, it seems that many of them end up taking away performance on the top band.

With the new regulations and decreasing sunspots, the number and strength of signals on 160 are going to increase. Will your rig be able to cope? Are you looking for a simple and inexpensive way to add a preselector/preamp to your station? This cheap and easy conversion may be just what you're looking for.

I'm not going to provide a treatise on filter design, so check the references for the data that you need. What this article will do is show you how to adapt any of the HF/MF command-set receivers to provide a foundation for the front-end adjunct that you need.

I chose the command sets for this project for several reasons. The main one is that they are almost a ready-made front end as they are, and the coils lend themselves to easy modification and rewinding. The components are of exceptional quality. In addition, my junk box contains a very high proportion of command-set components.

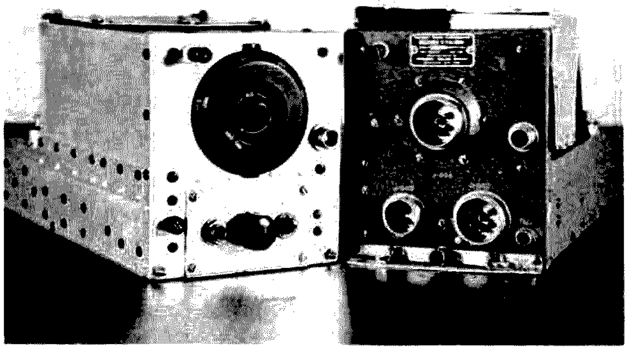

Photo A. The receivers before modification.

If you price the components for the Cohn-type filter from the *Handbook*, you'll find that the current cost of the inductors will be around $50. A used R-11A is $12.95 from Fair Radio (R-22 and R-25 are still available, but about twice as expensive). At our local hamfests they bring from $1 to $10. You can also check with your local OTs; there has to be at least one command receiver left for every ham in the US.

When choosing a unit at a hamfest, the only caution is that those units that have been bandspread (the dial will have homemade markings covering one band) should be bought for coils only as the variable capacitor in these conversions is gutted. Happily, most conversions don't affect the parts used for this conversion. The command sets are probably the most converted piece of surplus gear ever, so your chances of finding one at a hamfest that is completely original are slim.

The command-set receivers cover the range of 190 kHz to 9.1 MHz. Any of them will work for this conversion. See Table 1.

The last command receiver (civilian version) rolled off the assembly lines 20 years ago, the first well over 40 years ago, so even the diehards will have to admit that their usefulness as receivers is about at an end. With this in mind, get out the hacksaw and get ready for the very last command-set conversion.

The simplest passive unit (Fig. 2) uses the variable capacitor and two of the front-end coils (the small cans under the variable capacitor). The others make use of all the front-end coils and

Frequency	Model	Notes
190-550 kHz	R-23, BC-453, R-11	Modify variable
520-1500 kHz	R-24, BC-946, R-22	Scarce, seldom found at hamfests
1.5-3 MHz	R-25, BC-454	Least modification needed for 160
3-6 MHz	R-26, BC-454	
6-9.1 MHz	R-27, BC-455	Padding needed for variable capacitor

Table 1.

the i-f coils; shield cans may be used also.

The front-end coils and i-fs on the early models plug in; those on the later models (no dial) do not. The plug-in feature is nice while testing and constructing, but it is not a necessity. Each of the front-end coils is color-coded for frequency range and function as follows: brown—190/550, orange—1.5/3, yellow—3/6, green—6/9.1, red—.52/1.5. This color code is on the screw holding the coil form to the shield-can base.

The function color code, located in one corner of the shield-can base, is as follows: red—antenna, yellow—rf, blue—mixer.

The i-f cans can be used to house a second filter, as a housing for the amplifier circuit, or as the center inductors for a Cohn-type filter. The 2830-kHz i-fs from the 6/9.1 receiver have a very nice coil form that is easily rewound or modified. The i-f cans can be screw-mounted to the chassis or the tube socket holes can be enlarged and the original plugs used. The mounting brackets will have to be removed to fit the three i-f cans across the chassis as shown in Photo D.

If you do not wish to use the original dial mechanism, or if your unit has no frequency dial, you will have to modify the variable capacitor.

The variable capacitors are rated as follows: 6/9.1, 75 pF; 3/6, 150 pF; the rest are 450 pF. These values are for one section and are approximate as there are some variations in the different models. To lower the capacity, you must remove plates; this is not difficult, but it must be done carefully.

Basic Conversion

First strip the chassis and then the front panel. Set aside the hardware, the front-end coils, the variable capacitor and its shield, the i-f cans, and the small variable capacitor from the front panel. If you have one of the dial-less units, remove the plugs from the front panel. If the aluminum cup is still in your unit, remove it from the front panel also. The front panel should be clean with the exception of the spline shaft holder. If you intend to use the original right-angle setup, leave it on the panel. If not, remove the two pins and then unscrew the nut that holds it to the chassis.

Are you going to use the i-f cans? If so, remove the two tube sockets located immediately behind the variable capacitor shield. Also remove the i-f plugs (if present) by running a screwdriver under the rolled edges and prying up gently.

Now, using a hacksaw with a fine-tooth blade, cut off the rear of the chassis right behind the two i-f holder nuts. This is 5" measured from the front panel. If you will not be using the i-f cans, cut between the shield holder nuts and the first i-f holder nuts. This is 3-3/16" measured from the front panel. Of course, you can leave more rear apron if you need it for relays, power supply, or whatever.

What you now have is a three-section variable capacitor with coils, shield cans, and an enclosure to mount it all in. Now to assemble the finished product.

See Fig. 2. Using the antenna and rf coils, this unit covers the original frequency range of the receiver.

Modify the antenna coil by adding a two-turn coil to the bottom using #20 wire. Connect one end to the ground end of the original coil and the other to an unused pin. Modify the rf coil by removing the pie-wound coil on top of the form and adding a two-turn link as in the antenna coil. Remove the core locks from both coils and screw the cores all the way into the coil form. At this point you may wish

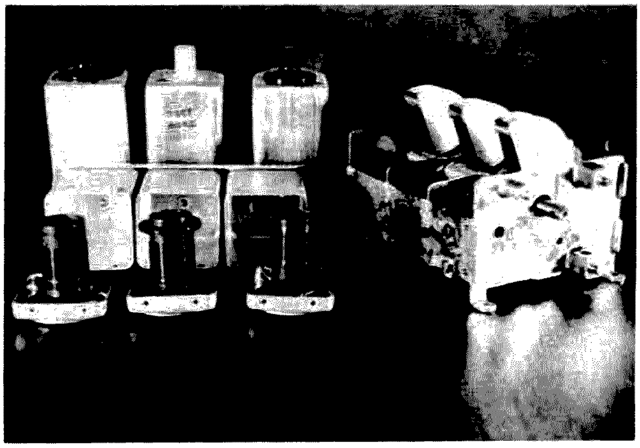

Photo B. The parts used showing a modified variable capacitor.

to remove the shield cans from the bracket and drill holes in them to clear an alignment tool. The shield cans do change the frequency of the tuned circuit. Now, plug or mount the two coils in the first two sockets or holes using the first two sections of the variable capacitor (the ones with the trimmers). Wire the unit to agree with Fig. 2. Make sure that the coupling capacitor does not interfere with the variable capacitor.

Using the trimmers and adjusting the cores, the unit should track across approximately the original range of the receiver. The response is a bit broad on 6/9.1 and adequate on 3/6 and 1.5/3.

See Fig. 3. This adds a preamp and another tuned circuit to Fig. 2. You will have to rewind the mixer coil using the antenna coil as a model. The link is the same and the tap will depend on the gain desired from the amplifier. A dual-gate device could be used here with a gain-control voltage applied to G2. You can use your favorite amplifier circuit here, or even one of the commercial gain blocks. Just remember to use only the amount of gain needed to overcome filter loss or Rx antenna inefficiency—overdoing it will defeat the purpose of the device.

To cover frequencies other than that for which the receiver was designed, you will of course have to rewind (or unwind) the coils and perhaps add some pad-

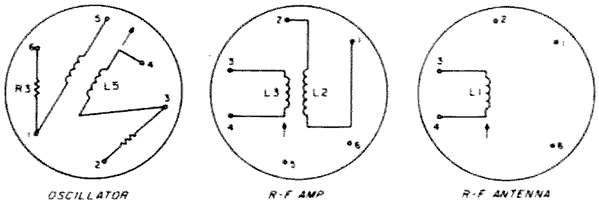

Fig. 1. Typical command-set coils.

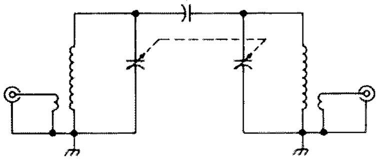

Fig. 2. Simple two-section unit.

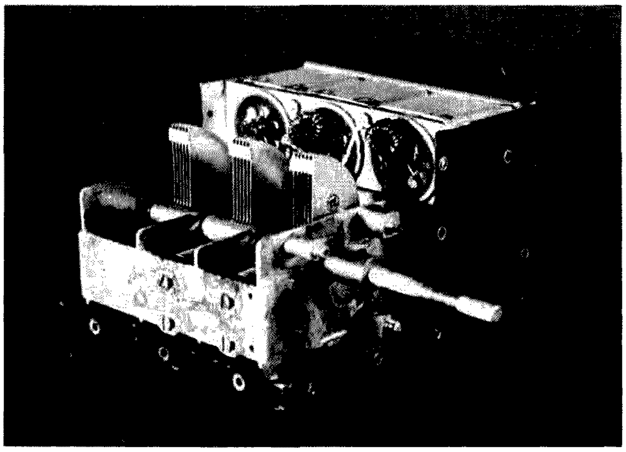

Photo C. Multi-section filter using R-11a parts (no dial assembly), variable capacitor shield removed to show details. Note position of bottom coupling toroid coils.

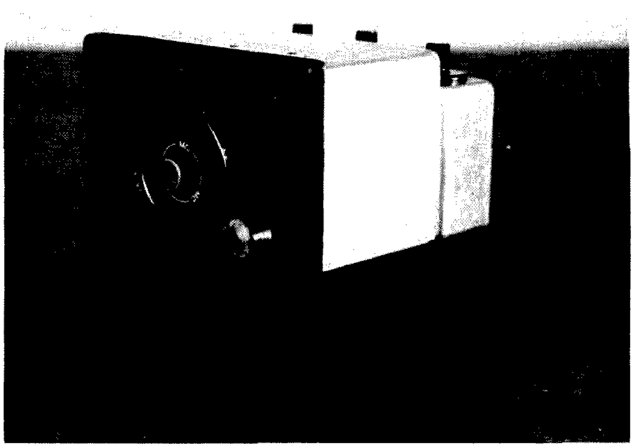

Photo D. Completed unit showing possible placement of i-f cans.

ding to the variable capacitor. If you use the 3/6 and 6/9.1 units, a good starting place for 160 is about an inch of closewound turns of #32 wire. The 190/550 units can be modified by either rewinding the coils or unwinding them. The variables have a bit too much capacitance, but they will work. See Fig. 4. This filter can be made with the coil set from the 190/550 units by unwinding the antenna coil, removing the large coil from the top of the mixer coil, unwinding the small coil, and then unwinding the two coils on the rf coil form until they reach the proper inductance. Unwind only enough from each of the four coils for it to reach the right frequency. This involves a bit of extra "cut and try" time, but it is worth it. Remember that the two center inductors are twice the inductance of the outside coils and that the bottom coupling links and in/out links should be in place as you bring the inductors to frequency.

I have covered only a few of the possibilities for this conversion here; your needs will determine the final form yours takes.

There is room inside the shield can to build the amplifier. The i-f coils can be used to build a second filter for a different range. The switch should have each section shielded to prevent stray coupling. To modify the 450-pf variable capacitors to reduce capacity, do the following:

First, remove the end rotor plate, using long-nose pliers, working it gently back and forth until it breaks free. Remove the next rotor plate the same way. This one and the rest will have to be freed from the band stop bar. Trim the band stop bar after removing each plate. The stator plates are a bit easier to remove. Twist gently at the attachment point opposite the trimmers until it breaks free, then work it up and down until the other side breaks free. Do not put too much pressure on either the shaft or the stator plates or the ball bearings will break free and you will have a Chinese puzzle to assemble. If one or more of the glass beads the stator plates are mounted on is missing, acceptable substitutes can be found at your local crafts shop. Leave six rotor and six stator plates in each section and make sure that the plates are properly aligned. More plates may be removed if the capacity is still too high.

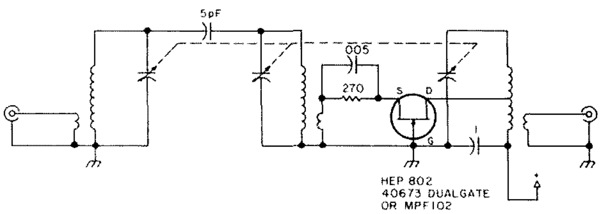

Fig. 3. Preamp and tuned circuit attached.

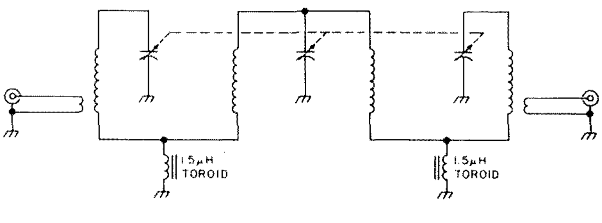

Fig. 4. Multi-coil setup.

More Capacitor Modifications

The antenna section of the variable capacitor either has no trimmer or, if there is one, it has fewer plates than the others. The capacitor that you removed from the front panel can be remounted and used for a trimmer or the trimmer on the shaft end can be used by running an insulated wire from it to the antenna section under the variable capacitor, along the front panel.

To remove the angle drive, first remove the pin in the worm gear shaft, then remove the two gears from the bottom of the capacitor by prying off the retainers with a small screwdriver. Pull the splined end out and then remove the end nut and the worm gear. Remove the gear from the end of the shaft by driving out the pin gently—remember the ball bearings. If the pin is stuck, drill it out. Then remove the triangular plate (this plate helps support the shaft while you remove the pin) and pull the gear off the shaft.

I used as much of the original covers as I could to house the unit. If you remove the drive, you will have to cut a U-shaped slot in the capacitor shield to clear the shaft and coupler.

The time that you spend getting the unit to track will pay off in performance. Take your time and get it right.

I used a GDO to get the circuits close to frequency and then used a signal gen-

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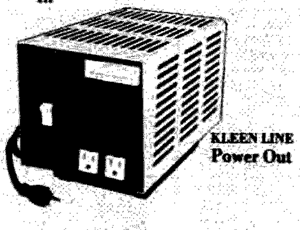

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erator and scope for final adjustment. If you have access to a sweep generator, it makes alignment very easy.

If you use the unit with a transceiver, automatic switching is a must—the coils don't last long with 100 Watts of rf in them.

If you use the i-f cans to house commercial coil forms, you may have to drill out the center hole for an alignment tool.

For the time spent, this conversion provides a definite improvement in performance at a minimum cost.

A Note to Elmer:

When one of your current crop of KAs brings this article to you and asks if you might have one of these things lying around, don't get misty-eyed and try to explain why you've kept it all these years. He won't understand the sacrilege of applying a hacksaw to a pristine Q-Fiver. I know how you feel, I know how many you converted and passed on to prospective Novices (remember, I was one of them), and yes, I remember the R-24 you put in the '54 Chevy. You saved a hundred bucks and the dynamotor didn't make a bit more noise than a vibrator. I remember, too, when we rewound the coils and put it on 15 and my first VK came back. But, to him it's just a homely box. So bite the bullet and help him out; after all, a ham shack without an ARC-5 (or part of one) isn't really complete! ■

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CardSoft: The Transportable QSL Generator

If your machine runs Basic, it can run this program.

Anyone out there priced QSL cards lately? Have you noticed how often you get (or send) an SASE with the ole pasteboard? Well, possibly the day is fast coming when the familiar QSL "penny" postcard will be only a memory (or fading on the wall). I, personally, haven't sent or received QSL cards in several years without an SASE being involved, and at the cost of Uncle's postal service, who can afford it these days? Well, for those who have their own microprocessor (and printer)—and there seem to be rapidly growing numbers of them—here's a solution to part of the problem.

CERTIFICATE

TO ALL WHOM THESE PRESENTS COME: GREETINGS!

KNOW YOU by the Authority invested in Us by the Federal Communications Commission, a regulatory agency of the Government of the United States of America. We do hereby certify that on the date, and at the time and on the frequency herein inscribed:

Two-way radio communication was established between:

WB5LLM

A RADIO STATION licensed by the above referenced Federal Agency, to Us, in accordance with the Rules & Regulations of the Amateur Radio Service.

AND

WD4EDQ

a radio station operating in the aforesaid Service.

QSO DATA

DATE 28 / 9 / 82 / TIME(UTC): 12542 FREQUENCY 14.078 MHZ.
TRANS.-Hallicrafters HT-32a/RCVR.-Hammarlund HQ-180/A
RTTY/SSTV - TRS-80(C) w/ CV-89A/URA-8A Converter
ANT. SYSTEM: 20M. VERT. REMARKS: GUD LUCK WID YR.W.A.S.,BOBBY
SIGNAL REPORT R= 5 S= 9 T= 9 MODE: RTTY

FURTHERMORE, know you that this CERTIFICATE shall be accepted as Confirmation of said contact and exchange of Signal Reports, etc., for any, and all, purposes that the aforesaid Awardee deems his want; be it Contest, Operating Awards, etc., in use of the above referenced Station in the Amateur Radio Service.

THEREFORE, In recognition of the above, We hereby set our Hand and Seal, this, the 28TH day of SEPTEMBER, 1982 .

JOE RYAN, LICENSEE
A.R.S. WB5LLM
P.O. BOX 622
FLORENCE, MS. 39073

WB5LLM's QSL certificate.

The main reason that all this QSL swapping goes on these days, in view of the growth of RTTY, SSTV, FAX, and FSTV, is the need to have the confirming operator's signature on the written confirmation of a completed two-way contact. With this program and your trusty printer, you'll be able to crank out your QSLs neatly, efficiently, and with little cost in either money or time.

Nothing in the book says that a QSL must be on a postcard in two or more colors, costing anywhere from 5 to 10 cents each (or more). So, I sat down one day and faced my Tandy TRS-80C, which I use for RTTY and SSTV, and considered the problem. What I came up with is a program that is usable by almost anyone with the above micro/printer combination that will run in Basic. Some minor changes, such as changing the PRINT#-2 statements to LPRINT, etc., will let this program run on any Tandy micro, Apple, Star, etc., and even on those dedicated micros sold for RTTY use (if they have the Basic capability).

Now to the program itself. First, you'll notice that the DIM statement is in the middle of the program. That's because we're changing the values in the DIM statement every time we run the program and possibly during the program operation. This is when you've run off one or more certificates and then decide that you missed some.

Notice that in line 1 we have cleared 13000 for string-array space. There are fifteen inputs, three of which don't change from certificate to certificate. These are the date statements for the date of the certificate. Since you may be running a bunch at a time, you might as well leave that set at one date (saves typing it in repeatedly). With a space of 13000 cleared, you will be able to enter the data for at least 100 certificates. Of course, this was written on a micro with 32K of memory available (no, I didn't clear out the video area for additional space). If you have a 16K memory, reduce this statement in line 1. That will, of course, reduce the number of certificates you can make in one run.

Lines 200 to 480 cover the actual printing of the text of the certificate and were merely figments of my imagination. The wording was more or less copied from certificates issued by the State of Mississippi but probably is close enough to that used in most certificates to be acceptable. However, if you want to modify it—go to it! Don't forget to follow the REM statements and insert your own call letters and name and address to replace mine.

Lines 550 to 670 are the query and data input area. I don't recommend exceeding 20 characters or more of text in the COMMENTS or ANT. SYS. inputs as this will throw off the balance of the finished certificate. Other than that, have at it.

I've used this for a while now and have had no kickback, and it certainly beats spending an evening writing out QSL cards, one after another after another, etc., ad nauseam. Once you get it debugged (if you make typing errors like I do), just run the program (don't forget to save it, either on tape or disk) and enter the date for the certificates and the number you're running at this time. From then on, follow the prompts.

When you've entered all the callsigns and QSO data for the number of QSLs you're sending out, check your printer. I should mention here that this was written for use with the Tandy Line Printer VII, so if you have a different printer you will want to experiment with the PRINT#-2 (or LPRINT or what have you) statements. You can replace these with control characters that your printer recognizes (you know, CHR$(?)); I didn't bother, as the VII printer seems to like the PRINT#-2 just as well.

Once you have it all in and your printer is ready with the paper lined up at the top, you can follow the instructions and hit ENTER and go on about your business—watch TV, get on the air and let out with a CQ, meet your favorite net, etc. The program and printer will carry on until done and, if you are using the TRS-80C, will sound a tone (if you have the TV volume up, that is) when finished. Alternatively, you can stand or sit there and watch the screen (it displays the data and certificate number of each certificate as it is printing same) and the printer—it doesn't care!

Oh, one last thing—type carefully and don't forget to sign and mail 'em!■

```
                              CROSS-REFERENCE
LABEL REFERENCES

00001   00500
00200   00560
00210   00190
00500   00490
00510   00500
00520   00070
00570   00530
A$      00170 00530 00660
A$( )   00200 00340 00520 00530
AC$     00500 00500
C$      00080 00530 00580
C$( )   00200 00300 00520 00530
CB$     00550 00550
CR$     00190 00550
D$      00040 00100 00530
D$( )   00200 00440 00520 00530
DC      00110 00530 00600
DC( )   00200 00320 00520 00530
F       00120 00530 00630
F( )    00200 00320 00520 00530
M$      00050 00100 00530
M$( )   00200 00440 00520 00530
MC      00110 00530 00610
MC( )   00200 00320 00520 00530
MM$     00150
MO$     00530 00670
MO$( )  00200 00350 00520 00530
N       00020 00200 00520 00530
NL      00520 00520 00520 00520 00520 00520 00520 00520 00520 00520 00520
        00520 00520 00520 00520 00520
R       00140 00530 00640
R$      00160 00530 00650
R$( )   00200 00340 00520 00530
R( )    00200 00350 00520 00530
S       00140 00530 00640
S( )    00200 00350 00520 00530
T       00120 00130 00140 00530 00620 00620 00640
T$      00130 00530 00620
T$( )   00200 00320 00520 00550
T( )    00200 00350 00520 00530
X       00200 00200 00200 00200 00200 00200 00200 00200 00200 00200 00200
        00200 00200 00200 00200 00200 00200 00300 00320 00320 00320 00320
        00320 00340 00340 00350 00350 00350 00550 00440 00440 00440 00490
        00530 00550 00550 00530 00550 00530 00530 00530 00530 00530 00530
        00530 00530 00530 00530 00530 00540
Y       00060 00100 00550
Y( )    00200 00440 00520 00530
YC      00110 00550 00610
YC( )   00200 00320 00520 00530

NUMBER OF LABELS     = 44
NUMBER OF REFERENCES = 192
NUMBER OF LINES      = 69
NUMBER OF STATEMENTS = 170
STATEMENTS/MINUTE    = 29.7
```

Cross-reference label references.

```
1 CLEAR 13000
10 CLS4:PRINT@40,"QSL CERTIFICATE"
15 PRINT:PRINT
20 PRINT:INPUT"HOW MANY CERTIFICATES ";N
30 PRINT"CERTIFICATE DATE"
40 INPUT"DAY(IE. 1ST., 17TH,ETC.) ";D$
50 INPUT"MONTH(IE. FEBRUARY) :";M$
60 INPUT"YEAR(IE. 1982):";Y
70 GOTO 520
80 CLS3:LINEINPUT"CALLSIGN OF STATION          :(IE. EX.= XX0XXX) ";C$
90 PRINT"CERTIFICATE DATE          (EXAMPLE - 23RD AUGUST 1982)"
100 INPUT"DAY";D$:INPUT"MONTH";M$:INPUT"YEAR (ALL 4 DIGITS)";Y
110 PRINT"QSO DATES":INPUT"DAY";DC:INPUT"MONTH";MC:INPUT"YEAR";YC
120 INPUT"TIME(IN UTC)";T:INPUT"FREQUENCY";F
130 T$=STR$(T)
140 PRINT"R-S-T RPT",:INPUT"R=";R:INPUT"S=";S:INPUT"T=";T
150 INPUT"MODE";MM$
160 INPUT"REMARKS (20 CHAR)";R$
170 INPUT"ANT. SYSTEM";A$
180 CLS:PRINT$64,"CHECK YOUR PRINTER - I'LL PRINT NEXT"
190 INPUT "PRESS <ENTER> TO START";CR$:GOTO 210
200 FOR X=1 TO N:PRINT"PRINTING # ";X:PRINT C$(X),D$(X),M$(X),Y(X),DC(X),MC
    (X),YC(X),T$(X),F(X),R(X),S(X),T(X),R$(X),A$(X),MO$(X):PRINTSTRING$(32
    ,"$")
210 PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2,CHR$(31);TAB(14);"CERTIFICATE":PRIN
    T#-2:PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2,CHR$(35);TAB(15);"TO
    ALL WHOM THESE PRESENTS COME:    GREETINGS!"
220 PRINT#-2:PRINT#-2,TAB(15);"KNOW YOU by the Authority invested in Us by
    the Federal"
230 PRINT#-2,TAB(10);"Communications  Commission, a regulatory  agency
    of  the":PRINT#-2,TAB(10);"Government of the United States of Amer
    ica, We do hereby"
240 PRINT#-2,TAB(10);"certify  that on  the date,  and at  the  time  and
    on  the":PRINT#-2,TAB(10);"frequency herein inscribed,":PRINT#-2
250 PRINT#-2,TAB(15);"Two-way radio communication was established between:"
    :PRINT#-2
260 PRINT#-2,CHR$(31);TAB(17);"W85LLM":REM INSERT YOUR OWN CALLSIGN HERE, N
    OT MINE.
270 PRINT#-2,CHR$(30)
280 PRINT#-2,CHR$(30);TAB(15);"A  RADIO  STATION  licensed  by  the  above
    referenced":PRINT#-2,TAB(10);"Federal  Agency, to  Us, in  accordance
    with  the  Rules  &"
290 PRINT#-2,TAB(10);"Regulations of the Amateur Radio Service."
300 PRINT#-2:PRINT#-2,TAB(10);"AND":PRINT#-2:PRINT#-2,CHR$(31);TAB(17);C$(X
    ):PRINT#-2
310 PRINT#-2,CHR$(30);TAB(11);"a radio station operating in the aforesaid S
    ervice.":PRINT#-2:PRINT#-2,TAB(33);"#QSO DATA#":PRINT#-2,TAB(10);CHR$(
    10);CHR$(28);CHR$(255);CHR$(192):PRINT#-2
320 PRINT#-2,CHR$(30);TAB(12);"DATE";DC(X);"/";MC(X);"/";YC(X);"/";:PRINT#-
    2," TIME(UTC): ";T$(X);"Z";:PRINT#-2,"  FREQUENCY";F(X);" MHZ."
330 PRINT#-2,TAB(11),"TRANS.-Hallicrafters HT-52a/RCVR.-Hammarlund HQ-180/R
    ":PRINT#-2,TAB(11),"RTTY/SSTV - TRS-80(C) w/ CV-89A/URA-SR Converter":
    REM INSERT YOUR OWN STATION EQUIPT. HERE, NOT MINE.
340 PRINT#-2,TAB(12);"ANT. SYSTEM: ";A$(X);:PRINT#-2,"   REMARKS: ";R$(X)
350 PRINT#-2,TAB(17);"SIGNAL  REPORT ";"R=";R(X);" ";"S=";S(X);" ";"T=";T(X
    );:PRINT#-2,"MODE: ";MO$(X)
360 PRINT#-2,TAB(10);CHR$(15);CHR$(25);CHR$(255);CHR$(192):PRINT#-2:PRINT#-
    2
370 PRINT#-2,CHR$(30);TAB(15);"FURTHERMORE,  know you  that this CERTIFICAT
    E  shall  be"
380 PRINT#-2,TAB(10);"accepted as  Confirmation  of  said  contact and exch
    ange of"
390 PRINT#-2,TAB(10);"Signal  Reports, etc., for any, and  all, Purposes  t
    hat the"
400 PRINT#-2,TAB(10);"aforesaid  Awardee deems  his want; be it Contest, Op
    erating"
410 PRINT#-2,TAB(10);"Awards, etc., in use of the above  referenced Station
    in the":PRINT#-2,TAB(10);"Amataur Radio Service."
420 PRINT#-2
430 PRINT#-2,TAB(15);"THEREFORE, In recognition of the above,  We  hereby s
    et"
440 PRINT#-2,TAB(10);"our Hand and Seal, this, the ";D$(X);" day of ";M$(X)
    ;",";Y(X);"."
450 PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2
460 PRINT#-2,TAB(20);"JOE RYAN, LICENSEE":PRINT#-2,TAB(30);"A.R.S.  W85LLM"
    :REM INSERT YOUR OWN NAME AND CALLSIGN HERE, NOT MINE.
470 PRINT#-2,TAB(31);"P.O. BOX 622":PRINT#-2,TAB(20);"FLORENCE, MS. 39073":
    REM INSERT YOUR OWN ADDRESS HERE.
480 PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2:PRINT#-2
    :PRINT#-2
490 NEXT X:GOTO500
500 CLS:SOUND 150,10:INPUT"DO YOU WANT MORE CERT.(Y/N)";AC$:IF AC$="Y" THEN
    GOTO 1 ELSE GOTO 510
510 CLS:PRINT@70,"THATS IT !":END
520 NL=N:DIMC$(NL),D$(NL),M$(NL),Y(NL),DC(NL),MC(NL),YC(NL),T$(NL),F(NL),R(
    NL),S(NL),T(NL),R$(NL),A$(NL),MO$(NL)
530 FOR X=1 TO N:GOSUB570:C$(X)=C$:D$(X)=D$:M$(X)=M$:Y(X)=Y:DC(X)=DC:MC(X)=
    MC:YC(X)=YC:T$(X)=T$:F(X)=F:R(X)=R:S(X)=S:T(X)=T:R$(X)=R$:A$(X)=A$:MO$
    (X)=MO$:
540 NEXT X
550 CLS2:INPUT"FINISHED? (Y/N";CB$:IF CB$="Y" THEN PRINT:PRINT" CHECK YOUR
    PRINTER AND PAPER - I'M READY":INPUT" WHEN READY HIT <ENTER>";CR$
560 GOTO 200
570 CLS3:PRINT@8,"INPUT QSL DATA"
580 LINEINPUT "CALLSIGN :";C$
590 PRINT"QSO DATA"
600 INPUT"DATE OF QSO (IE 1 OR 22) :";DC
610 INPUT"MONTH (IE. 5 OR 10) :";MC:INPUT"YEAR (IE. 82 OR 83,ETC.)";YC
620 INPUT"QSO TIME (IN UTC) :";T:T$= STR$(T)
630 INPUT"FREQ. (IE. 14.093) :";F
640 PRINT"R-S-T RPT",:INPUT"R=";R:INPUT"S=";S:INPUT"T=";T
650 LINEINPUT"REMARKS";R$
660 INPUT"ANT. SYS.";A$
670 INPUT"MODE ";MO$:RETURN
```

Program Listing.

E. C. Miller N7APE
306 W. Court St.
Weiser ID 83672

The Six-Meter Vfo That Won't Quit

This hybrid has the best of both worlds. It's as steady as a rock and has broadband tuning.

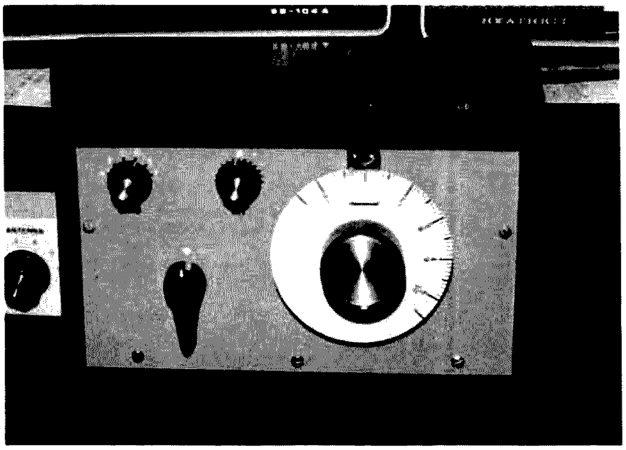
There are certain features I like in a vfo. The prime one is stability as near to a crystal as possible, another is ease of tuning (bandspread), and a third is the ability to tune to any frequency—right down to a Hertz or so. For crystal stability over a narrow range of frequencies, the vxo (variable crystal oscillator) permits infinite resolution. Mixing various crystal frequencies can extend that range, but with considerable complexity and cost. Now that we have ICs that greatly reduce their component count, though, a PLL (phase-locked loop) can provide precise frequencies, at equal spacing over a wide band, quite economically.

The block diagram shows how a PLL with 5-kHz intervals over a range of 500 kHz is combined with a vxo that has analog tuning over a 5-kHz range to give an output of 5.5 to 5.0 MHz. In this configuration, the 5.5 represents the low transmitter frequency and the 5.0 represents the high transmitter frequency. It was chosen because that's what is required by the Heath SB-104 with which it was to be used. By careful selection of the vxo and PL frequencies, the output can be any 500-kHz segment desired, and by choosing the vxo frequency to sum with the PLL generator, the output will not be inverted.

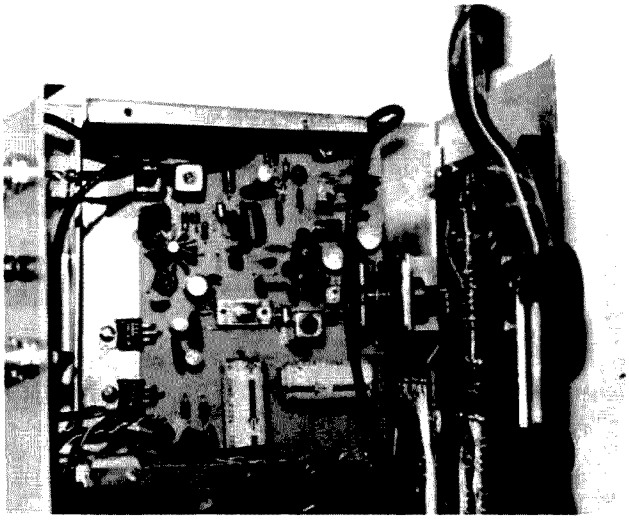
With a 5-kHz reference for the PLL, the "warping" of the vxo at 7.42 MHz is easily attained and quite linear. It also lets us use most any of the PLL chips found in the later CBs as well as the 10.24-MHz crystal associated with it.

The circuit is relatively simple. Q1 is the 10.24-MHz reference oscillator. Q2 amplifies and shapes its output to drive the 7473 divide-by-two counter. Further division takes place in the PLL (MC145109) to get the 5-kHz reference. Q10 is the vxo; its output goes to the mixer (Q11). The vco is Q8, and its frequency is controlled by the output of the phase detector in the PLL chip. The output of Q8 is the other mixer input and also goes to the LM703 buffer/amplifier. It, in turn, drives Q9, the vfo output stage. The mixer output is filtered and amplified by Q12 and then applied to the signal input of the PLL.

Q4 adds or removes a 4.7-uF tantalum capacitor in the timing network of the 555. The 555 runs all of the time, but its output is diode-gated by the UP or DOWN switches, which also determine which way the 4029



Vfo in operating position, showing panel layout.

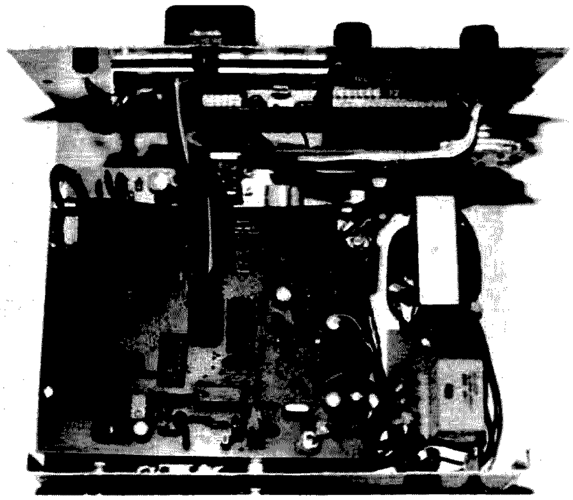


Inside view of oscillator circuit board shows vxo frequency trimmers, tuning capacitor, and voltage regulators.

counters count. Q3 shapes the gated output to ensure clean counting. The first counter is for the 5-kHz increment, and the other counter outputs step the remaining digits. SO1 is for the display connections. If the display is omitted, SO1 can be eliminated or jumpered (pin 2 to 14, 3 to 13, 4 to 12, 5 to 11, 6 to 10, and 7 to 9; pins 1 and 8 are left connected to the other circuitry).

The LD LED is enabled by Q5 when the PLL is in lock. When the PLL is not in lock, Q6 disables the vfo output by applying excessive bias to the LM703 through diode DA. Q7 enables the out-of-band indicator LED and disables the vfo output in the same way as Q6. Out-of-band in this circuit is anything outside of 5.0 to 5.5 MHz and may need modification (or elimination) if, because of the accuracy of the other transceiver crystals, the vfo must be shifted up or down.

The display portion is not needed with the SB-104 or similar transceivers with self-contained counters. For use with other rigs, it's a nice feature. When the display is used, PI-1 replaces the jumper in SO1, and the 4029 counters are set in the BCD mode by inserting a jumper from pin 9 to ground on the two most significant digit 4029s. The counters directly drive 4511 BCD-to-7-segment encoders and also two 4008 full adders to convert the BCD to binary for the PLL. Another 4008 allows adding 5 to the third digit (hundred thousand Hz) of the display. This permits setting the bandswitch of the vfo to 3.5 and 28.5 and counting from there on those band segments. The two most significant digits of the display are not a part of the counter but are set by a diode matrix and the bandswitch.



Upper portion is the display board and the PLL section is in the lower left. Power transformer is on the right.

The RIT circuit uses a varactor and a 10k pot to vary the frequency of the vfo in the receive mode. In the transmit mode, a positive regulated voltage is applied to the varactor to reduce its effect to a minimum. This is accomplished by Q13 and Q14 by the ap-

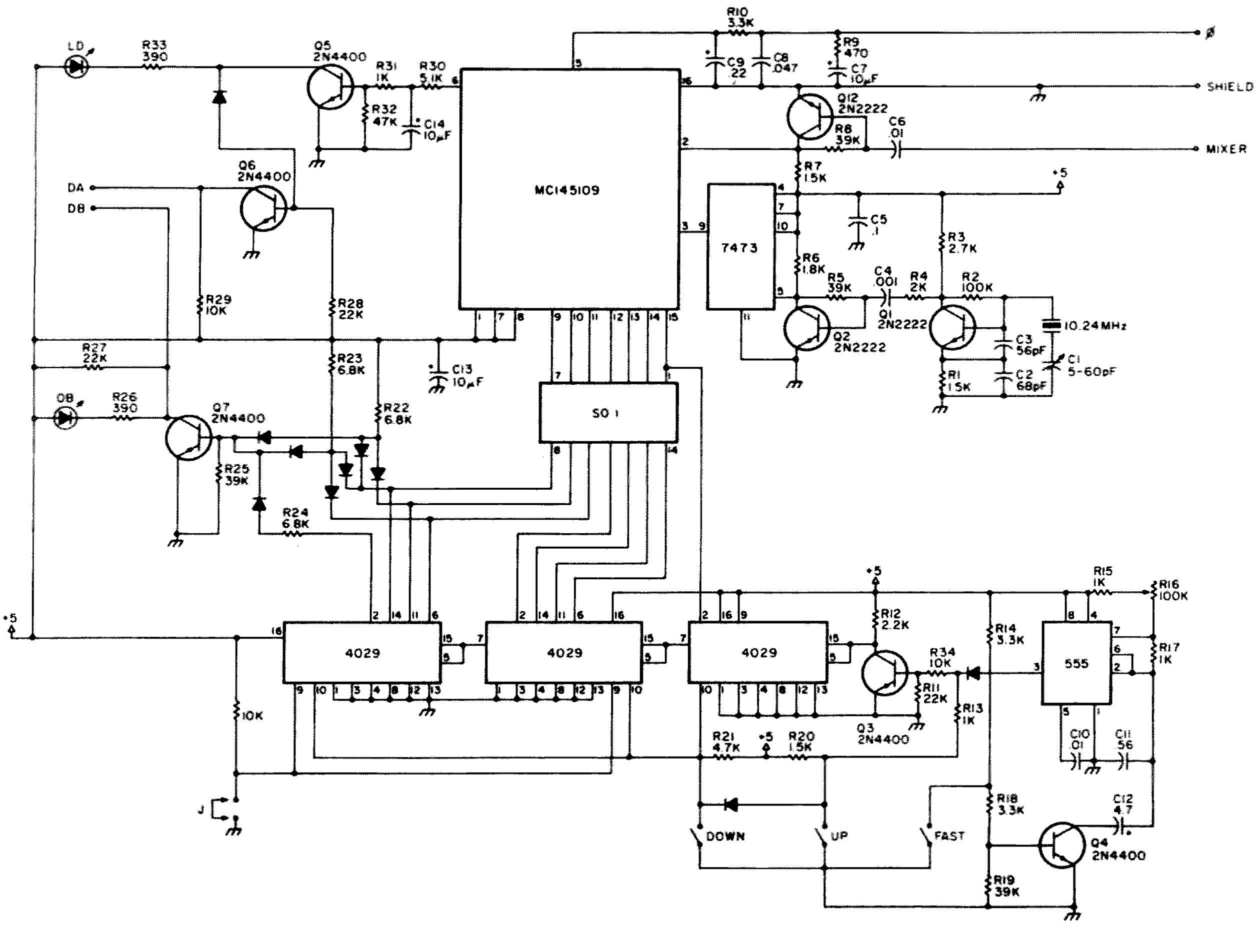


Fig. 1(a). PLL.

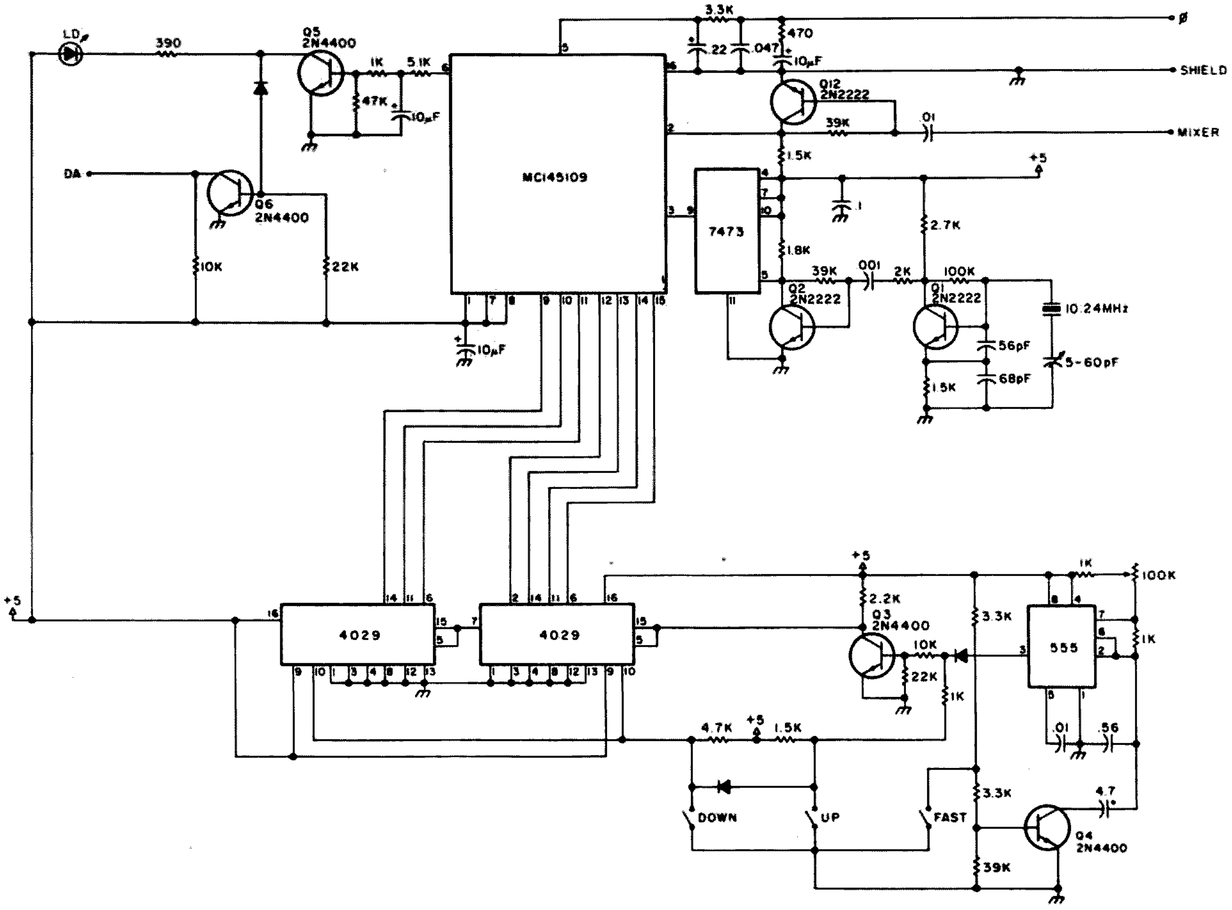


Fig. 1(b). Simpler layout for PLL.

plication of a positive voltage to the T/R terminal. In the same action, C_A is diode-switched into the circuit to cause the vxo to operate at the mid-frequency of the receive RIT range. Because the varactor is, in effect, in series with the tuning control (C_T), the RIT range varies from ±200 Hz at the minimum setting of C_T to ±360 Hz at its maximum setting.

Any regulated power supply providing +12 and +5 volts is satisfactory. The simple one shown in Fig. 4 was used in the prototype. Current requirements, including display, are about 300 mA total.

Although I used three circuit boards because that worked out best with the case I wanted, there is no good reason why it cannot be built on one or two boards. Layout is not particularly critical except for the usual considerations given to rf and digital construction, such as short rf leads and good decoupling. The bypass capacitors for the oscillators and integrated circuits should be placed as close as possible to the relative component. Except for L_A and L_B, all of the inductors are high-Q ferrite chokes. L_A and L_B are miniature rf transformers removed from a CB board and rewound. Because of the variations in permeability and winding area, the turns and wire sizes are not given. Both L_A and L_B should have unloaded Qs above 50 and be adjustable. T1 consists of a 60-turn primary and a 30-turn secondary of #30 enamelled wire, on a T-37-2 core. In the frequency-controlling portions of the oscillators, NPO capacitors are recommended. The other small capacitors can be mylar™, ceramic, or mica; the polarized ones, either tantalum or electrolytic. The nominal frequency of the crystal in the vxo (Q10) is not critical. Crystals from 7.422 to 7.425 were easily tuned.

Although many of the parts used can be salvaged from a CB board, two low-cost transistors were used throughout. In most cases, any of the NPN rf low-power transistors in a CB will probably work in place of the 2N2222, and audio and switching NPNs can replace the 2N4400. C_T is the fine-tuning control that covers only 5 kHz, so it doesn't need much knob reduction. I used a 5:1 vernier and I wouldn't recommend any larger ratio.

The first step in tune-up is preliminary adjustment of the vco. With power applied, temporarily ground the phase-detector output by shorting the .022 capacitor in the Ø line, set C_E to minimum capacity, and determine if Q8 is oscillating. This can be done with a counter or by placing a lead from a shortwave-receiver input near C_D and tuning the receiver in the area of 4.5 to 6 MHz. If it is not oscillating, increment C_E to larger capacities and continue to check until its signal is picked up. Then adjust L_A so the generated signal is about 5.55 MHz. Remove the short across the Ø line.

The initial adjustment of the vxo (Q10) is done in the receive mode with no voltage applied to the T/R terminal and with the RIT pot at its middle position. Loosely couple a frequency counter or receiver input to the source of Q10, set C_A to its middle position, and set C_B and C_C to their minimum capacities. Check the frequen-

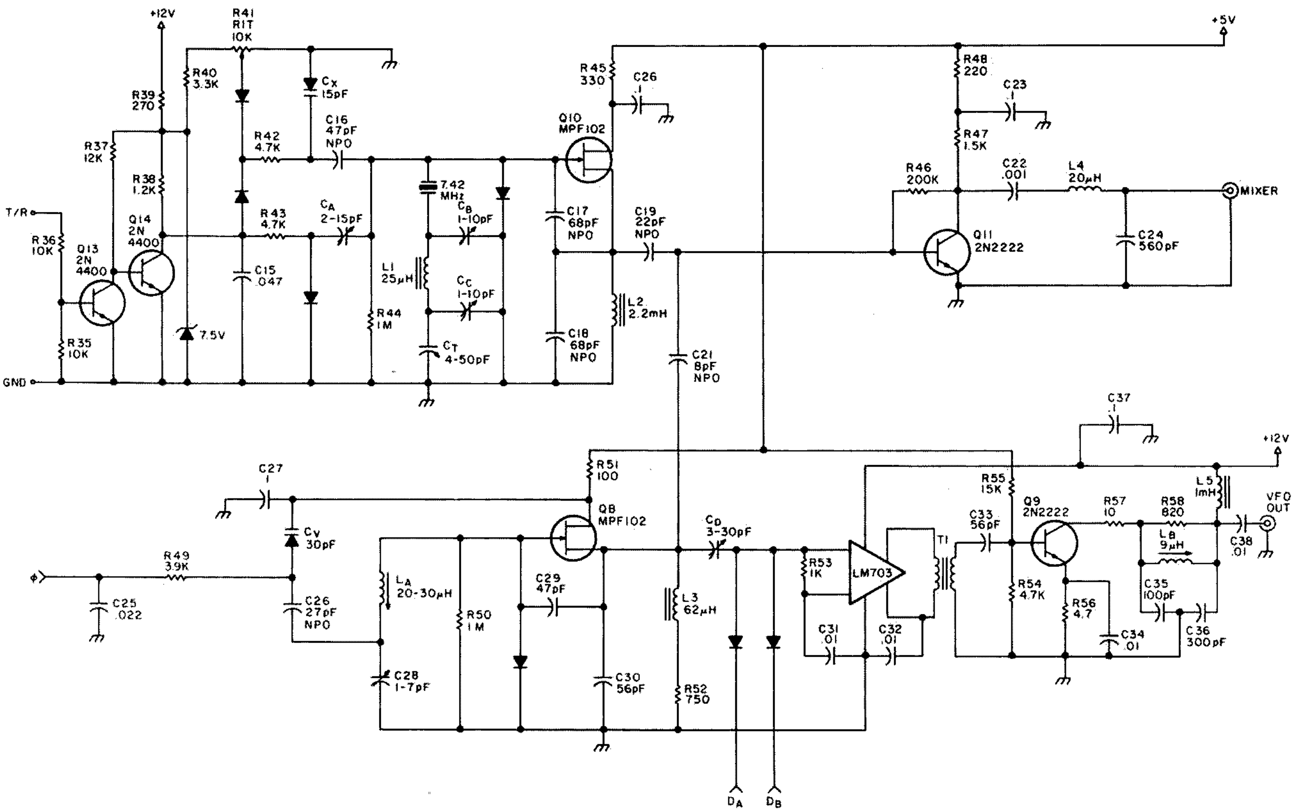


Fig. 2. Oscillators.

cy of Q10 at maximum and minimum settings of C_T. At 10 degrees short of minimum capacity, the desired frequency is 7.420 MHz. At 10 degrees short of maximum capacity, it should be 7.415 MHz. The ten degrees on either end allows for some overlap and keeps the dial markings in the more linear range of the capacitor. As C_B and C_C interact with each other, it is necessary to repeat their adjustments using C_C when C_T is near minimum and C_B when C_T is almost fully meshed.

When these adjustments are completed, set C_T near maximum and note the frequency. With +12 volts applied to the T/R terminal, adjust C_A to the same frequency. Leave the 12 volts connected to the T/R terminal until the rest of the alignment is done. If there are circuit errors, much time can be saved if the rest of the checks and adjustments are done systematically.

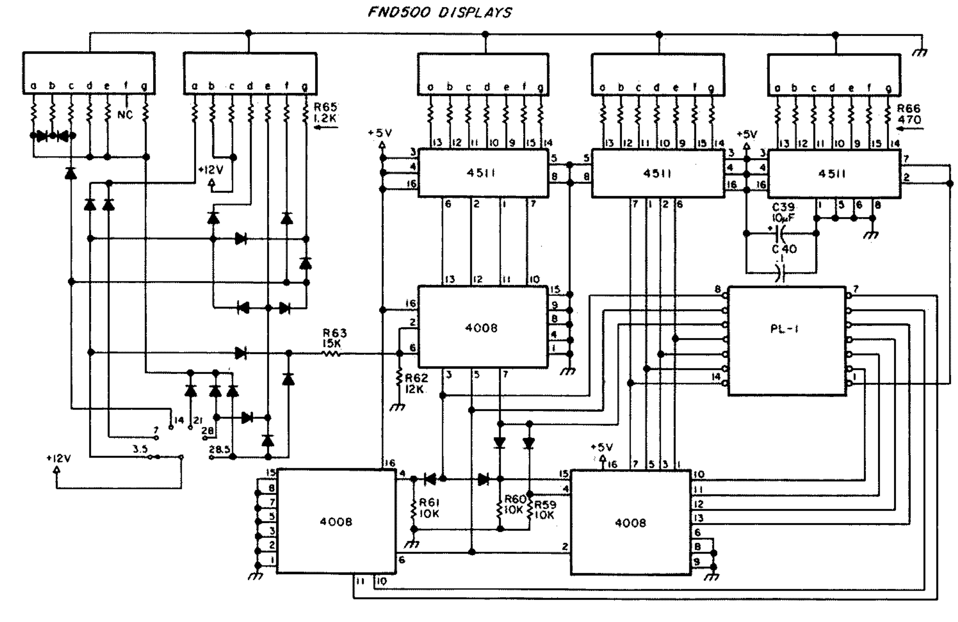


Fig. 3. Display.

Check the waveform at pin 9 of the 7473 with a scope. It should be a clean 5.12-MHz square wave. In lieu of a scope, loosely couple a receiver input to pin 9 by laying the antenna lead close to it and tune the receiver to 5.12 MHz. If the signal is steady and pure, the reference oscillator can be assumed to be working OK.

To check out the counter, measure the dc voltage present at pin 15 of the PLL (MC145109). It should swing from zero to nearly +5 volts as the counters are enabled by either the UP or DOWN switches. Check each of the counter output lines, pins 14 through 9 on the PLL. They, too, should alternate between zero and +5 volts, but at successive-

ly slower rates, when the UP or DOWN switches are closed. When you're satisfied with the results, run the counter up or down until pins 9 through 15 are all at zero volts. This represents a setting of 384 for the divide by N counter in the PLL. As the reference frequency is 5 kHz, the phase detector will lock on a frequency of 1.92 MHz (384 × 5000). If the vxo tuning capacitor (C_T) is set near minimum to a frequency of 7.420 MHz, then the phase detector in the PLL will try to tune the vco to 5.5 MHz (7.42 − 1.92). Note that the varicap in the vco returns to a positive voltage so the vco frequency will be lowered as the 0 voltage becomes more positive. Adjust L_A until it locks with a voltage of about +.3 volts at pin 5 of the PLL. Run the count from the 4029s to 483 (2.415 MHz) to make sure it stays in lock, then stabilize the slug of L_A with hot wax.

To adjust the vfo buffer and output, temporarily connect a 47- or 51-Ohm, 2-Watt carbon resistor across the vfo output jack and tune L_B for maximum output at 5.2 MHz. Adjust the rf output to about one volt with C_D, and remove the 2-Watt resistor.

The 10.24-MHz reference oscillator is most easily trimmed with the aid of a frequency counter. If the vfo is to be used with a transceiver with a built-in counter, precise alignment is not that important. In any case, you may want to calibrate the 5-kHz dial of C_T.

For the UP, DOWN, and

Parts List

Resistors (¼-Watt carbon):	
R56 (1)	4.7 Ohm
R57 (1)	10 Ohm
R51 (1)	100 Ohm
R48 (1)	220 Ohm
R39 (1)	270 Ohm
R45 (1)	330 Ohm
R26 (1), R33 (1)	390 Ohm
R9 (1), R66 (21)	470 Ohm
R52 (1)	750 Ohm
R58 (1)	820 Ohm
R13 (1), R15 (1), R17 (1), R31 (1), R53 (1)	1k
R38 (1), R65 (13)	1.2k
R1 (1), R7 (1), R20 (1), R47 (1)	1.5k
R6 (1)	1.8k
R4 (1)	2.0k
R12 (1)	2.2k
R3 (1)	2.7k
R10 (1), R14 (1), R18 (1), R40 (1)	3.3k
R49 (1)	3.9k
R21 (1), R42 (1), R43 (1), R54 (1)	4.7k
R30 (1)	5.1k
R22 (1), R23 (1), R24 (1)	6.8k
R29 (1), R34 (1), R35 (1), R36 (1), R59 (1), R60 (1), R61 (1)	10k
R37 (1), R62 (1)	12k
R55 (1), R63 (1)	15k
R11 (1), R27 (1), R28 (1)	22k
R5 (1), R8 (1), R19 (1), R25 (1)	39k
R32 (1)	47k
R2 (1)	100k
R46 (1)	220k
R44 (1), R50 (1)	1 meg
Potentiometers (standard 2-Watt carbon):	
R41 (1)	10k
R16 (1)	100k
Capacitors (ceramic NPO):	
C21 (1)	8 pF
C19 (1)	22 pF
C26 (1)	27 pF
C16 (1), C29 (1)	47 pF
C3 (1), C30 (1), C33 (1)	56 pF
C35 (1)	100 pF
(polystyrene):	
C36 (1)	300 pF
C24 (1)	560 pF
Capacitors (disc ceramic):	
C4 (1), C22 (1)	.001 uF
C6 (1), C10 (1), C31 (1), C32 (1), C34 (1), C38 (1)	.01 uF
C8 (1), C15 (1)	.047 uF
C5 (1), C20 (1), C23 (1), C27 (1), C37 (1), C40 (1), C44 (1)	.1 uF
(mylar):	
C25 (1)	.022 uF
C9 (1)	.22 uF
(tantalum):	
C11 (1)	.56 uF
C12 (1)	4.7 uF
(25-volt electrolytic):	
C7 (1), C13 (1), C14 (1), C39 (1), C43 (1), C45 (1)	10 uF
C41 (1), C42 (1)	1000 uF
(varicaps):	
C_X (1)	15 pF
C_V (1)	30 pF
(miniature ceramic trimmers):	
C28 (1)	1-7 pF
C_B (1), C_C (1)	1-10 pF
C_A (1)	2-15 pF
C1 (1)	5-60 pF
(mica compression trimmer):	
C_D (1)	3-30 pF
(standard air variable):	
C_T (1)	4-50 pF
Inductors (hi-Q, fixed):	
L4 (1)	20 uH
L1 (1)	25 uH
L3 (1)	62 uH
L5 (1)	1 mH
L2 (1)	2.2 mH
(shielded, variable):	
L_B (1)	7-10 uH
L_A (1)	20-30 uH
Transformers:	
T1 (1) (described in text)	rf
T2 (1) 115-V:12.6-V, 1-A	power
Transistors:	
Q8 (1), Q10 (1)	MPF102 FET
O1 (1), Q2 (1), Q9 (1), O11 (1), Q12 (1)	2N2222
Q3 (1), Q4 (1), O5 (1), Q6 (1), Q7 (1)	2N4400

Diodes:

2	LED	OB, LD
35	1N4148	signal diodes
1	1-A, 50-V	bridge rectifier

Integrated circuits:

1	LM340T12	voltage regulator
1	LM340T5	voltage regulator
1	LM703K	rf amplifier
3	4029	counters
3	4008	adders
3	4511	BCD-to-7 segment decoders
1	7473	dual flip-flop
1	MC145109	PLL circuit

Circuit boards, hardware, case, etc.

TRIONYX INC MANUFACTURER OF ELECTRONIC TEST EQUIPMENT 600 MHZ FREQUENCY COUNTERS $ 159.95 2 METER 5/8 WAVE HT ANTENNA $ 12.95 RUBBER DUCKS FORM $6.95 TO $7.95 DC TO DC H.T. CHARGERS $9.95 AMATEUR TV MICROWAVE SYSTEMS AND KITS

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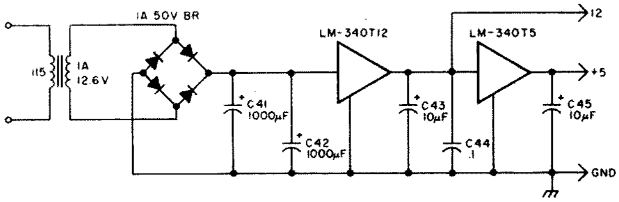

Fig. 4. Power supply.

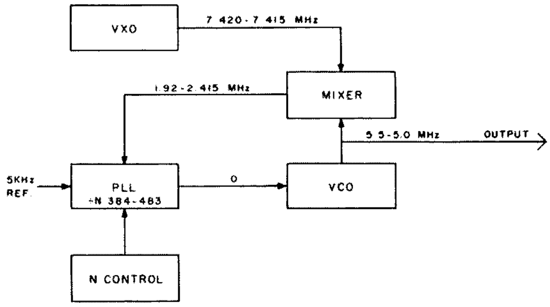

Fig. 5. Block diagram.

FAST switches, I used calculator keypads and the shaft and bushing of a discarded pot. A clockwise pressure closes the UP switch, counterclockwise the DOWN, and a gentle push puts it in FAST.

Construction and adjustment were not difficult. And best of all, several months of use have demonstrated its stability, reliability, and operating ease. It gives me what I want: A rock-hard signal with a soft touch. ■

COMPLETE READY-TO-USE SYSTEMS

ATV TRANSMITTER/CONVERTER

$399

TC-1

★ High resolution and color video
★ 10 watts output
★ Broadcast standard sound
★ Tunable downconverter and preamp

Connect to the antenna terminals of any TV set, add a good 450 MHz antenna, a camera and there you are . . . Show the shack, home movies, computer games, video tapes, etc.

ATV DOWNCONVERTER

For those who want to see the ATV action before they commit to a complete station, the TVC-4 is for you. Great for public service setups, demos, and getting a buddy interested. Just add an antenna and a TV set tuned to CH. 2, 3, or 4 and plug in to 117 volts a.c. $89.00

TVC-4

TVC-4L extra low-noise version . . . $105 delivered in USA

MODULES

TXA5-4 Exciter/Modulator . . . . . . $89.00 ppd. Wired and tested module designed to drive PA5 10 watt linear amplifier. The 100 MHz crystal design keeps harmonics out of two meters for talk back. Video modulator is a full 8 MHz for computer graphics and color. Requires 13.8 VDC reg. @ 70 ma. 80 mw output power. Tuned with crystal on 439.25, 434 or 426.25 MHz
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TVC-2 ATV Downconverter . . . . . . $49.00 ppd. Stripline MRF 901 preamp and double balanced mixer digs out the weak ones and resists intermod and overload. Connects between UHF antenna and TV set. Output channels 2 or 3. Varicap tuner 420 to 450 MHz. Requires 12 to 18 VDC @ 20 ma.
Extrasensitive TVC 2L with NE64535 preamp (.9 dB NF) . . . . $59.00 ppd.
Supersensitive TVC 2G with GaAs Fet preamp (.5 dB NF) ant. mount . . . . $79.00 ppd.

FMA5 Audio Subcarrier Generator . $29.00 ppd. Puts audio on your camera video just as broadcast does at 4.5 MHz. Puts out 1 V p-p to drive TXA5. Requires low Z mike, 150 to 600 Ω and 12 to 18 VDC @ 25 ma. Works with any transmitter with 5 MHz video bandwidth.

PA5 10 Watt ATV Power Amplifier . $89.00 ppd. The PA5 will put out 10 watts RMS power on sync tips when driven with 80 mw by the TXA5 exciter. 50 ohms in and out plus bandwidth for the whole band with good linearity for color and sound. Requires 13.8 VDC reg. @ 3 amps.

Let P.C. put you on the air and SAVE!
All four modules —
Complete System price $245.00
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Call or write for our complete catalog of specifications, station setup diagrams, and optional accessories which include: antennas, modulators, test generators, cameras and much, much more. See Ch. 14 1983 ARRL Handbook.

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John E. Fail KL7GRF
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Long Beach CA 90805

Foolproof Logging

KL7GRF designed a logbook program that any TRS-80 owner can use. And it manages your QSLs, too.

As all amateurs know, the rules for logbookkeeping have been relaxed considerably by the FCC in recent years. For most amateurs, however, the log is akin to a ship's log. It is kept and kept accurately.

In these days when home computers are invading households all over America, the ham shack is one of most likely places to find a home computer. One of the most common of these is the Radio Shack TRS-80*, the largest-selling home computer in the world. Software is plentiful for the TRS-80, and programs of almost any kind can be found at your local computer store, which brings me to the subject of this article.

The home computer is a natural for keeping a log and keeping it well. Described herein is a logkeeping program that should satisfy the requirements of almost any amateur. In designing this

*TRS-80 is a trademark of Radio Shack, a division of Tandy Corporation.

Program listing.

```
10 CLEAR7000
20 CLS:DIML$(100,10):FORT=1TO10:READLE$(T):NEXTT
30 DATADATE,TIME,STATION,SIGNAL SENT,SIGNAL RCVD,MODE,FREQUENCY,REMARKS,QSL SENT
,QSL RCVD
40 RESTORE
50 C$="KL7GRF":CA$="LOG BOOK FOR AMATEUR RADIO STATION ":T$="UTC":E$=CHR$(255):D
$=STRING$(63,145):LL$=STRING$(79,"-")
60 H$="    %  %    %     %  %  % %  % %  %    %        % %   % %   %"
70 F$="##. %  %% % %      % %  % %  % %     % %        % % %   % %"
80 G$="%      % %                                      %"
90 IFSK=1THEN1190
100 IFSW=1THEN300
110 PRINT@198,"AMATEUR RADIO LOGBOOK BY JOHN E. FAIL KL7GRF."
120 PRINT@320,"100 DAILY ENTRIES ARE ALLOWED. EXTENSIVE USE OF SINGLE KEY"
130 PRINT@384,"INPUT IS USED EXCEPT DURING ACTUAL DATA ENTRY.  SINGLE KEY"
140 PRINT@448,"INPUTS ARE ENCLOSED WITHIN PARENTHESES, EXAMPLE ---> (C)."
150 PRINT@648,"PRESS (C) TO CONTINUE WITH THE PROGRAM."
160 GOSUB1690:IFB$<>"C"THEN160
170 CLS:PRINT@10,CA$;C$:PRINT:PRINTD$:PRINT:PRINT"1. CREATE A NEW DAYS LOG.":PRI
NT"2. ADD TO EXISTING LOG.":PRINT"3. UPDATE QSL INFORMATION"
180 PRINT"4. SAVE LOG TO DISK.":PRINT"5. LOAD LOG FROM DISK.":PRINT"6. SUMMARY O
F DAYS LOG.":PRINT"7. OUTPUT LOG TO PRINTER."
190 PRINTD$:PRINT@896,"YOUR SELECTION PLEASE (1-8) ?";
200 GOSUB1690:C=VAL(B$):IFC<1ORC>8THEN200
210 ONCGOTO220,700,730,960,1140,1380,1530:GOTO170
220 'NEW LOG
230 IFLEN(L$(1,2))=0THEN300
240 GOSUB1790
250 GOSUB1690
260 IFB$="C"THEN290
270 IFB$="R"THEN170
280 GOTO250
290 GOTO1750
300 DY$="":SW=0:CLS:PRINT@448,"(ENTER) THE DATE TODAY, USE FORMAT SHOWN -> MAY21
.";:INPUTDY$:IFDY$="X"THEN170
310 IFLEN(DY$)<>7THENGOSUB1710:GOTO300
320 GOSUB1780
330 FORX=1TO101
340 IFX=101THENGOSUB1870:GOTO170
350 L$(X,1)=LE$(1)
360 IFLEN(L$(X,2))>0THEN690
370 CLS:PRINT@10,CA$;C$:PRINTD$
380 PRINT@192,"LOG ENTRY NUMBER:";X;:PRINT@216,"*USE (ENTER) KEY*":PRINT@237,"DA
TE: ";DA$
390 PRINT@320,LE$(2);:PRINT@334,STRING$(4,136);:PRINT@339,T$;:PRINT@332,CHR$(14)
;:INPUTL$(X,2):PRINT@332,CHR$(128)
400 IFLEN(L$(X,2))=0ORLEN(L$(X,2))>4THENPRINT@320,E$:GOSUB1720:GOTO390
410 PRINT@384,LE$(3);:PRINT@398,STRING$(8,136);:PRINT@396,CHR$(14);:INPUTL$(X,3)
:PRINT@396,CHR$(128)
420 IFLEN(L$(X,3))<1ORLEN(L$(X,3))>8THENPRINT@384,E$:GOSUB1720:GOTO410
430 PRINT@448,LE$(4);:PRINT@462,STRING$(4,136);:PRINT@460,CHR$(14);:INPUTL$(X,4)
:PRINT@460,CHR$(128)
440 IFLEN(L$(X,4))<1ORLEN(L$(X,4))>4THENPRINT@448,E$:GOSUB1720:GOTO430
450 PRINT@512,LE$(5);:PRINT@526,STRING$(4,136);:PRINT@524,CHR$(14);:INPUTL$(X,5)
:PRINT@524,CHR$(128)
460 IFLEN(L$(X,5))<1ORLEN(L$(X,5))>4THENPRINT@512,E$:GOSUB1720:GOTO450
470 PRINT@576,LE$(6);:PRINT@590,STRING$(7,136);:PRINT@588,CHR$(14);:INPUTL$(X,6)
:PRINT@588,CHR$(128)
480 IFLEN(L$(X,6))<1ORLEN(L$(X,6))>7THENPRINT@576,E$:GOSUB1720:GOTO470
490 PRINT@640,LE$(7);:PRINT@654,STRING$(7,136);:PRINT@652,CHR$(14);:INPUTL$(X,7)
:PRINT@652,CHR$(128)
500 IFLEN(L$(X,7))<1ORLEN(L$(X,7))>7THENPRINT@640,E$:GOSUB1720:GOTO490
510 PRINT@704,LE$(8);:PRINT@718,STRING$(40,136);:PRINT@716,CHR$(14);:INPUTL$(X,8
):PRINT@716,CHR$(128)
520 IFLEN(L$(X,8))>40THENPRINT@704,E$:L$(X,8)="":GOSUB1720:GOTO510
530 PRINT@768,LE$(9);:PRINT@782,STRING$(3,136);:PRINT@780,CHR$(14);:INPUTL$(X,9)
:PRINT@780,CHR$(128)
540 IFLEN(L$(X,9))>3THENPRINT@768,E$:L$(X,9)="":GOSUB1720:GOTO530
550 PRINT@832,LE$(10);:PRINT@846,STRING$(3,136);:PRINT@844,CHR$(14);:INPUTL$(X,1
0):PRINT@844,CHR$(128)
560 IFLEN(L$(X,10))>3THENPRINT@832,E$:L$(X,10)="":GOSUB1720:GOTO550
570 PRINT@980,"DATA CORRECT (Y/N) ?";
580 GOSUB1690
590 IFB$="Y"THEN640
600 IFB$="N"THEN620
610 GOTO580
620 FORZ=1TO10:L$(X,Z)="":NEXTZ
630 GOTO370
640 PRINT@980,"ANOTHER ENTRY (Y/N) ?";
650 GOSUB1690
660 IFB$="Y"THEN690
670 IFB$="N"THEN170
680 GOTO650
690 NEXTX
700 'ADD TO EXISTING LOG
710 IFLEN(L$(1,2))=0THENGOSUB1730:GOTO170
720 GOTO330
730 'UPDATE QSL INFO
740 IFLEN(L$(1,2))=0THENGOSUB1730:GOTO170
750 CLS:SO=0:PRINT@448,"(ENTER) RECORD NUMBER OF ENTRY TO BE UPDATED, (101) TO E
XIT";:INPUTX:IFX=101THEN170
760 IFX<1ORX>101THEN750
770 IFLEN(L$(X,2))=0THENCLS:PRINT@464,"NO DATA FOR RECORD NUMBER";X;"IN FILE":FO
RT=1TO500:NEXTT:GOTO750
780 CLS:PRINT@256,USINGH$;LE$(2),LE$(3),RIGHT$(LE$(9),4),RIGHT$(LE$(10),4),LE$(6
),LE$(7),LEFT$(LE$(9),5),LEFT$(LE$(10),5)
790 PRINT@320,USINGF$;X,L$(X,2),T$,L$(X,3),L$(X,4),L$(X,5),L$(X,6),L$(X,7),L$(X,
9),L$(X,10):L$(X,9)="":L$(X,10)=""
800 PRINT@388,USINGG$;LE$(8),L$(X,8)
810 PRINT@448,LE$(9);:PRINT@462,STRING$(3,136);:PRINT@460,CHR$(14);:INPUTL$(X,9)
820 IFLEN(L$(X,9))>3THENPRINT@448,E$:GOSUB1720:GOTO810
830 PRINT@512,LE$(10);:PRINT@526,STRING$(3,136);:PRINT@524,CHR$(14);:INPUTL$(X,1
0)
840 IFLEN(L$(X,10))>3THENPRINT@512,E$:GOSUB1720:GOTO830
850 PRINT@661,"DATA CORRECT (Y/N) ?"
860 GOSUB1690
870 IFB$="Y"THENSO=0:GOTO900
880 IFB$="N"THENGOTO780
```

program, I attempted to make it versatile and easy to change to fit an individual amateur's requirements. Most of all, I attempted to make it compatible with 16K cassette TRS-80 owners, as well as those with disk-drive systems. It's a toss-up as to which peripheral most will upgrade to from the cassette-based system, a printer or disk drives. Another consideration was keeping it suitable for those who use cassettes with a printer, but don't have disk drives.

The program uses sequential I/O techniques instead of random-access files. I chose this method so that the program could be easily modified to run on cassette as well as disk. Some purists will argue that random I/O is the only way to go. However, the average amateur does not make more than 10-15 contacts a day. Therefore, the in-memory storage of information is practical if the log and its data are based on daily files instead of keeping a month's log in one file on a disk.

This program is written in Microsoft Basic for the TRS-80, but should be easily adaptable to other computers, such as Apple, North Star, and others.

The program features the following:

1. In-memory log for all contacts in a day's operation.
2. Add-on to a log or previously-filed log.
3. QSL information and management of received QSL as well as outgoing QSL information. Manipulation of QSL files is provided.
4. A hard-copy printout of each day's log data.
5. Permanent filing of log data on disk or cassette on a daily basis.
6. Compatibility with 16K as well as larger systems.
7. Day's log summary is provided on the video terminal.
8. Allows for 100 entries a day (as is), which should be changed for smaller systems and increased for larger systems if desired (details on this later).
9. "Customizing" the log to fit your requirements is easy.

```
           LOG BOOK FOR AMATEUR RADIO STATION KL7GRF

....................................................

1. CREATE A NEW DAYS LOG.
2. ADD TO EXISTING LOG.
3. UPDATE QSL INFORMATION
4. SAVE LOG TO DISK.
5. LOAD LOG FROM DISK.
6. SUMMARY OF DAYS LOG.
7. OUTPUT LOG TO PRINTER.
....................................................

YOUR SELECTION PLEASE (1-7) ?
```

Fig. 1. Sample of directory on video display.

```
      TIME     STATION  SENT RCVD MODE    FREQUENCY QSL S QSL R
   5. 1513UTC W6DOW     59   59   SSB     3850.1    NO    NO
      REMARKS AMSAT NET
  QSL SENT     ? YES
  QSL RCVD     ? NO.

                   DATA CORRECT (Y/N) ?
```

Fig. 2. Sample of QSL update on video display.

The Program

The program is numbered starting at line 10 in increments of 10, so just set the TRS-80 to AUTO 10,10 and start entering the program. Lines 10-80 set up the variables, DIM statement for the actual data entries (L$), and establish data statements for use later in the program. Change string variable C$ in line 50 to your own callsign. String variable T$ in line 50 is set to UTC (Universal Coordinated Time); if you desire to set time inputs to local time, change T$ to "PDT" or whatever. Do not exceed three letters in T$ or it will throw off the PRINT@ strings in lines 60, 70, and 80. The CLEAR statement in line 10 should be changed for smaller systems as well as the DIM stratement in line 20 (more on this later). Variables SK and SW are switches used to reset all variables to null for restarting a new log or loading data from disk or cassette.

Lines 110-160 are merely there to prompt you through the first few times you use the program; they can be deleted when you are familiar with the program, shortening execution time and saving memory. The remainder of the program should be unchanged except as described later when detailing changes for the cassette-based system. Disk-drive operators can use the program "as is."

```
890 GOTO860
900 PRINT@661,"ANOTHER UPDATE (Y/N) ?"
910 GOSUB1690
920 IFB$="Y"THEN730
930 IFB$="N"THEN950
940 GOTO910
950 CLS:PRINT@455,"DON'T FORGET TO SAVE THIS LOG BACK TO DISK!!!!":FORT=1TO1000:
NEXTT:GOTO170
960 'SAVE TO DISK
970 IFLEN(L$(1,2))=0THENGOSUB1730:GOTO170
980 GOSUB1760
990 GOSUB1690
1000 IFB$="D"THEN1030
1010 IFB$="X"THEN170
1020 GOTO990
1030 FS$=DY$+"/LST"
1040 OPEN"O",1,FS$
1050 CLS:PRINT@468,"SAVING ENTRY #:"
1060 FORX=1TO100
1070 IFLEN(L$(X,2))=0THEN1130
1080 PRINT@483,X
1090 FORZ=1TO10
1100 PRINT#1,X,CHR$(34);L$(X,Z);CHR$(34)
1110 NEXTZ
1120 NEXTX
1130 CLOSE:GOTO170
1140 'LOAD FROM DISK
1150 IFLEN(L$(1,2))<>0THENGOSUB1790ELSE1190
1160 GOSUB1690
1170 IFB$="C"THENGOTO1740
1180 IFB$="R"THEN170
1190 FS$="":SK=0:CLS:PRINT@448,"(ENTER) FILE DESIRED,USE EXAMPLE, -> MAY2181 (EN
TER) 'X' TO EXIT":INPUTFS$:IFFS$="X"THEN170
1200 IFLEN(FS$)<>7THENGOSUB1710:GOTO1190
1210 GOSUB1760
1220 GOSUB1690
1230 IFB$="D"THEN1260
1240 IFB$="X"THEN170
1250 GOTO1220
1260 ONERRORGOTO1360
1270 FS$=FS$+"/LST":CLS:PRINT@468,"LOADING ENTRY #:"
1280 OPEN"I",1,FS$
1290 FORX=1TO100
1300 PRINT@484,X
1310 FORZ=1TO10
1320 IFEOF(1)THEN1360
1330 INPUT#1,X,L$(X,Z)
1340 NEXTZ
1350 NEXTX
1360 CLOSE(1):DY$=LEFT$(FS$,7):GOSUB1780:GOTO170
1370 GOTO170
1380 'PRINT SUMMARY
1390 IFLEN(L$(1,2))=0THENGOSUB1730:GOTO170
1400 P=128:X=1
1410 CLS:PRINTTAB(20)"LOG SUMMARY: ";DA$
1420 IFX=101THENGOSUB1770:GOSUB1690:GOTO170
1430 PRINT@64,USINGH$;LE$(2),LE$(3),RIGHT$(LE$(9),4),RIGHT$(LE$(10),4),LE$(6),LE
$(7),LEFT$(LE$(9),5),LEFT$(LE$(10),5)
1440 IFLEN(L$(X,2))=0THENGOSUB1770:GOSUB1690:IFB$="R"THEN170ELSE1440
1450 PRINT@P,USINGF$;X,L$(X,2),T$,L$(X,3),L$(X,4),L$(X,5),L$(X,6),L$(X,7),L$(X,9
),L$(X,10)
1460 P=P+64:PRINT@P+4,USINGG$;LE$(8),L$(X,8)
1470 IFP=832THEN1480ELSEP=P+64:X=X+1:GOTO1440
1480 PRINT@960,"PRESS (C) TO CONTINUE SUMMARY, PRESS (R) TO EXIT TO DIRECTORY";
1490 GOSUB1690
1500 IFB$="C"THENX=X+1:P=128:GOTO1410
1510 IFB$="R"THEN170
1520 GOTO1490
1530 'PRINT LOG
1540 IFLEN(L$(1,2))=0THENGOSUB1730:GOTO170
1550 CLS:PRINT@460,"LINE UP PAPER, PLACE PRINTER ON LINE.":PRINT@523,"PRESS (P)
TO PRINT, PRESS (X) TO ABORT."
1560 GOSUB1690
1570 IFB$="P"THEN1600
1580 IFB$="X"THEN170
1590 GOTO1560
1600 CLS:PRINT@470,"PRINTING LOG":PG=0:GOSUB1820
1610 FORX=1TO100
1620 IFLEN(L$(X,2))=0THEN1660
1630 LPRINTTAB(5)USINGF$;X,L$(X,2),T$,L$(X,3),L$(X,4),L$(X,5),L$(X,6),L$(X,7),L$
(X,9),L$(X,10)
1640 LPRINTTAB(9)USINGG$;LE$(8),L$(X,8):LPRINTLL$:LC=LC+3:GOSUB1850
1650 NEXTX
1660 LPRINT"":LPRINTTAB(25)"END OF LOG FOR "DA$
1670 GOTO170
1680 END
1690 B$=INKEY$:IFB$=""THEN1690
1700 RETURN
1710 CLS:PRINT@473,"IMPROPER ENTRY":FORT=1TO700:NEXTT:RETURN
1720 PRINT@974,"NO ENTRY PROVIDED OR INPUT TOO LONG";:FORT=1TO400:NEXTT:PRINT@96
0,E$;:RETURN
1730 CLS:PRINT@459,"THERE IS NO DATA PRESENT IN THE FILE !!!":FORT=1TO800:NEXTT:
RETURN
1740 CLEAR:SK=1:GOTO20
1750 CLEAR:SW=1:GOTO20
1760 CLS:PRINT@453,"INSERT DATA DISK AND PRESS (D), PRESS (X) TO ABORT":RETURN
1770 PRINT@960,"END OF LIST FOR "DA$" PRESS (R) TO RETURN TO DIRECTORY";:RETURN
1780 DA$=LEFT$(DY$,3)+" "+MID$(DY$,4,2)+", 19"+RIGHT$(DY$,2):RETURN
1790 CLS:PRINT@448,"THERE IS DATA ON FILE FOR "DA$", IT WILL BE LOST IF":PRINT@5
12,"YOU CONTINUE FURTHER. PRESS (C) TO CONTINUE OR PRESS (R)"
1800 PRINT@576,"TO RETURN TO DIRECTORY."
1810 RETURN
1820 PG=PG+1:LC=0:LPRINTTAB(5)CA$;C$;", ";DA$;" PAGE:";PG:LPRINTLL$:LPRINTTAB(5)
USINGH$;LE$(2),LE$(3),RIGHT$(LE$(9),4),RIGHT$(LE$(10),4),LE$(6),LE$(7),LEFT$(LE$
(9),5),LEFT$(LE$(10),5)
1830 LPRINTLL$:LC=LC+4
1840 RETURN
1850 IFLC=58THENLPRINTSTRING$(7,CHR$(10)):GOSUB1820
1860 RETURN
1870 CLS:PRINT@470,"THE LOG IS FULL!!!":FORT=1TO600:NEXTT:RETURN
```

```
LOG BOOK FOR AMATEUR RADIO STATION KL7GRF, MAY 21, 1981 PAGE: 1
-----------------------------------------------------------------------
     TIME     STATION  SENT RCVD MODE       FREQUENCY QSL S QSL R
-----------------------------------------------------------------------
  1. 0413UTC W6SP      59   59   SSB        144       YES   NO
     REMARKS JOHN  RANCHO PALOS VERDES CA. QSL DIRECT
-----------------------------------------------------------------------
  2. 0615UTC W6MMK     56   57   OSCAR 8 MODE J       YES   NO
     REMARKS VIC  DUARTE  CA.
-----------------------------------------------------------------------
  3. 0812UTC W6HEW     54   54   OSCAR 7 MODE B       NO    NO
     REMARKS MORT  SAN CLEMENTE CALIF.
-----------------------------------------------------------------------
  4. 1213UTC W3OEY     59   59   SSB        14282.0   YES   NO
     REMARKS JAN KING  MARYLAND  QSL VIA BUREAU
-----------------------------------------------------------------------
  5. 1513UTC W6DON     59   59   SSB        3850.1    YES   NO
     REMARKS AMSAT NET
-----------------------------------------------------------------------
  6. 1514UTC W6CG      59   59   SSB        3850.0    NO    NO
     REMARKS AMSAT NET
-----------------------------------------------------------------------

                END OF LOG FOR MAY 21, 1981
```

Fig. 3. Sample of printer output.

Operation of the Program

Extensive use is made of the INKEY$ function in the program, making it faster in use. The only time the ENTER key is used is when more than one character is to be entered. When you see a letter in parentheses, "(C)", it means that a single key input is requested and the ENTER key is not required. When the ENTER key is required, it will appear as "(ENTER)" a value. Lots of error trapping is included, so it is hard to make a mistake. Wherever a mistake is possible or imminent, a message is provided on the screen and the opportunity to exit the danger area is provided by an exit function.

No delete-entry routine is provided, since a log is defined by law as a legal document. Corrections should be made by drawing a line through the deleted or changed entry. They should then be initialed by the person making the change(s). Any changes to the log can be inserted on the hard copy produced by the printer. The printer output routine is based on an 80-column printer. The format of the output to the printer is shown in Fig. 3.

The DIRECTORY video display (Fig. 1) is single-key entry. Selecting "1. CREATE A NEW DAYS LOG" clears and resets all variables. If data is present in memory, you will be warned and given the opportunity to exit to the directory and save the data to disk. If the data has already been saved and you want to start a new log, merely press the (C) key and the program will proceed to start the new setup. If no log data is present in memory, the program will proceed normally. A word of warning: When starting a new log, you will be asked for the date in a specific input manner, i.e., MAY2181. Note that no spaces are allowed. The date display is derived from this input and, more importantly, the Filespec for writing to disk is derived from it. The program checks to make sure you did in fact put 7 characters in and gives you an error message if it detects any fewer or more than 7 characters. No checking is done for proper sequence. A disk and cassette file will not accept a number as the first character of a filespec, so pay particular attention to this question.

"2. ADD TO EXISTING LOG." If data for a given day is already in memory and you wish to add to it, just press 2 and it will select the next available sequential number available and display the data input form. If you wish to add on to a filed log (on disk or cassette), load that log through the "LOAD LOG FROM DISK" function and then select the "ADD" function. Don't forget to save the log back to disk. Killing the old file is not needed since sequential techniques write over the old file which will have the same Filespec as what you write back out after additions to the log. This is a bit of a problem for cassette systems, as will be described later.

"3. UPDATE QSL INFORMATION" is a routine to account for outstanding QSL cards received. The procedure for this is to load the file for the data to be updated through the "LOAD FROM DISK" function. Then use the "SUMMARY" function to locate the entry you wish to update (or use the printed copy previously printed to locate the entry number). Enter the "UPDATE" function and make the corrections. The display for "UPDATE" is shown in Fig. 2.

"4. SAVE LOG TO DISK." When completing a day's operation, use this function to save the data to disk. The Filespec is automatically created using the date question described earlier. Use this function to save back to disk after using the "UPDATE" function or "ADD TO LOG" function if a file was loaded for addition of entries.

"5. LOAD LOG FROM DISK" is used to retrieve old files for QSL manipulation or "ADD." You will be asked the date question again here. Use care: The computer creates the Filespec from this information.

"6. SUMMARY OF DAYS LOG" gives a rundown of the day's operation (see Fig. 5). This can be looked at after loading an old file or with data already in memory.

"7. OUTPUT LOG TO PRINTER" provides neat, orderly output to a line printer for permanent record purposes. It is based in format on many of the commonly available logbooks (see Fig. 3). Full pagination is

1. Change line 10 to: CLEAR4000
2. Change DIML$ statement in line 20 to: L$(50,10)
3. Change "DISK" to "CASSETTE" in lines 180 (2 times), 950, 960, and 1140
4. Change line 330 to: FORX = 1TO51
5. Change line 340 to: IFX = 51THENGOSUB1870:GOTO170
6. Change line 1610 to: FORX = 1TO50

SAVE TO CASSETTE SECTION

7. Change line 1000 to: IFB$ = "D"THEN1050
8. Delete line 1030
9. Delete line 1040
10. Add line 1055: PRINT#-1,DY$
11. Change line 1060 to: FORX = 1TO50
12. Delete line 1070
13. Add line 1095: IFLEN(L$(X,2)) = OTHENL$(X,2) = "##":PRINT#-1,L$(X,2):GOTO170
14. Change line 1100 to PRINT#-1,X,L$(X,Z)
15. Change line 1760 to: CLS:PRINT@384,"1. PLACE DATA TAPE IN RECORDER.":PRINT"2. SET RECORDER TO 'PLAY' AND 'RECORD'.":PRINT"3. PRESS (D) TO SAVE OR (X) TO ABORT." :RETURN

LOAD FROM CASSETTE CHANGES

16. Change line 1210 to: GOSUB1880
17. Add line 1880: CLS;PRINT@448,"1. PLACE DATA CASSETTE IN RECORDER, ADVANCE COUNTER TO LOCATION":PRINT"DESIRED. PRESS (D) TO LOAD, (X) TO ABORT.":RETURN
18. Change line 1260 to: ONERRORGOTO1370
19. Change line 1270 to: CLS:PRINT@468,"LOADING ENTRY #:"
20. Change line 1280 to: INPUT#-1,DY$
21. Change line 1290 to: FORX = 1TO50
22. Change line 1320 to: INPUT#-1,X,L$(X,Z)
23. Change line 1330 to: IFL$(X,Z) = "##"THEN1360
24. Change line 1360 to: GOSUB1780:GOTO170
25. Change the 100 in line 120 to 50

Table 1.

```
            LOG BOOK FOR AMATEUR RADIO STATION KL7GRF
..................................................................

LOG ENTRY NUMBER: 1      *USE (ENTER) KEY*    DATE: MAY 21, 1981

TIME         . 0413 UTC
STATION      . W6SP....
SIGNAL SENT  . 59..
SIGNAL RCVD  . 59..
MODE         . SSB....
FREQUENCY    . 144....
REMARKS      . JOHN  RANCHO PALOS VERDES CA. QSL DIRECT
QSL SENT     . YES
QSL RCVD     . NO.

                    DATA CORRECT (Y/N) ?
```

Fig. 4. Sample of data entry on video display.

provided for 8.5 by 11 inch paper including page numbering.

Data Input to Log

Data input format to the log is shown in Fig. 4. When this display is presented, a series of graphic blocks will be displayed to indicate the maximum length of the input. You must put an entry into each data block. Merely pressing ENTER will cause an error message and a return to that data entry. On the other hand, exceeding the blocks will also cause an error and a reprint of the requested data. The only entries that will accept no data input are REMARKS, QSL SENT, and QSL RCVD. Since this is optional information, the leeway is allowed. After completing the "form," you will be asked if the data is correct; if not, the program returns to the same entry number and resets the block in order for you to retype the entry. If it is correct, the program will ask if you want to add another entry. If not, you return to the directory. The time entry is done in military 4-digit style, i.e., 2343, 0416, etc. No commas or quotes are allowed by the TRS-80 and any data entered after a comma is inserted will be cut off. Periods are OK. The requirement for power input in the log was not forgotten. The TRS-80 video display is limited to 64 characters and addition of power input would have crowded the display quite a bit. So, I chose to leave the power input for the remarks data input.

QSL Update

This operates in a manner similar to that of DATA ENTRY, except that you only manipulate the QSL information.

Hints

Save your data off to disk often during a day of operation to prevent loss of data from accidental turning off of the computer, power failures, etc. Use particular care in entering the PRINT@ variables in lines 60, 70, and 80, and make sure you see and enter the % sign on the extreme right of variable G$. For disk systems, set the clock in the expansion interface from DOS prior to going to Basic; the time will then appear right next to your callsign through most of the program. Single-disk-drive owners can use this program by killing off all of the programs on a TRS-DOS diskette and loading this program and maintaining all data files on the same disk. Multiple-drive owners should maintain separate data diskettes. If you own a printer, then hard-copy files only could be kept, eliminating the need for data diskettes or cassettes. To increase the handling capabilities for larger systems, change the CLEAR statement to a larger value, such as 10-12000, and change all 1 to 100 FOR NEXT loops to a value of 300 or so. Contest logs are possible by fixing certain variables to fixed values and inserting a duplicate-checking routine. Write if you want information on this; the changes are beyond the scope of this article.

Those having heavy fingers on the keyboard should beware: If you are not used to single key entry, it's fast. Be sure to experiment with small amounts of data until you get the feel of the program, rather than commit large amounts of data.

```
                 LOG SUMMARY: MAY 21, 1981
   TIME    STATION  SENT RCVD MODE      FREQUENCY QSL S QSL R
1. 0413UTC W6SP      59   59  SSB        144       YES   NO
   REMARKS JOHN  RANCHO PALOS VERDES CA. QSL DIRECT
2. 0615UTC W6WNK     56   57  OSCAR 8 MODE J       YES   NO
   REMARKS VIC  DUARTE  CA.
3. 0812UTC W6HEW     54   54  OSCAR 7 MODE B       NO    NO
   REMARKS MORT  SAN CLEMENTE CALIF.
4. 1213UTC W3GEY     59   59  SSB        14282.0   YES   NO
   REMARKS JAN KING  MARYLAND  QSL VIA BUREAU
5. 1513UTC W6DDW     59   59  SSB        3850.1    NO    NO
   REMARKS AMSAT NET
6. 1514UTC W6CG      59   59  SSB        3850.0    NO    NO
   REMARKS AMSAT NET

PRESS (C) TO CONTINUE SUMMARY, PRESS (R) TO EXIT TO DIRECTORY
```

Fig. 5. Sample of summary on video display.

Cassette Operation and Changes

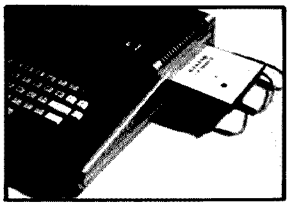
Ah, yes, the cassettes, the one true headache of home-computer operation. This program will work very well with cassette-based I/O, but it will be very slow on the I/O operations (probably slower than you could ever believe). You must have a minimum of 16K memory for this program. I have intentionally reduced the CLEAR, DIM, and FOR NEXT loops, since you will have trouble finding a digital tape long enough to hold 100 entries. The changes to the program required for cassette operation are shown in Table 1.

Summary

Contained in this article is a program that is versatile, fast, and easily changed to fit individual requirements. I hope you have fun with it. Write me with any questions.

If demand is high enough, I would consider producing this program on formatted disk and/or cassette. Contact me for information on this. ■

MORSE CODE from MITRONIX



Turn your Radio Shack Color Computer into a complete Morse Code terminal.

MITRONIX MODEM—Interfaces the computer to your transceiver via the ROM PAC slot.

Cartridge: $54.95

—You have your choice of 5 CW programs to pick from including:

—MITRONIX TRANSLATOR
This Machine Language program allows you to transmit & receive from 5-60 WPM. Features split-screen with reverse video receive, a 1024 character TX buffer, auto CQ, & 4 message memories.

Cassette: $26.95

KA9FSQ PERSONAL CW MAILBOX—
Written in COLOR BASIC, this program allows you to transmit to 50 WPM, & receive to 30 WPM. In the MAILBOX mode, it will answer a CW call, get other station's call letters, message, data & time, and store it in memory for instant recall when you return. Also hard copy.

Cassette: $21.95

For additional information and programming, write to:

Michael L. Rice, Jr. KA9FSQ
MITRONIX ✓240
5953 N. Teutonia Ave.
Milwaukee, WI 53209
(414) 466-6151

Sales please include 5% postage

Russell F. Lee WA4VLE
10 Dudley Circle
Durham NC 27703

The Program No Net Control Should Be Without

Every net generates lists. Keep yours up to date with this TRS-80 Basic program.

Soon after we began the Central North Carolina Weather Net on the two-meter band, the net-control station needed a better way of keeping track of the hams who had joined the net. In order to facilitate call-up, the net-control stations decided to maintain a sequential list of members, each with an assigned number. At the same time, we needed to determine quickly whether a station checking in had been assigned a number—that is, whether he was already listed as a member of the net. After inadvertently assigning several stations multiple numbers, I wrote a net roster program to keep track of the net membership.

The program lists stations in numeric sequence, thirty at a time, for net call-up and searches for a given call to determine if it is in the register; it corrects an erroneous entry and adds a new member's call to the register.

This program is organized as a series of subroutines called by a main calling program. This approach simplifies programming and debugging; if I want to change one of the features in the program, I change only one subroutine.

Overview

The program stores each member's call letters, county of residence, and name. The program includes the following routines: read data from tape, save data to tape, list a block of 30 net members, search for and display a specified call, sort the data by call letters, change an entry, and add an entry. The Search routine is fast—about ½ second to search up to 511 entries for a specified call.

Fig. 1 shows a flowchart of the program. The program first initializes variables (lines 10–20), reads a look-up table of county names (subroutine at line 590), and reads the file of net members from tape (subroutine at line 80). You can bypass this tape-read routine if you plan to make all the entries from the keyboard. Immediately after reading the tape, the program sorts the data by call letters. The Sort routine does not move the main files around physically, but sets up a list of integer pointers indicating the alphabetic order of the callsigns. The callsigns and related data remain in their original order. You can reenter this routine later to include any new entries in the sorted array of pointers.

At this point the program prints the menu of commands (line 50): #—LIST, 'C'—CHANGE, 'SAVE', 'A'—ADD, 'S'—SORT. The # represents a numeric input. Any entry other than those on the menu initiates a search for that entry among the list of call letters.

When you enter a number, the computer lists the net member with that number, plus the next 29 members (subroutine at line 410). For example, if you enter 25, the program lists the call, county of residence, and name of the operator of the twenty-fifth through the fifty-fourth members of the net. This facilitates calling up the net. At the start of the net session, you, as net-control station, announce, "Net members, numbers one through thirty check in now." With the first thirty members on the screen, you can greet each member by name even if your memory for names is terrible.

When a member checks in who does not remember his number, enter his call letters. The computer checks to see whether the entry is a C, S, SAVE, or A. If it is none of these, the computer presumes the entry to be call letters, calls the subroutine at line 460, and initiates a binary search through the net roster for that call. Even though it is programmed in BASIC, you can search more than 500 entries in less than ½ second. If a match is found, the call letters, county of residence, and the operator's name are displayed at the center of the screen. If a match is not found, you can add the new station to the roster.

To add a new member to the roster, enter A. The subroutine at line 530 re-

quests call letters, county name, and operator's name. The program stores the call letters and operator's name in memory, but does not store the entire county name. The program stores an integer number that identifies the appropriate county from the list of counties which you read in at program start. This allows many more entries in my 16K machine than would otherwise be possible.

To change an entry, enter C (subroutine at line 330). You can reenter a call, county name, or an operator's name to correct an error. If you do not wish to change the entry, press Enter to retain the original content.

The binary Search routine finds only those calls which have been ordered by the Sort routine. Any time you enter one or more new calls or change one or more call letters, you need the Sort routine. This routine begins at line 120.

In order to save an updated roster to tape, Enter SAVE. At this point, the program gives you an option to turn on the recorder in order to cue the tape or to continue with the Save routine (subroutine at line 270). Outputting 4 to port 255 cues the tape. This turns on the tape recorder motor in Model I machines. Then the program enters a timing loop for a few seconds before turning the recorder off. This same routine spaces into the tape a few seconds before saving the data when you continue with the Save routine. The cueing routine may not work on Model III TRS-80s. As presently constructed, the program causes the computer to first CSAVE the program, then save the data to tape.

Sort and Search Routines

A children's guessing game goes like this:

"I'm thinking of a number between one and fifty. Guess what it is."

"Is it 10?"

"No, you're too low."

"Is it 40?"

"No, now you're too high."

And so on. The first time you played this game, you probably guessed numbers randomly until you guessed the correct number. In the example above, that could mean as many as fifty guesses. After a few such games, you may have discovered that you could guess the correct number much faster if you first guessed the middle number of the range of possible numbers—25 or 26 in the example above. If that guess is too low, the correct answer must be between 26 and 50. You then guess the middle of that range—38. If that is too high, you next guess the midpoint of the range from 26 to 37, and so on. Each time you divide the size of the range of possible answers by *two*—hence the name *binary* search. Using the binary search, the correct number between one and fifty will always be found by the sixth guess, at the worst. That is a lot faster than 50 guesses! More than 500 entries can be searched by this method with no more than nine guesses.

In the net roster program, membership is sorted by call letters. A pointer table indicates the order; the master list is not reordered. Moving integers in memory is faster than moving strings. The master list remains in numerical order, which is convenient for display during net call-up.

The first entry in the pointer table is the subscript of the call which would be first in alphabetical order. The second entry in the pointer table is the subscript of the call which is second in alphabetical order, and so on. For example, suppose there are seven net members, with their call letters stored in the A array as follows:

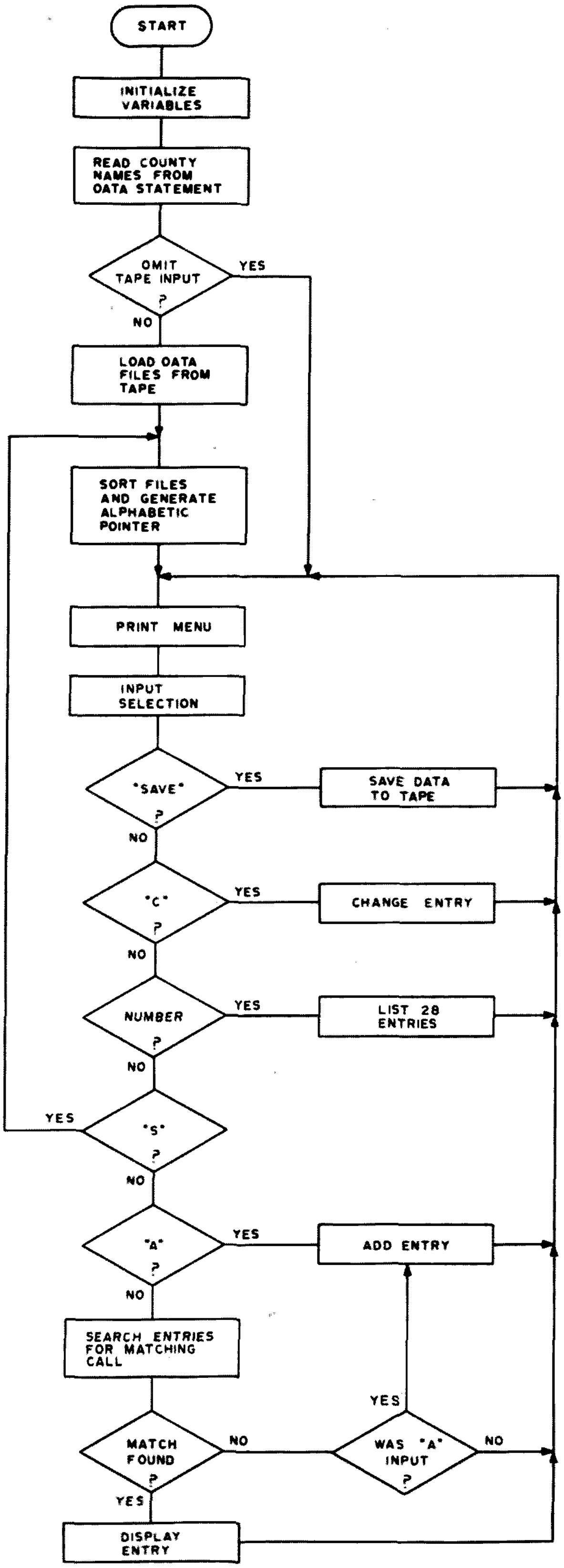


Fig. 1. Flowchart of the ham-radio-net roster.

A(1) W4CBC
A(2) W4BAA

```
10 CLS: CLEAR 6000: DEFINT 1, J, K, N, M, L: DEFSTR A, B: MX=512
20 DIM A(MX), IC(MX), AN(MX), IA(MX), AC(105): GOSUB 590
30 INPUT "TO OMIT TAPE INPUT, ENTER '1', OTHERWISE SIMPLY PUSH 'ENTER'";I: IF I=
1 THEN 50  ELSE GOSUB 80
40 GOSUB 120
50 PRINT@ 960,;: INPUT "#-LIST, 'C'-CHANGE, 'SAVE', 'A'-ADD, S-SORT";B
60 IF B="SAVE" THEN GOSUB 270  ELSE IF B="C" THEN GOSUB 330  ELSE IF  VAL(B)<>0
THEN GOSUB 410  ELSE IF B="S" THEN 40   ELSE IF B="A" THEN GOSUB 530  ELSE GOSUB
 460
70 GOTO 50
80 INPUT#-1,N
90 FOR I=1 TO N STEP 8
100 INPUT#-1, A(I), IC(I), AN(I), A(I+1), IC(I+1), AN(I+1), A(I+2), IC(I+2), AN(
I+2), A(I+3), IC(I+3), AN(I+3), A(I+4), IC(I+4), AN(I+4), A(I+5), IC(I+5), AN(I+
5), A(I+6), IC(I+6), AN(I+6), A(I+7), IC(I+7), AN(I+7)
110 NEXT I: RETURN
120 M=N: FOR 1=1 TO N: IA(I)=I: NEXT I
130 M=INT(M/2)
140 IF M=0 THEN 260
150 J=1: K=N-M
160 I=J
170 L=I+M
180 IF A(IA(I))<=A(IA(L)) THEN 230
190 IT=IA(I): IA(I)=IA(L): IA(L)=IT
200 I=I-M
210 IF I<1 THEN 230
220 GOTO 170
230 J=J+1
240 IF J>K THEN 130
250 GOTO 160
260 RETURN
270 PRINT "PUSH 'R' KEY TO QUEUE TAPE FOR 10 SECONDS": PRINT "PUSH 'C' TO CONTIN
UE"
280 XX$=INKEY$: IF XX$="" THEN GOTO 280  ELSE IF XX$="R" THEN GOSUB 710  : GOTO
280
290 GOSUB 710  : CSAVE "W": GOSUB 710  : PRINT#-1,N: FOR I=1 TO N STEP 8
300 PRINT#-1, A(I), IC(I), AN(I), A(I+1), IC(I+1), AN(I+1), A(I+2), IC(I+2), AN(
1+2), A(I+3), IC(I+3), AN(I+3), A(I+4), IC(I+4), AN(I+4), A(I+5), IC(I+5), AN(I+
5), A(I+6), IC(I+6), AN(1+6), A(I+7), IC(I+7), AN(I+7)
310 NEXT I
320 RETURN
330 INPUT "NUMBER OF ENTRY TO BE CHANGED";I
340 GOSUB 550
350 B=A(I): INPUT "CALL";B: A(I)=B
360 B=AC(IC(I)): INPUT "COUNTY";B: FOR J=0 TO 105: IF B<>AC(J) THEN NEXT J: GOTO
 360  ELSE IC(I)=J
370 B=AN(I): INPUT "NAME";B: AN(I)=B
380 GOSUB 550
390 PRINT
400 RETURN
410 I=VAL(B): CLS
420 FOR J=0 TO 14: IF I>N THEN RETURN ELSE PRINT@ J*64,;: GOSUB 550  : I=I+1: NE
XT J
430 FOR J=0 TO 14: IF I>N THEN RETURN ELSE PRINT@ J*64+32,;: GOSUB 550  : I=I+1:
 NEXT J
440 B=STR$(I)
450 RETURN
460 M=2[(INT(LOG(N-1)/LOG(2))+1)
470 J=M/2: I=J/2
480 IF B>A(IA(J)) THEN J=J+I ELSE IF B<A(IA(J)) THEN J=J-I ELSE 510
490 IF I=0 THEN PRINT "*** CALL NOT FOUND ***": GOTO 520
500 I=I/2: GOTO 480
510 I=J: GOSUB 570  : RETURN
520 INPUT "ENTER 'A' TO ADD";B: IF B<>"A" THEN RETURN
530 I=N+1: N=I
540 GOTO 350
550 PRINT USING "### %     % %         % %         %"; I, A(I), AC(IC(I)), AN(I);
560 RETURN
570 CLS: PRINT@ 448, USING "### %     % %         % %          %"; IA(I), A(IA(I)),
 AC(IC(IA(I))), AN(IA(I));
580 RETURN
590 FOR I=1 TO MX
600 A(I)=CHR$(191):IA(I)=MX
610 NEXT I
620 AC(0)="": FOR I=1 TO 105
630 READ AC(I)
640 NEXT I
650 RETURN
660 DATA "ALAMANCE", "ALEXANDER", "ALLEGHANY", "ANSON", "ASHE", "AVERY", "BEAUFO
RT", "BERTIE", "BLADEN", "BRUNSWICK", "BUNCOMBE", "BURKE", "CABARRUS", "CALDWELL
", "CAMDEN", "CARTERET", "CASWELL", "CATAWBA", "CHATHAM", "CHEROKEE", "CHOWAN",
"CLAY", "CLEVELAND"
670 DATA "COLUMBUS", "CRAVEN", "CUMBERLAND", "CURRITUCK", "DARE", "DAVIDSON", "D
AVIE", "DUPLIN", "DURHAM", "EDGECOMBE", "FORSYTHE", "FRANKLIN", "GASTON", "GATES
", "GRAHAM", "GRANVILLE", "GREENE", "GUILFORD"
680 DATA "HALIFAX", "HARNETT", "HAYWOOD", "HENDERSON", "HERTFORD", "HOKE", "HYDE
", "IREDELL", "JACKSON", "JOHNSTON", "JONES", "LEE", "LENOIR", "LINCOLN", "MADIS
ON", "MARTIN", "MCDOWELL", "MECKLENBURG", "MITCHELL", "MONTGOMERY", "MOORE", "NA
SH", "NEW HANOVER"
690 DATA "NORTHAMPTON", "ONSLOW", "ORANGE", "PAMLICO", "PASQUOTANK", "PENDER", "
PERQUIMANS", "PERSON", "PITT", "POLK", "RANDOLPH", "RICHMOND", "ROBESON", "ROCKI
NGHAM", "ROWAN", "RUTHERFORD", "SAMPSON",
700 DATA "SCOTLAND", "STANLY", "STOKES", "SURRY", "SWAIN", "TRANSYLVANIA", "TYRR
ELL", "UNION", "VANCE", "WAKE", "WARREN", "WASHINGTON", "WATAUGA", "WAYNE", "WIL
KES", "WILSON", "YADKIN", "YANCEY", "GA", "KY", "TN", "SC", "VA"
710 OUT 255,4: FOR I=1 TO 8000: NEXT I: OUT 255,0: RETURN
```

Program listing.

A(3) W4AFF
A(4) W4GGO
A(5) W4HLK
A(6) W4JXW
A(7) W4JAV

The pointer table is stored in array IA and indicates the alphabetical order of the calls:

IA(1) 3
IA(2) 2
IA(3) 1
IA(4) 4
IA(5) 5
IA(6) 7
IA(7) 6

The first call in alphabetical order is A(IA(1)). Since IA(1) is 3, the call is in A(3), and this is W4AFF. Similarly, the second call, alphabetically, is A(IA(2)), which is A(2), or W4BAA. A search for W4HLK would proceed this way. The first guess is the fourth call in the alphabetical order, or A(IA(4)), which is A(4), or W4GGO. This is too low. The next guess is the sixth in alphabetical order, A(IA(6)), or A(7) which is W4JAV. This is too high. The next guess is the fifth call in alphabetical order. That is A(IA(5)), or A(5) which is W4HLK—the correct call. The call was found on the third try. A list of up to 511 entries can be searched by checking nine entries at most by this method.

Another "trick" to speed up the search process even more compares only one letter of the call at first, then looks at the rest of the call only when necessary. Unfortunately, if we start the comparison (and the original sorting of the data) with the first letter of the call, we will be comparing Ws with Ws so often that no time will be saved. Another solution is to sort the calls initially by the most variable letter position in the call, and search first on that letter position. Then we can take advantage of the time saved by looking first at only one character.

The first character of any call can be only A, K, N, or

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W—four possibilities. The second character can be A, B, D, N, or a number. Although that number can be any value from 0 through 9, only one or two are likely to predominate in any given area. That is little improvement over the first character. The third character can be any letter of the alphabet or a number, but numbers—usually one number—will dominate because most calls begin with a two letter prefix (WA, WB, WD, KA, and so on). The fourth character is the best choice. Any alphabetic character is possible and equally likely. In this program, the calls could be sorted by the fourth character and the search carried out first on the fourth character.

Improvements

The most time-consuming part of the program is the Sort routine. It takes about two minutes. Even though it is normally used only during program initialization, a faster routine would be desirable. One possible approach is to use a machine-language subroutine. A much easier approach is to eliminate the sort altogether, and substitute a subroutine that automatically makes the necessary changes in the pointer table whenever you add a new entry or correct an existing entry. Then the pointer table would be saved to tape along with the rest of the data.

Another useful improvement might be the addition of a map with the counties outlined on it to be displayed on the screen whenever you want. Some intriguing possibilities exist for compact storage of such a map in a string variable using the space compression codes—ASCII codes 192-255. ■

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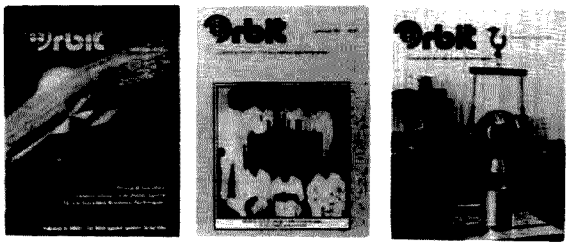
Orbit



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The World's Cheapest Modification

All you need to put the FT-101 on 30 meters is three pieces of wire. What could be cheaper than that?

Fred Johnson WB9DDI
307 Walnut Street
Knoxville IL 61448

The new WARC bands present a problem to the owner of an older transceiver. How do you modify the receiver and transmitter circuits to operate on these new amateur bands? New crystals and tuned circuits will be needed to put most rigs on the new bands, but I have found that my trusty old FT-101 needs only three pieces of wire added to be fully operational on the 30-meter (10-MHz) band. This modification should work on the later versions such as the FT-101B, FT-101E, FT-101EE, etc. I have not yet tried it on any of these rigs, but their schematic diagrams are similar and the same modification should work.

The Yaesu FT-101 already has 10-MHz receiving capability built in to allow the operator to check the internal crystal calibrator against WWV. After studying the schematic for some time, I decided that the only things stopping transmission on this band were the lack of tuned circuits in the driver and final plate circuits. Unlike the 11-meter band upon which the rig was designed to operate, the FT-101 was never built to transmit on the 30-meter band. There is no brightly colored jumper wire disabling the transmitter on 30 meters. In fact, there are no connections at all to several of the bandswitch wafers in the 30-meter position.

The outside appearance of the FT-101 remains essentially unchanged. Only the bottom cover plate and internal shield need be removed during the 30-meter modification. The position of all front-panel controls should be as shown after tuning up on 30 meters.

The tuned circuit in the driver plate circuit is gang-tuned with circuits in the driver grid circuit and in the gate circuit of the receiver's first rf transistor (T103, T102, and T101 respectively on the schematic). The front-panel preselector control tunes all of these coils at once by running their ferrite slugs in and out together. Whatever I did to modify the FT-101, I had to maintain the proper tracking of all of these tuned circuits in both the transmitter and receiver sections of the FT-101.

The Driver

In the 10-MHz receive mode, the gate and drain circuits of the first rf transistor are connected to the 20-meter trimmer capacitors. The tuning range of the preselector is such that 10-MHz WWV can be received by running the ferrite slugs further into their coils and resonating the 14-MHz coils at 10 MHz. The FT-101's design made life easy for me in theory. All I had to do was connect the 20-meter and 30-meter band positions together in the transmitter and tune the preselector control for maximum drive.

The tuned circuit (T102) at the drain of the receiver rf stage is diode-switched to the grid of the driver tube during transmit, so no additional modification is needed here. The driver plate circuit (T103) has no connection on 10 MHz, so I had to add a jumper on wafer S1g of the bandswitch from the 20- to the 30-meter positions. The correct lugs to solder to can easily be located by rotating the bandswitch and watching where the wiper points. This operation is simple but requires a soldering iron with a very long thin tip, a pair of long-nose pliers, and the necessary skill to use these tools in tight quarters without burning or melting any important parts. A bright light with a magnifying lens will help tremendously with the modification to the bandswitch throughout this operation. (Bandswitch modifications

are definitely not for cowardly or nervous types.)

The Finals

With the driver stage taken care of, only the pi network (and the FCC) was standing in the way of my 10-MHz signal. I imagined that tying the 30-meter position to the 20-meter bandswitch position on wafer S1m would work here just as it did in the driver section, but for maximum power transfer and harmonic suppression, the coil in the pi network should have an inductance between that for the 40- and 20-meter bands. There were five turns between the 40-meter and 20-meter taps. I guessed and soldered the 30-meter tap on at a point three turns from the existing 40-meter tap. Be very careful to avoid shorting adjacent turns of the coil, as this results in very strange operation on most bands later. (This is the voice of experience speaking!) Pushing down one turn on each side of the new tap's location helps avoid shorting turns. (Yes, those tricks in the handbook really do work.) Since there is considerable rf current at this point, I used a piece of number 14 solid copper wire to connect the new tap to the 30-meter position on the bandswitch.

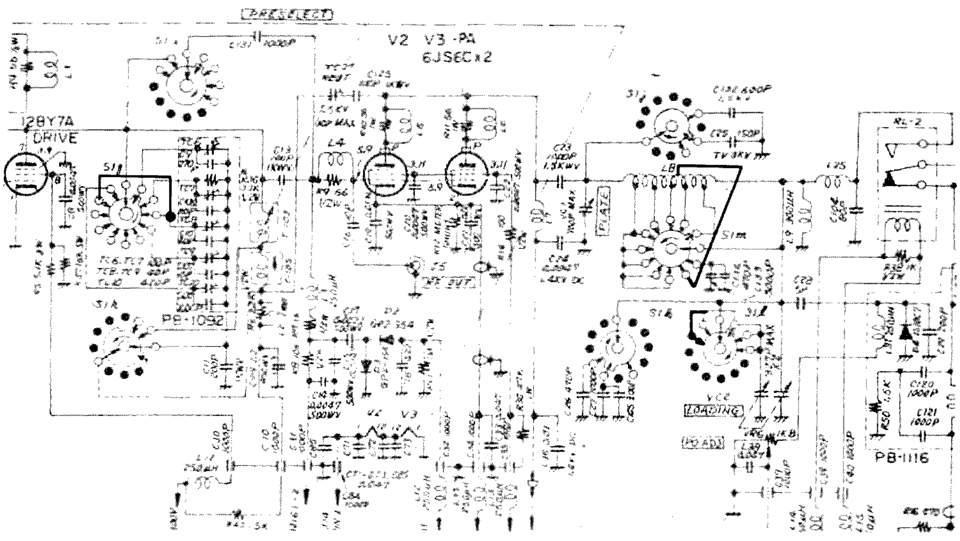
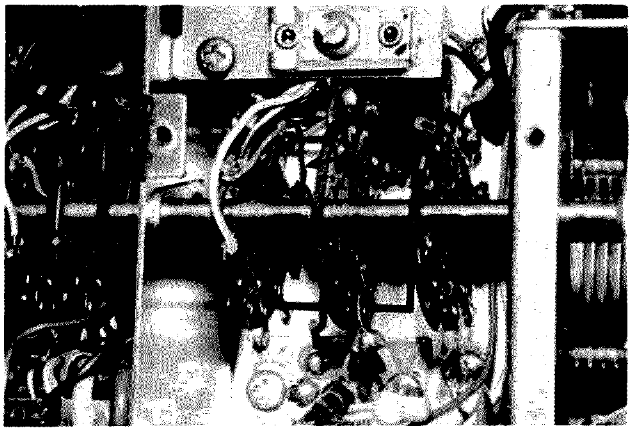


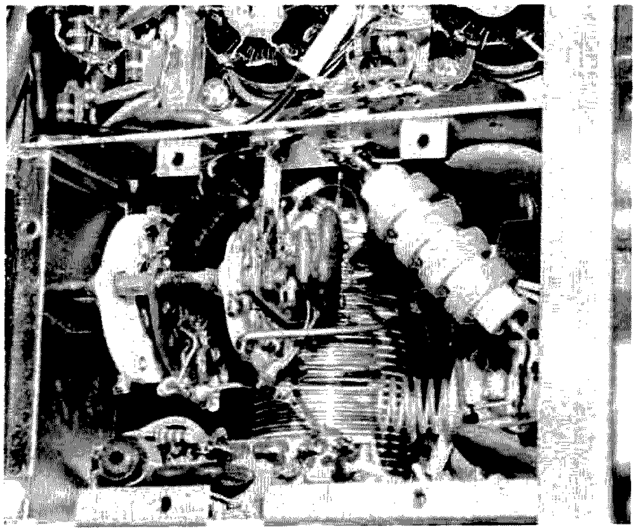
Fig. 1. Schematic diagram from the owner's manual showing the location of the three wires added to allow the FT-101 to transmit on 10 MHz.

The only other modification needed is to switch in the extra section of the variable loading capacitor. On my particular vintage FT-101, there was not a contact on wafer S1l of the bandswitch at the position that I needed to switch the extra loading capacitor section into the pi network. To get around this problem, I bent a short piece of wire to the shape of a contact. Since the 160-meter band used the extra capacitor section that I needed, I soldered the home-brew wire contact to the 160-meter position adjacent to the new 30-meter position. By carefully shaping and bending this piece of wire, it was made to function as a switch contact on the 30-meter band position. A little TV tuner grease will lengthen the life of this contact considerably.

Results

Testing was performed using a Bird 43 wattmeter and a Heathkit Cantenna dummy load. No change was noted in the performance of the modified FT-101 on any of the existing six bands. I made a comparison of the transmitter operation on the 20- and 30-meter bands. The modified FT-101 produced 125 Watts output for 180 Watts input power (300 mA @ 600 volts) on both bands for an efficiency of 70 percent. The only dif-


The jumper wire from the 20-meter to the 30-meter position on wafer g of the bandswitch is indicated by an arrow in this photograph. Wafer g is located at the front of the driver plate compartment.


Bottom view of PA plate compartment. The home-brew switch contact can be seen on the center wafer, S1l, of the bandswitch. Also seen in this photograph is the heavy wire added from the rear ceramic wafer, S1m, to the new tap on the pi network coil. Since the second harmonic of the 30-meter band is not an amateur band, you will need all the shielding available. Be sure that you replace all of those screws in the PA compartment's bottom shield.

OPTIONAL MOD

An additional modification may be made to the FT-101 which is not necessary to fire it up on 30 meters, but will center the load control while operating on that band.

Without this change, the antenna loading position will be about "2" when tuned for maximum rf output into a 50-Ohm load at 400 mA. However, by adding a fixed 270-300 pF, 500-600-V silver mica capacitor parallel with the variable loading capacitor (VC2), the loading position will move to about "4" or "5" when fully tuned. The capacitor should be added to the 30-meter position of bandswitch wafer S1k which faces the front of the rig.

First, however, a contact must be added to the 30-meter position of the wafer. Remove capacitors C26, C27, and C105 to get a clearer view of the wafer, then inspect the contacts on S1k closely so that you will be able to identify the correct style of contact to mount. The wrong style could result in damage to the rotating wiper of the wafer.

When you know what you are looking for, head for the junk box and find an unused wafer with the proper contacts. Remove a contact from the "donor" wafer by carefully drilling out the rivets that secure the contacts to the wafer. Mount the contact on the 30-meter position of S1k using a small bolt. Make sure that the contact is mounted on the side facing the front of the rig and tighten the bolt securely. Run the switch wiper across the new contact a few times to ensure that they make proper contact, then solder the 270- or 300-pF capacitor between the contact and ground. Don't forget to resolder capacitors C26, C27, and C105 when you are done.

James R. Snyder WØUR
1050 Hawthorn Avenue
Boulder CO 80302

ference noted was that 30-meter operation required slightly more drive. During the tune-up, 180 Watts input were produced on 20 meters with the carrier control set at 6, but when operating on 30 meters, the carrier control had to be advanced to 8 to produce the same 300-mA cathode current indication.

More Bands

The other obvious modification would be to convert the unused (I hope) 11-meter band to the new 18-MHz or 24.5-MHz band. This will require a new crystal 6.02 MHz higher than the bottom edge of the band. In other words, a 30.52-MHz crystal would be needed to operate on the 24.5-MHz band, and a 24.02-MHz crystal to operate on 18 MHz. Since the existing 10/11-meter tuned circuits will probably work fine on 24.5 MHz, only a new crystal should be needed for this band.

If you want to convert the 11-meter band to 18-MHz operation (to get better DX like 20 meters), then the existing tuned circuits cannot be stretched that far and the 15-meter trimmer capacitors will have to be connected to the 11-meter position in all stages of both the transmitter and the receiver. (Sections c, e, g, and m of S1, the bandswitch, will all need this modification.) Adjusting the preselector to a lower frequency should be all that is then needed to be operating on 18 MHz.

Conclusion

With 10-MHz operation now a reality, the modification to get on 30 meters is simple and cheap. Very cheap! Now that the band is opened, let's use it.

Now, let's see, where is that antenna formula? Hmmmm... a bit over 23 feet on each side of a dipole. ■

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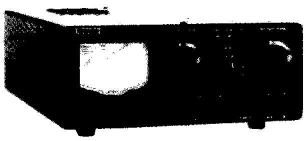

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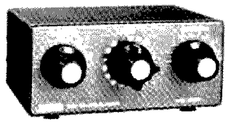

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Specifications
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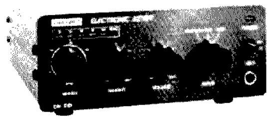

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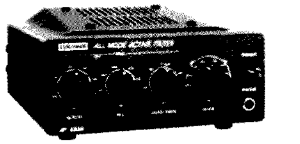

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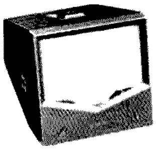

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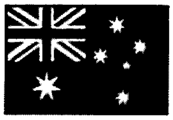
Each month, 73 brings you amateur radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Avery L. Jenkins WB8JLG.*



AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
Altona 3018, Australia

Perhaps the best way of explaining amateur radio in Australia would be to let you know what frequencies we are allowed to operate on and what our different license classes are.

We have 3 classes of license, the first being a Novice license. To obtain this, you have to pass an exam of 50 multi-choice questions on electronic theory (at a fairly easy level), 30 questions on regulations, and a CW exam at 5 wpm, send and receive. The Novice operators are easily recognized, as they have a 3-letter suffix starting with either N, P, or V, e.g., VK3NOL, POL, VOL. They can operate on phone or CW on the 75m, 15m, or 10m bands.

The next grade is the Limited license. For this you have to sit a much harder exam on theory and regulations, with no CW. This license entitles you to operate on all bands allocated to Australian amateurs above 50 MHz. They also have a 3-letter suffix, starting with X, Y, or Z.

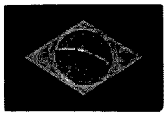
The Full Call on AOCP (Amateur Operators Certificate of Proficiency), sometimes called the Full Call, entitles you to use all bands and modes available to Australian amateurs. The only difference between this license and the Limited license is that you have to sit a CW exam at 10 wpm, send and receive. The suffix for the Full Call is either 2 letters or 3 letters, starting with A, B, C, D, or E.

It has been said that 10 wpm is below the world standard of 12 wpm. But with our exam on CW, we have to send the equivalent of 25 words (averaging five letters per word), in mixed plain language and figures (each figure counting as two letters), in 2½ minutes. More than four incorrect or improperly corrected errors or failure to complete the test in 2½ minutes will result in failure. In the receiving test, you have to receive 50 words (average five letters per word), in mixed plain language and figures (each figure counting as two letters), in 5 minutes. Each figure or letter incorrectly received counts as one error, with a maximum of 3 errors being counted in one word or group of figures. More than 7 errors will result in a failure.

This test, I think, is much harder than having to listen to a text sent in CW at 12 wpm, with no sending involved, when all that is required is that you write a rough draft of what has been sent (and, providing you get a fair gist of the message sent, you pass). Even at 16 wpm, I know which one I would prefer to sit for, but we cannot get the reciprocal licenses in some countries unless we get a 12-wpm endorsement on our license.

Speaking of reciprocal licensing, overseas amateurs visiting Australia for less than 12 months may get a license equivalent to their own home privileges. They also have to adhere strictly to the Australian amateur-radio conditions under which the license is issued. To obtain a license in Australia, you must write to the Superintendent of Regulatory and Licensing in the state you propose to visit, with at least 3 months advance notice prior to your visit.

In the next article, I will start to explain something of what Australia is like, with information on our DX locations.



BRAZIL

Gerson Rissin PY1APS
PO Box 12178 Copacabana
20000 Rio de Janeiro, RJ
Brazil

CB OPERATION ON 28 MHZ

The Brazilian Department of Communications (DENTEL) has been focusing its efforts to find pirate stations using CB equipment to operate at the beginning of the 10-meter CW band.

The CB band ends at 27.605 MHz, but they use modified equipment to extend their operations as far as 28.1 MHz. In this way, it is very difficult to have a QSO on 10-meter CW, especially during the weekends. We can hear pirates from a few countries in South America as well as from Europe.

All Brazilian CW groups are encouraging their members to use the 10-meter band as much as possible and banish the pirates.

ONE MORE BRAZILIAN BEACON

For propagation purposes, the Brazilian Amateur Radio League/Department of Americana, in the state of Sao Paulo, has constructed a QRP beacon with 10 Watts output on 28.300 MHz. Carlos PY2VRX, Roberto PY2FUZ, and D'Orssay PY2CRI all assisted in establishing the transmitter.

The station is already on the air, with the callsign PY2AMI, and transmits the following message: VVV DE PY2AMI PWR 10W ANT GP LAT 22 45 S LONG 47 16 W AMERICANA SAO PAULO. Any report or QSL may be sent to PY2AMI, Beacon Project, PO Box 31, 13470 Americana, SP, Brazil.

10-MHZ BAND

Brazilian amateurs are not yet allowed to use the 10-MHz band. Most of them have already bought new equipment using the WARC bands, but the authorities are still studying the treaty.

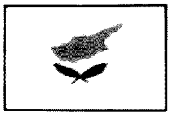
GPCW AWARD

Sponsored by the Grupo Praiano de CW, the GPCW Award is available to all licensed amateurs for confirmed contacts with three GPCW members.

Contacts must have been made after November 5, 1973, on any amateur band. Only 2-way CW contacts with a minimum RST of 338 are allowed. No QSL is necessary.

Send a list of stations worked (call, date, time, band, mode, and report) and 5 IRCs for mailing expenses to GPCW, PO Box 556, 11100 Santos, SP, Brazil.

GPCW members are: PR7CM, PS8AUJ, PT8AVV, PY1AFA, PY1CMS, PY1DG, PY2ARX, PY2BBQ, PY2BKT, PY2BOP, PY2CAR, PY2CE, PY2CJW, PY2CZL, PY2DBU, PY2DCP, PY2DHP, PY2DV, PY2DYX, PY2ESW, PY2ETW, PY2EW, PY2EYF, PY2FDO, PY2FHC, PY2FK, PY2FNB, PY2FNE, PY2FRW, PY2GCP, PY2HAB, PY2HAF, PY2IBH, PY2IEG, PY2IEM, PY2JN, PY2KL, PY2OIL, PY2OIN, PY2ORF, PY2RAD, PY2RAN, PY2RRG, PY2SCR, PY2SFI, PY2SLS, PY2TT, PY2TUE, PY2UGR, PY2US, PY2VFA, PY2ZEB, PY2ZV, PY3BU, PY3CJI, PY4ETW, PY5CMS, PY6WF, PY7BOS, PY8BI, PY9AY, F6HSX, and CT1CFG.



CYPRUS

Aris Kaponides 5B4JE
PO Box 1723
Limassol, Cyprus

BEACONS IN CYPRUS

For many years, the Cyprus Amateur Radio Society has been running experimental transmitters as beacons for the study of radio-wave propagation.

At the moment, there are three beacons in operation:

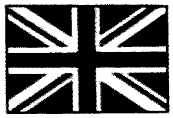
a) *28.220 MHz*—This beacon is used for the study of shortwave propagation and transmits the call 5B4CY. This beacon is watched by many amateurs throughout the world who often send reports or QSL cards with information about the reception of its signal. The power of this beacon is 15 to 20 W and the antenna is a quarter-wave vertical on the ground with lots of radials under the soil.

b) *50.5 MHz*—A transmitter on this frequency aids the study of many phenomena such as sporadic-E and TEP (Trans-equatorial Propagation), and during the period of maximum sunspot activity, it was heard in all continents. The transmitter was home-brewed by 5B4AZ and has an output of 15 W and a ground-plane antenna.

c) *70.11 MHz*—This beacon is also used for sporadic-E and TEP studies and has been heard in Europe and South Africa. The transmitter was donated to CARS by G4BPY, whom the Cyprus amateurs would like to thank very much for his most useful and generous offer. We do hope that other amateurs will help our society in other fields. Because of its small size, it is running on a shoestring and every little bit of help is greatly appreciated. The 70.11-MHz beacon gives 15 W, and the antenna is a 4-element yagi beaming to Europe between May and August and beaming to South Africa the rest of the time.

All beacons are located at Zyghi at the site of the BBC relay station, and they all transmit the callsign 5B4CY.

The beacon keeper is Nick 5B4AZ and all reports of 5B4CY should be sent to him.



GIBRALTAR

Jimmy Bruzon ZB2BL
27/2 Flat Bastion Road
Gibraltar

On June 18, the 1st Battalion, The Duke of Wellington's Regiment, celebrated the 168th anniversary of the Battle of Waterloo, and to mark the occasion, an open day was held at Lathbury Barracks where the Gibraltar Services Amateur Radio Club set up an amateur-radio station using the callsign ZB2DWR. Unfortunately, due to poor conditions and the fact that the date coincided with some contest, not too many stations were worked. The station was operated by Iain Morris ZB2HC and Peter Green ZB2HM. QSL information is either via the Bureau or to PO Box 292, Gibraltar.

Another bit of news was the first-ever two-way QSO on 6 meters between Gibraltar and the United Kingdom. This took place on May 6, when Ken G5KW and I managed to work each other, first on CW and then on SSB. Ken has been doing quite extensive monitoring of the ZB2VHF 6-meter beacon. For those of you who are also operational on 6 meters, the ZB2VHF 6-meter-beacon frequency is 50.035 MHz, running 30 Watts to a 5-element yagi. Reception reports are most welcome and should be mailed to me via the Bureau or, preferably, to my home address.

The oldest licensed amateur still resident on the Rock is Gordon Black ZB2J. Gordon's interest in amateur radio was aroused through ZB2A, the RAF Amateur Radio Club, back in 1948. Of course, home-brewing was the in thing in those days; the RAF Amateur Radio Club station consisted of a couple of T-1131 transmitters, AR-88 and HRO receivers, and other bits and pieces of wartime equipment. Some time later, Gordon and some of his work-mates at the Royal Navy wireless station decided to form the Royal Navy Amateur Radio Club. Through their Commanding Officer, they applied for a club callsign and were issued ZB2G. The RN Amateur Radio Club was active for a number of years on 7, 14, and 28 MHz, and in those days, there was stacks of room to operate in, so receiver selectivity was not necessary. All one had to do was to QSY some kHz up or down the band and find a clear spot to operate on.

In 1950, Gordon decided it was about time he got his own ticket, so after sitting the RAE and CW test, he was issued callsign ZB2J. He then constructed his own receiver and transmitter which he used until he got posted to the UK. While in Wales, Gordon was issued the callsign GW3HIJ, and since the rigs were far from portable in those days, it was a matter of home-brewing once again. From Wales, Gordon operated on CW for a couple of years until he got posted, and then came a period of inactivity.

In 1955, Gordon returned to Gibraltar and re-applied for his ZB2 call. He was active mostly on CW until 1964-65 when he joined the Gibraltar Broadcasting Corporation. With work taking up most of his time, ZB2J was inactive until 1979.

The days of home-brewing were now over, and since the idea of playing around

Gordon ZB2J operating his station. Note the home-built ATU on top of the TS-520.

with a soldering iron and voltmeter at home didn't appeal to him any more (having been Chief Engineer for the Gibraltar Broadcasting Corporation for a number of years), he decided to get a TS-520, which forms part of his present setup. The antennas are a 10-meter dipole, a 20- and 15-meter dipole on a single feeder, and a longwire for 40 meters. He eventually intends to get a beam antenna, possibly some compact triband beam.

Gordon is active just about every morning and most evenings on 20 meters; he prefers operating on 15 or 10 meters when it's open. Being a rag-chewer, he prefers to keep away from those "my-name-is-Gordon-you're-RST-599-please-QSL" style QSOs. Gordon has worked about 180 countries, though he admits he is not a wallpaper collector. His QTH is located on the west side of the Rock; from there he has a very good take-off towards the southwest, west, and north.

Though Gordon does not enjoy contest operating, he does enjoy working DX stations and adding new countries to his collection. At present he is the General Manager of the Gibraltar Broadcasting Corporation.

Next month we shall be visiting John ZB2AT. John is also the license-holder for the 1st/4th Scout Group ZB2FFG.

Currently, the Gibraltar Amateur Radio Society is experiencing some TVI problems. However, as soon as that's sorted out, ZB2BU shall be active on 10, 15, and 20 meters. The GARS meets on Tuesday evenings and if all goes well, I shall be able to provide you with more details next month.

Best 73 es CU next month, or perhaps work you before then.

GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire, England

THE UK SCENE

Those of you awaiting QSL cards for recent contacts with G2MT probably do not appreciate the historical significance of that call.

Some sixty years ago, the callsign 2MT was used to introduce the first scheduled entertainment broadcasting in the United Kingdom. Recently, the Home Office (the then-regulatory authority for amateur radio in the UK) approved the use of G2MT by the Marconi Radio Society, whose members are drawn from the employees of Marconi Space and Defence Systems Ltd. in North London.

The station will operate from the Stanmore headquarters of the Marconi Radio Society, but bands and operating schedules are subject to prevailing propagation conditions.

At the time of this writing, we are well into the summer mobile rally calendar with two or three events each weekend. (Even though the English summer sometimes lasts only a week or two, the rallies are held resolutely through October!)

On a slightly smaller scale than, say, the Dayton Hamvention, mobile rallies are very popular over here and are characterized by big crowds, warm beer, and curly sandwiches.

Local events often are held in school or social halls with only a handful of regular trade stalls; filling the remaining space are weekend traders and tables rented by individuals.

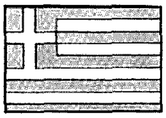
Regional events attract more traders who exhibit their full range of Japanese black boxes. Unfortunately, these invariably remain in their shrink-wrap protective covers and no facilities exist for demonstrations (any operating station is usually being provided by a local club). It never ceases to amaze me that fellow hams will part with vast sums of money (a Yaesu FT-One currently retails here at about $2200) for equipment chosen in these conditions.

Far better to visit one's local store as I do occasionally. Not only do I get to try any gear in which I am interested, but I also get a cup of coffee and a chat with Peter G4KKN (who runs the local Amateur Radio Exchange).

Despite all this, mobile rallies can be fun—particularly listening to the talk-in channel whilst approaching. I recently heard a ham three times do the opposite of the instructions given him and then wonder why he remained lost.

A big complaint against mobile rallies is that they occupy the OM on a Sunday and provide little if any attraction for the family. In one event, at least, this is not so. The RSGB National Mobile Rally is held at Woburn Abbey, seat of the Marquis of Tavistock. Surrounded by beautiful parkland, the house alone is worth a visit, but the intrepid can always take in the wildlife game reserve.

The RSGB's advertising for this event highlights the many side attractions of Woburn but fails to mention the area's most interesting sideline—Woburn Golf Course, home of the Masters and other tournaments. Perhaps the organizers do not share my interest in golf.



GREECE

Manos Darkadakis SV1IW
Box 3751
Athens, Greece

This month's column will bring you all the necessary information for getting an SV license while in Greece. (See box.) At the moment, reciprocity agreements exist with the US, Canada, and Cyprus. Therefore, only amateurs from these three countries can obtain an SV call during their stay in our country.

Please note that for the first category the minimum requested time for the issue of the license is 3 to 4 weeks, and it is 3 months for the second. Therefore, applicants must apply in advance of that time.

Lately, many efforts have been directed toward the establishment of a guest license in Greece. This one will be valid for a maximum of three months and will be available to every licensed amateur worldwide. Anyway, we will be back with more details after the agreement.

INSTRUCTIONS FOR FOREIGN AMATEUR-RADIO OPERATORS
(Legislative Decree 1244/72
Official Gazette 181/A/16 Oct 72)

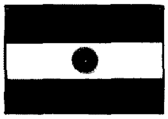
Foreign amateur-radio operators who are citizens of countries having a reciprocal agreement with Greece may operate amateur-radio stations in Greece if they submit an application with the following supporting documents to the: Ministry of Communications, General Directorate of Posts and Telecommunications, Directorate of Radio Communications Control, Section III, 49 Leoforos Syngrou, Athens, Greece.

1) Amateur-radio operators who wish to operate stations in Greece for less than one year must submit:
- a) An application giving full personal identification data, the intended location of the radio station, and the point and manner of entry of the radio equipment into Greece.
- b) A photocopy of the amateur-radio license notarized by the appropriate government agency or amateur-radio club of the applicant's home country. If the license has no expiration date, the applicant must provide a certification by the appropriate government agency or amateur-radio club in his home country that the license is still valid.
- c) Technical characteristics of the radio station.

The above documents must be submitted to the Ministry before a permit to operate is granted. This will be valid for a period equal to the applicant's intended stay in Greece, not to exceed one year, and will not be renewable.

2) Amateur-radio operators residing permanently in Greece must submit:
- a) An application bearing a 10-Drachma revenue stamp.
- b) Identification data.
- c) A photocopy of the amateur-radio license notarized by the appropriate government agency or amateur-radio club of the applicant's home country.
- d) Technical characteristics of the station.
- e) A document showing the applicant's membership in the Greek Amateur Radio Club.
- f) A 300-Drachma fee.
- g) A 50-Drachma revenue stamp.

The permit will be valid for two years and will be renewable. Amateur-radio operators in this category are entitled to transmit using the output wattage permitted by their license, but not to exceed 300 Watts PEP.



INDIA

James Kalassery VU2ARL
PO Box 1446
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Cochin 682 011, India

Under the 1978 Indian Wireless Telegraph (Amateur Service) Rules which are currently in force, we have four categories of licenses—Advanced, Grade I, Grade II, and Grade II (VHF).

Grade II and Grade I are available to anyone who is at least 14 and 16 years old respectively and has passed the respective Amateur Station Operator's Certificate (ASOC) examination. However, an Advanced ASOC examination can be taken only by those who have held a Grade I license for 2 years or a Grade II license for 3 years. Morse-code requirements are the same (12 wpm) for both Grade I and Advanced licenses, and therefore Grade I amateurs need pass only the theory portion of the Advanced ASOC examination, which is of a slightly higher standard, to qualify for the Advanced license. Those who do not qualify in the Morse-code test (5 wpm) of the regular Grade II ASOC examination can get the Grade II (VHF) license, which will permit them operation on 2-meter phone.

Out of the around 1800 amateurs in India, only about 30 are Advanced licensees; almost the same number hold the Grade II (VHF) license. The rest of the ham community is almost equally divided among Grade I and Grade II.

The largest representative body of radio amateurs in India is the Federation of Amateur Radio Societies of India (FARSI), which has more than 60 affiliate clubs and a total membership well over 1000. Most of these clubs are in cities, but some smaller towns also have very active clubs. The largest affiliate is the Radio and Electronic Society of India (RESI), followed by Madras Amateur Radio Society (MARS)

and Kerala Amateur Radio League (KARL). Many clubs conduct regular classes, assisting candidates preparing for the ASOC examinations. Being World Communications Year, more and more clubs are being formed and affiliated with FARSI this year.

One of the main projects of FARSI is the All-India Convention held every three years. The last one was held in Bombay in 1981 and the next one is expected to be held soon. FARSI also publishes a monthly journal, *Radio*, which is sent free to the members of all affiliate clubs.

With the arrival of many more rigs imported under the Open General License of the Import Policy, more and more Indian amateurs are now being heard on the bands, which means more QSOs and more QSLs. To take care of the flow of these cards, FARSI runs a well-managed QSL Bureau (PO Box 6538, Bombay 400 026), which serves all radio amateurs in India, irrespective of their membership.

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev Mobile Post Office 85530
Israel

VHF IN ISRAEL

One of the most popular aspects of ham radio in Israel today is VHF operation—more specifically, two-meter FM. Please note: We do not have a code-free VHF class of license here, so those operating on VHF also have full HF privileges. Thus, Israelis chose two meters on its own merits alone.

Although the widespread use of these shorter wavelengths has occurred here only in the last decade, it would be wrong to assume that the world above 30 MHz was unknown until the early '70s. In the last yearbook of the Israel Amateur Radio Club, we see a couple of snapshots of Bruno 4X4DH taken on a field day in 1965 at Kibbutz Sasa in the mountains of the Upper Galilee. The first one shows him raising a two-meter yagi on the kibbutz's water tower, and the second depicts him crouched over an SCR-522 making the first contact between Sasa and Haifa. A year earlier, in 1964, Bruno had made news by being the first amateur to make satellite contact between Europe and Asia via OSCAR 3. Bruno also had received the signals of pioneer OSCAR 1 transmitting its famous HI beacon.

The real boom in VHF happened in the spring of 1974 when the police department decided to update its communications equipment. The Ministry of Communications, perhaps because of the prompting of a few hams holding key posts there, deemed that the equipment being retired was unfit for commercial use. This left only one possible area for the release of the gear—the radio hams!

So, for a small fee you became the proud possessor of a Motorola D43GGV high-band FM transceiver, sporting about thirty tubes, including a 6146 final. If you were fortunate, you had an ac supply built in—otherwise you had to deal with a real humdinger of a 12-volt vibrator.

The other item made available to the ham population was the Japan Radio Corporation hand-held FM transceiver. This was a real beaut—totally solid state, dual channel, although about 2½ times the volume of today's hand-helds. You may recall that we then called such units "bricks." I don't remember what these cost us, but the Ministry did give a few of these free of charge to club stations.

Well, through the Israel Amateur Radio Club, a bulk order of crystals was made from Tadiran, Israel Electronic Industries, and two meters came to life! People were having a ball, tasting the joys of this new mode of communications. There we all were on 145.725, thinking that this intercom party line was great, not knowing that bigger and better things were just around the corner.

A few of the boys in Beersheva took a Motorola GGV and turned it into a primitive repeater, Israel's first. The next issue of *HaGal* (The Wave), the IARC periodical, came out with a band plan, allocating repeater and simplex frequencies for the various cities and districts. This was based on the European scheme with 25-kHz spacing between channels—145.000 to 145.225 being the repeater uplinks for R0 to R9, and 145.250 to 145.575 being simplex channels S10 to S23. Of course, 145.600 to 145.825 are the repeater outputs going from R0 to R9—standard 600-kHz splits. (R8 and R9 have been dropped in the last couple of years to accommodate amateur satellites as per the IARU band plan.)

Your correspondent, living in the Negev, had been content to chit-chat on the Beersheva frequency with his GGV, occasionally making a DX contact with the Tel Aviv repeater on the other crystal channel when tropo ducting permitted. One day, I visited a nearby ham who had a synthesized rig, and I was astounded to hear the Haifa repeater 250 km north of here coming in full quieting. I was hooked, and by January, 1979, I had purchased a scanning transceiver.

This was indeed the time of the real two-meter boom here—people had had a lot of fun with the "junk" rigs and were now buying commercial synthesized gear. The repeater and simplex channels were buzzing day and night. By virtue of a few amateurs holding key positions in Motorola Israel, retired repeaters and duplexers were donated to the IARC, and at this time, there are five two-meter machines in operation (R0—Haifa, R1—Jerusalem, R3—the Galilee, R5—Beersheva, and R7—Tel Aviv) and one 70-cm repeater in the center of the country.

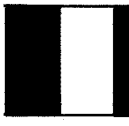
Israel, located on the Mediterranean coast and having frequent high-pressure weather systems, is a VHFer's paradise. All summer long (6 months!) there is tropospheric ducting, making long-range contacts commonplace and two-meter QSOs with Cyprus a regular affair. Sometimes sporadic E appears, and on FM I've worked into Greece, Italy, and Yugoslavia and have heard Hungary. Of course, the serious two-meter DXers are on CW and SSB around 144.300, and some have contacted England. But for us run-of-the-mill FMers, this DX is really the icing on the cake.

Two meters has really changed the face of Israeli ham radio almost beyond recognition. Some sneaky fellows have lent their two-meter gear to "retired" oldtimers and have thus rekindled their fire, getting them back on the air. Previously, the only local meeting ground was 40 meters for a few hours on the Sabbath, but now hams in the country are in touch with each other all week long at all hours. For better or for worse, the hams now are acquainted with each other very well, and Israeli hamdom has become a kind of village!

The repeaters are now less active than they were a year or two ago. It seems that either the novelty has worn off or the long roundtables have talked themselves out. Still, I suspect, just as many people are monitoring—it's simply that they don't reach for the microphone as often.

Every time Shimshon 4X4GF, "Gefilte Fish," meets a new operator on two meters, he enters him into his list and tells him what number station he is that he's worked on the band. The last time I heard, he had just passed the 380 mark, definitely deserving a place on the Honor Roll!

Visiting amateurs are always very welcome on our straight carrier-access repeaters. Should you be coming here, by all means bring along that portable rig. It will add another warm human dimension to your trip to Israel. Reciprocal licensing is no problem, and details may be found in my column in the June, 1983, issue of *73*.



ITALY

Mario Ambrosi I2MQP
Via Stradella, 13
21029 Milano, Italy

RECIPROCITY IN ITALY

In accordance with the Telecommunications Act of March 29, 1973, foreigners are granted permits for short visits and station licenses for longer stays in Italy. A temporary permit is granted for a maximum of three months, and it cannot be extended. However, a foreigner can submit a new application in order to obtain another permit, although consecutive permits will not be granted for more than a 12-month period.

Any foreigner who intends to stay in Italy for more than one year must first register his residence. Then he can request that his amateur license be converted into an Italian operating license, which will then be granted in the same way that Italian nationals receive theirs.

Applications sent from abroad may be written on plain paper, while applications from Italy must be on revenue-stamped paper. All must be filled out in Italian and accompanied by a 3000-lira revenue stamp and an additional 2100 lira for postage. IRCs may be substituted at an exchange rate of about 500 lira per coupon. In addition, the license granted in the country of origin must be valid for the entire period of the Italian temporary permit.

Notes

A photocopy of the station license must be mailed with the application, and I recommend that you post the envelope as a registered letter. For overseas airmail service, add 3700 lira, and if the application is handled through the reciprocal licensing department of the ARI, only $8 US is required to cover expenses.

It is advisable to apply for a temporary permit at least 45-50 days prior to the expected date of arrival in Italy.

You must also pay a fee of 2000 lira at any post office when you fill out the form attached to the permit. Prior to payment, fill out the front sides, and on the back write "Canone per l'autorizzazione temporanea rilasciata a cittadino straniero per l'impianto e l'esercizio di una stazione di radioamatore in Italia" (Art. N; 331 D.P.R. 156 del 29/3/73).

The postal address of the licensing administration is: Ministero Delle Poste E Delle Telecomunicazioni, Direzione Centrale dei Servizi Radioelettrici, Divisione 5 Sezione 3, Viale Europa 160, 00100 Roma. The telephone number is: International + 39 6 54601, extension 4975. All correspondence and calls should be in Italian.

The address of the reciprocal licensing department of the ARI is: ARI-R.L.D., Via Giorgione 16, att. Manuel F. Caiero I4CMF, 40133 Bologna. The telephone number is: International + 39 51 389502. Phone calls are answered in English, French, or Spanish after 8 am GMT, except weekends.

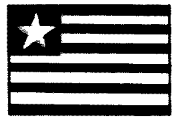
Here are instructions on how to fill out the application form:

1) When you fill out the form, please remember that mobile operation is allowed only on VHF and UHF.

2) Indicate the manufacturer and model number of your equipment. The input must not exceed 300 W.

3) It is very convenient to apply to the reciprocal licensing department of the ARI, since they will take care of many of the administrative details.

4) If you do any travel in Europe, it is worthwhile to purchase *The International VHF-FM Guide*, by J. Baldwin G3UHK, 41 Castle Drive, Maidenhead, Berks SL6 6DB, Great Britain. The book contains lots of useful information regarding VHF and UHF repeaters all over Europe. It also provides the addresses of various postal administration offices in Europe and procedures for obtaining temporary licenses. The cost of the book is $3 US, plus postage, and the editor's phone number is: International + 44 628 37837.



LIBERIA

Brother "Don" Donard, Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia, Republic of Liberia

Liberia amateur radio, when the truth is out, is primarily expatriate amateur radio. Missionaries, doctors, teachers, and even business people like to have an amateur-radio license so that they can talk to their friends and relatives back home. When they travel, they like to pass on information regarding airplane schedules, arrival times, and things like that.

There are many of these people in Liberia. To say that they number in the hundreds is conservative. Not all of them have radios, but as it works out, there are more expatriates operating amateur radios than there are natives. This is not a desirable situation, and we in the Liberia Radio Amateur Association are trying to do something about it.

The point of this article is to discuss amateur radio in Liberia in its relation to medicine. There are a few major cities in Liberia that have hospitals, doctors, and other medical facilities. People who can reach these places can be cared for, but the greater part of the population lives in villages where there may be no communication, difficult transportation, and no doctors or medical facilities. Some of these villages are served by medical missionaries who operate mobile clinics, and some of them are not served at all.

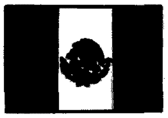
One day, I was turning the dial on my radio when I heard a call come in from one of these outlying areas. The amateur up there was in communication with a doctor, an amateur, here in Monrovia. He was describing severe leg infection which could involve the loss of the limb. The doc-

tor stated simply that the patient would have to go to a hospital. The answer came back—there isn't any. The next suggestion—he must see a doctor; again the answer—it is out of the question, the nearest doctor is forty miles away and there is no way of getting there.

Running out of alternatives, the doctor here in Monrovia began to ask detailed questions about the situation and to prescribe over the air. A schedule was set for 24 hours later at which time a decision had to be made as to whether or not the infected area would be lanced.

Medical consultation on amateur radio is common here. Many times there are emergencies where this medium is the only communication available. Some weeks ago, I received a frantic call from an amateur in the vicinity of one of the leper colonies. They were out of a medicine which the lepers must have on a regular basis to hold the disease in check. I drove downtown to bring the message to the leprosy control center.

We, the amateurs, lack numbers. We have other commitments; radio is a hobby. So, it is difficult, but we are trying to set up a network of communications (the Liberian Net) which will operate on a regular, daily basis. As we expand our numbers and equipment, we may make this a reality.



MEXICO

Mark K. Toutjian XE1MKT
Apartado Postal 42-048
06470—Mexico, D.F.

Since Mexico borders with the United States and has a lot of tourist attractions in all of its 32 states, many questions have come up in the minds of our fellow hams from outside the country with regards to regulations here, happenings, and anything to do with radio-wave activity from down "south of the border." I hope to answer some of these questions one by one as a correspondent for *73*. Some have asked about what awards are offered here. Let's take a peek at one of these awards this month.

THE MEXICO CERTIFICATE

Well, one of the unique awards that the Mexican Radio Experimenters League offers to hams around the world is the Mexico Certificate or diploma, with the following requirements.

1) Confirm at least 50 Mexican stations; anything from January 1, 1957, on is accepted.

2) Confirm 15 different states within Mexico, including what we call "D.F" (Mexico City). (See box.)

3) Stations confirmed should be legally authorized by the Secretary of Communications and Transports (SCT).

4) Combining CW and phone is not accepted, although either of the two is OK as are SSTV and RTTY.

5) Your registered correspondence should be sent to La Liga Mexicana de Radio Experimentadores, A.C., PO Box 907, 06000 Mexico, D.F.

6) The Mexican ham operators who apply for this award have to confirm bilateral contacts with at least 20 different states besides Mexico City.

7) You should include with your application the confirmed QSL cards, the corresponding list, and $3.00 US for postage and handling. Don't forget, CW, AM, SSB, RTTY, and SSTV are accepted.

There are quite a few other awards that are available through our Radio Experimenters League here in Mexico and from different radio clubs; I will deal with them in future columns.

Personal satisfaction can be derived through obtaining one of these awards, since time and experience as a radio operator is obviously a factor. Part of the etiquette of the Mexican ham operator is the importance for one to be balanced, not letting the radio control your daily activities; rather you should control the rig so that it doesn't push aside the more important things in life. I, personally, live by that standard. That's the good thing about obtaining awards now and then. You're not pressed for time in order to obtain them. You can take your sweet time (days, weeks, or even years) and eventually begin framing those lovely certificates. And, of course, your ability to work "over the air" and set up your antennas and equipment in emergency situations should improve as time goes on.

So, try for the Mexico Award! Get started soon! And for those of you who already have some QSLs saved up from Mexico, work on the states you lack still, and happy DXing!

STATES IN THE MEXICAN REPUBLIC

D.F. (Mexico City)	Guerrero	Quintana Roo
Aguascalientes	Hidalgo	San Luis Potosi
Baja California (Northern)	Jalisco	Sinaloa
Baja California (Southern)	Mexico	Sonora
Campeche	Michoacan	Tabasco
Coahuila	Morelos	Tamaulipas
Colima	Nayarit	Tlaxcala
Chiapas	Nuevo Leon	Veracruz
Chihuahua	Oaxaca	Yucatan
Durango	Puebla	Zacatecas
Guanajuato	Queretaro	

THE NETHERLANDS

Hank Meerman PD0DDV
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2111 GR Aerdenhout
The Netherlands

A TEMPORARY LICENSE IN HOLLAND

When you're planning a visit to the Netherlands and would like to talk to the Dutch amateurs, you'll need a license for it. I will give you all some tips:

The application for a temporary amateur-radio license must be sent to Holland at least six weeks in advance of the date that you desire the license to be used. For the application form that you'll have to fill in and a copy of the Dutch amateur-radio license conditions, send your request to: Radio Control Services, PO Box 570, 9700 AN Groningen, The Netherlands.

Remember, too, that the Dutch Radio Control Services will not deal with any license requests before you have paid the annual charge of D. fls. 65-- (about $20.00) in advance. Unfortunately, you have to pay for a whole year even if you only stay for a week or so. Furthermore, your payment can only be made by International Money Order addressed to: P.T.T. Centrale Dienst, Kortenaerkade 12, 2518 AX The Hague, The Netherlands.

Note that your callsign must be stated on your money order.

Together with your application form, you have to send a verified photostat copy of your license and a copy of your money order. The copy of your license must be verified by your postal service or the authorities that deal with licenses in your country. There must be a clear indication on your license that it is still valid.

To be granted an amateur-radio license in The Netherlands, you have to be at the age of sixteen or over.

The license conditions, as you know, vary from country to country. For Holland, they are gathered in a small 39-page booklet in the English language that you'll receive together with your application form. When you open this booklet, you'll find out that 50 and 220 MHz are not amateur frequencies in Holland. Licenses for those bands are very rarely given.

Other things that are not allowed in Holland are:

a) The use of transmitters in aircraft.

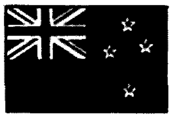
b) The transmission of messages from third parties.

c) The transmission of messages of a commercial nature.

It is interesting to know that most of the Dutch amateurs on 2 meters use horizontally-polarized antennas at their QTHs, while most of the mobile stations and repeaters use verticals.

When you arrive at Schiphol Airport (Amsterdam), give a shout on the nearest repeater there: PI3HLM on 145.775 MHz. Almost all Dutch amateurs speak English in some way and they will be glad to hear you and will answer any question you'll ask them. If you have a bit of luck, you will find a YL or an OM who will show you around the beautiful city of Amsterdam—the museums, buildings, etc. If you are in for a romantic trip, take a boat trip through the canals of Amsterdam at night!

So, if you are planning a trip to Amsterdam, there are reasons enough to bring your HT along. Don't forget fresh batteries (Hi).



NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier, New Zealand

Kia Ora atu i Aotearoa! (Hello from New Zealand.) This month I will continue with the special groups within the New Zealand Association of Radio Transmitters; I shall cover the OTC, the Old-Timer's Club, New Zealand's equivalent of the QCWA in the USA.

The formation of the Old-Timer's Club was approved at the 1952 Annual Conference of NZART at Dunedin. During the ensuing year, the old-timers throughout the country worked towards the inaugural meeting of the group to be held during the 1953 Annual Conference of the Association at Palmerston North.

The first meeting was duly held at 1940 NZTima on May 31, 1953, in a convenient room, after the conference sessions were finished. Sixteen eligible "old hams" attended and had discussions on the proposed objectives of the club and the conditions of eligibility for joining the club. The following was decided and remains applicable today, 30 years later.

Membership is available to any ZL amateur who has held an amateur license for the last 25 years or more and is still an active amateur.

The objectives of the Old-Timer's Club (ZL) as set out in its constitution adopted in 1954 are as follows:

(i) To recognize service to amateur radio.
(ii) To revive and maintain interests and good fellowship among the older members in the common cause.
(iii) To offer aid to the "young-timers."

Within the first three months, the numbers of the OTC had grown to 55, and they all were issued with Certificates of Membership on September 30, 1953, and all deemed to be foundation members of the club. The certificates were donated by two old listener members, Monty and Old Fred, and were designed by one of the members.

The OTC has continued to flourish. Today it has over 500 members, 150 who have received their 50-year certificates and one his 60-year certificate. The club meets regularly "on the air" in OTC Nets on 80 and 40 meters on Sunday mornings. Eyeball QSOs also are maintained in the main cities, where old-timers get together during the afternoon for meetings or on the weekends during the summer for picnic outings. The Old-Timer's Club has its Annual Meeting and Reunion during the NZART Annual Conference each year, when they elect their president, the Grand Old Man, who holds office for one year.

There is no set subscription or entry fee for membership, but any small donations made with applications for membership do assist with the club's expenses for postage and stationery. Also, there is usually a collection made at the club's annual meeting each year to supplement the finances.

The OTC also has a regular column in the Association's magazine, *Break-In*, and offers an award, the Old-Timer's Cup, to the elected Grand Old Man each year. A certificate in keeping with this grand office is presented to the holder of the cup as a permanent reminder of his year in office. The Montgomery Cup, another OTC award, is presented to the member or members who have contributed the most worthy item or article to *Break-In* each year.

Recently, the OTC published a Directory of Members containing the names of all members at the date of publication, along with other relevant information such as present call, radio name, original call, other calls held, year first licensed, QTH, and OTC number. The Directory is available to interested overseas amateurs by writing to the Secretary, OTC—G. E. Brown ZL2BD, 35 Chamberlain Street, Nelson, New Zealand, enclosing US$3.00 or 12 IRCs, which includes return postage.

BITS 'N' PIECES

OTC Diamond Jubilee operators, Dan Wilkinson ZL2AB and Len Spackman ZL1AC, are joined by another two old-timers who also celebrate 60 years of ham radio this year. They are George Blake ZL3FX and Bob Robinson ZL4AC. Congratulations, George and Bob, on joining that elite corps of 60-year operators! Also two honorary OTC members have achieved

Continued on page 134

Tom Bowman WA3REY
4 Judy Drive, RD #3
Annville PA 17003

A Two-Tone Squelch to Solve Your Scanner Woes

Selective listening is the key to success. This squelch will help you cut the chatter.

If you're like me and listen to a scanning monitor much of the time that you're at home, then you probably have the same problem I've had: The monitor either drowns out the wife and kids or the family retaliates, turning up the TV and winning the battle of Television vs. Scanner.

Go ahead—try to explain to your wife how important it is for you to hear the location of that fire or ambulance call if you're a volunteer fireman or paramedic. Or tell her that you're waiting for a call on the local amateur repeater. You'll probably agree with me that you need more than an explanation. I figured I needed a quick and dirty sequential tone squelch to silence the "10-21 or furnish a number" and "QTH is Pine Grove and the rig is an Icom 2-AT" that filled the scanner's speaker.

I'm not an engineer and I wasn't about to re-invent the wheel or the tone squelch. Instead, I searched through back issues of *QST, Ham Radio,* and *73* looking for an easy-to-build two-tone sequential squelch. The closest circuit I could find appeared in the October, 1974, issue of *73* written by Earl Dunn W5LCT. His squelch used 567 decoders to detect four sequential tones. I wanted to build a squelch for the two tones of my local fire department. So, out came the protoboard and my well-stocked junk box.

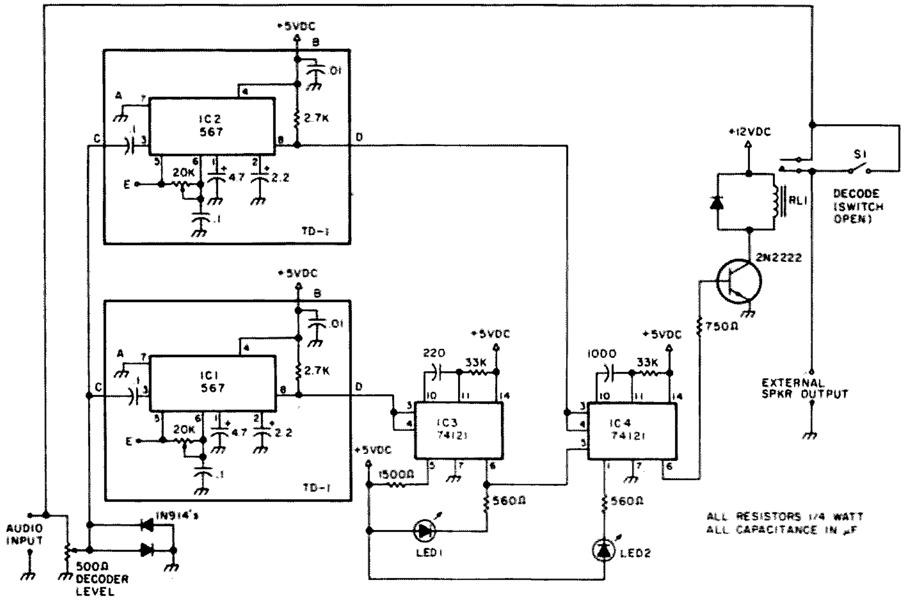
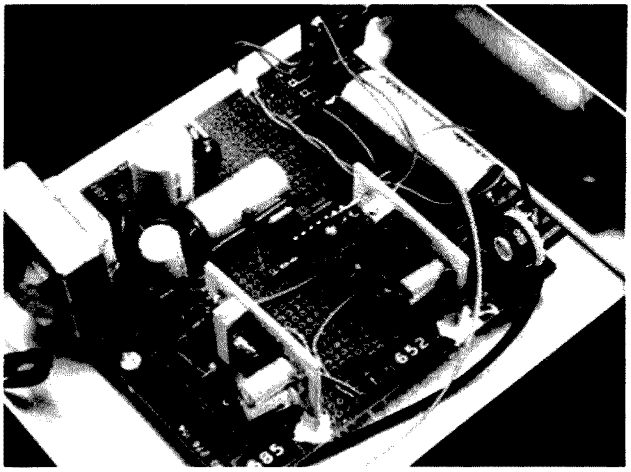


Fig. 1. Schematic.

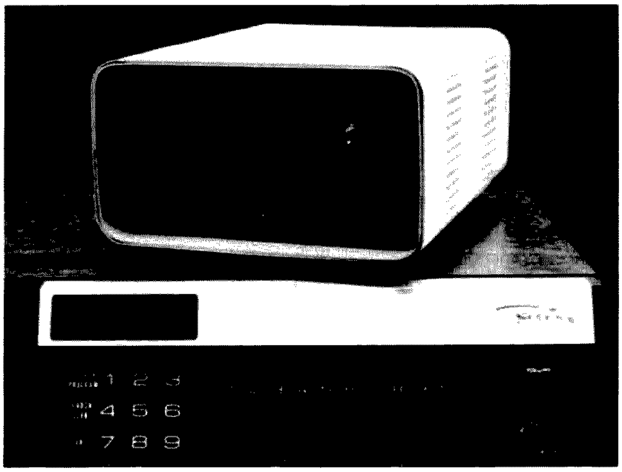
Redesigning the Squelch

Since I was interested in decoding only two tones, I set out to simplify W5LCT's circuit. I used Ramsey Electronics TD-1 tone-decoder kits for each tone. Their PC boards are easy to assemble, reliable, and cheap. Check the ads in the back of any *73*—I believe Ramsey has advertised in every *73* since they opened their doors for business. (Kind of reminds me of the antenna company "In *QST* since '53 without missing an issue." OK, old-timer—name that company.) Back to decoder kits.

The Ramsey TD-1 kit sells for $5.95 and comes complete with an on-board 5-volt zener. Since I needed 5 volts for the control logic and the TD-1 decoders, I built a regulated supply using a 7805 and eliminated the zener diode and series resistor, D1 and R3, that came with the Ramsey kits. The TD-1 boards are mount-



Inside view of the tone squelch. The TD-1 decoder kits are mounted vertically.



Overall view of the completed tone squelch. The squelch fits easily on top of the scanner.

ed vertically on the main board. The photo of my tone squelch shows the TD-1 boards next to the labels marking the decoder frequencies. The control logic, relay, and power supply are on the board behind the decoders. I used the copper pads on the board (Radio Shack 276-156) to wire the control and power-supply circuits.

Logic and LEDS

For my squelch to open, a 585-Hz tone must first be received, followed by a 652-Hz tone. Looking at the schematic, IC1 is tuned to 585 Hz. When that tone is received, the output of the decoder goes low. IC3 starts timing a six-second window and LED1 goes off. During this six-second period, a 652-Hz tone must be received and decoded by IC2. LED2 lights when the second tone is decoded. LED2 stays lit for about 25 seconds. During this time (set by the 1000-uF cap between pins 10 and 11 of IC4), the 2N2222 is turned on and relay RL1 pulls in, connecting an external speaker to the output of my scanner.

Building and Operating the Squelch

Building the tone squelch isn't all that difficult and layout isn't critical. The letters A through E marked on the schematic refer to points on the Ramsey TD-1 decoder boards. Relay RL1 came from my junk box. It's marked 360 Ohms at 12 volts and is a good starting point for substitution. I built a simple power supply using a 12-volt clock-kit transformer. A 1-Amp bridge rectifier followed by a 7805 regulator provides the 12 volts and 5 volts shown on the schematic. Both sides of the ac line are protected with an Elmenco fused plug.

The decoders are adjusted with the tone squelch's input disconnected from the scanner. A frequency counter is attached to point E on the decoder board. The 20k pot is adjusted until the counter reads the frequency you want to decode. Remember, IC1 must be set for the first tone and IC2 set for the second tone in the 2-tone sequence.

To operate the squelch, I plugged the audio input of the tone squelch into the external output of my scanner through a mating plug. An 8-Ohm speaker was connected to the output of the tone decoder. I used the idle tone from a local 152-MHz mobile-telephone channel to set the decoder levels. With the tone present, I set the decoder level pot for about 100 millivolts measured with an ac voltmeter at point C on the decoder boards.

Keep the decoder audio input as low as possible to narrow the bandwidth of the decoders. Also, with sequential tones as closely spaced as those in my squelch, the center frequency of each decoder can be slightly offset in opposite directions if decoder-falsing is a problem. In all cases use the minimum amount of audio at point C that permits reliable decoder operation.

After the decoders are set to frequency and the input level is adjusted, place switch S1 in the open or decode position. Audio from your scanner will be heard only after the correct tones are decoded in the right sequence. The 25 seconds of audio from your scanner can be adjusted by changing the value of the 1000-uF capacitor between pins 10 and 11 of IC4.

With the help of this squelch you, too, might end the battle with your television and hear those tone-encoded calls. ■

Parts List

2 Tone decoders, Ramsey Electronics, TD-1	$11.90
3 Diodes, 1N914 (276-1122)	.33
1 Transistor, 2N2222 (276-2009)	.79
2 LEDs (276-026)	.79
1 Potentiometer, 500 Ohms (271-226)	.59
2 Resistors, 560 Ohms	.19
1 Resistor, 750 Ohms	.10
1 Resistor, 1500 Ohms	.10
2 Resistors, 33k	.19
1 Capacitor, 220 uF (272-956)	.79
1 Capacitor, 1000 uF (272-958)	.79
1 Relay, RL1 (273-213)	4.49
	$21.05

Optional Power Supply

1 Transformer, 12 volts, 1.2 Amps (273-1505)	$3.99
1 Diode bridge, 1.4 Amps at 50 piv (276-115)	1.09
1 Voltage regulator, 7805 (276-1770)	1.59
1 Capacitor, 1000 uF, 35 WV dc (272-1019)	1.59
2 Capacitors, .22 uF, 50 WV dc (272-1070)	1.78
	$10.04

All numbers are from the 1982 Radio Shack Catalog No. 354.

S. Dick Uhrmacher K0VKH
212 48th Street
Rapid City SD 57701

Electronic Mail Comes of Age

These mailboxes may be thousands of miles away, but they're instantly accessible.

Has your mailbox had a little dust in the bottom of it recently? Have your friends forgotten how to write? Are you tired of all of the junk mail you've been receiving? Well, maybe it's just because you haven't been checking the *right* mailbox!

This article is designed to acquaint you with the new Message Storage Operation, more affectionately known as the MSO or Electronic Mailbox, and to give you some hints on proper ways to exploit the systems, where to find them, and a bit about on-frequency ethics. I hope to present the most important facts about the MSO, but since it is a wide-ranging subject, I'm sure that I will miss something and take this opportunity to invite you not only to experiment with the various MSOs to answer your questions, but also to correspond with me at the above address should you feel it necessary.

The Message Storage Operation is an adjunct to the ever-popular Hal DS-3100 Automatic Send-Receive Terminal, manufactured by the Hal Communications Corporation, Urbana, Illinois. For those of you who presently own a DS-3100 without the MSO, it can be added to your unit with a minimum of trouble and expense. The MSO is a completely solid-state device which adds mass storage to the DS-3100 and which can be accessed either locally or by remote users. It has a 32,768-byte capacity (approximately 450 lines of message storage or retrieval), which has shown to be more than adequate storage.

Control of the MSO can be accomplished by the local or remote user simply by typing a series of commands recognizable by the MSO. Files (messages) can be written to, read from, or deleted from the system by use of these commands, and a "Help" command is provided to assist in using the system. At this point, I would like to mention that the system is fully automatic, written with "fail-safe" features in mind, and cannot be harmed in any way by either the local or remote user. Everyone is a novice when he first uses any sophisticated system; the MSO is not only forgiving, but also will tell you quickly if you make any mistakes.

First and foremost concerning the use of the MSOs is a basic understanding of our frequency usage. No frequency is reserved, set aside, allocated, or otherwise designated for *only* MSO usage! It is important to observe some very basic rules and precautions *before* you activate one of the MSOs in order to prevent QRM to other users of the frequency, whether they be other MSO users or an already-established QSO on or near the frequency. Just as with any other frequency or mode you use, please *listen* on the frequency before you activate one of the systems. Propagation conditions vary from hour to hour, and it is important to listen for a few minutes on the frequency to keep from stepping on someone else who may be in QSO or using one of the MSOs. Your cooperation in this one area alone will do more for smooth operation of the MSOs than all of the other areas combined!

Just where do you find these mysterious electronic MSOs? Both 20 and 40 meters have well-established MSO operations. The frequencies of 14,085,625 Hertz and 7,096,375 Hertz are popular with many stations, and other smaller operations are appearing daily. I'm told that there is at least one MSO operating on 80 meters (in the western part of the United States), although I'm unaware of its frequency. Those who maintain MSO systems on the various bands almost without exception use some form of crystal control for their transmitters/receivers. Consequently, you can count on these MSOs appearing at the same spot on your dial in day-to-day operations.

This brings up our next most important subject relative to good frequency usage. It is very important that the tones emanating from your equipment match as closely as possible the tones output from the MSO. In this regard, tradition states that it is the mark frequency with which we measure RTTY frequencies. For instance, in order to successfully activate and use the MSO systems maintained on 20 meters, your mark tone (which is 2125 Hertz lower than your operating or carrier frequency) must land on 14,085,625 Hertz. Your digital readout may read 14,087.7 or some other reading, but it is the mark tone frequency that is important to match with the MSO. Off-frequency operation causes many difficulties, some of which are: unsuccessful activation and de-activation of the MSO, QRM from "fishing expeditions" trying to find the frequency, unsuccessful .WRITE, .READ, and .DELETE commands, and a general lack of smooth operation of the MSO. Modern demodulators have *sharp* front-end filters and, as such, require a very close match to successfully demodulate RTTY signals!

Now that we are sure that the frequency is clear and that we have our transmitting/receiving equipment on the correct frequency, let's talk a bit about some "golden rules" for MSO usage:

1) Anonymity is great, but the FCC *requires* that you properly identify your station! So, please properly identify your station when you are utilizing the MSOs.

2) Always start your transmissions to the MSOs with a short "mark hold" of 2 to 3 seconds, followed by at least one carriage return/line feed (CR/LF). This stabilizes both your equipment and that of the MSO.

3) Each command to the MSO must be preceded by a period, (.WRITE, .READ, .DELETE, etc.) and the command must be "left justified" (positioned on the extreme left margin). Commands sent to the MSO from other than the left margin or without the period are ignored. The only exceptions to this are the Access Code and the four Ns (NNNN), which may be sent from any position in the print line.

4) Limit your messages to that information necessary to get the message across. In *all* cases, limit your message to *less than* ten minutes in length, in order to comply with FCC identification requirements.

5) Please utilize the .DELETE command to remove messages directed to you from the MSO after you have .READ them.

6) Please use the .SDIR (short-form directory) in lieu of the .DIR (long-form directory) unless you need the information in the long-form directory.

7) Be *sure* to use the .EXIT command to deactivate the MSO when you are through. Failure to shut down one MSO means that it may respond to commands directed to another MSO on the frequency. This does cause a bit of confusion!

As stated earlier, the MSO system does contain a .HELP command to refresh your memory on the various commands available and a .FILEHELP command to help in constructing files and passwords. Please note that there is a mandatory space character between the .WRITE command and the file name and mandatory carriage return/line feed immediately after the file name. (A carriage return/line feed after each command to the MSO is highly recommended!)

The file name can be any combination of letters and numbers that the receiving station will recognize. Typically, the file name is something like this: .WRITE KØVKH DE K4KOZ (CR/LF). This immediately tells KØVKH that he has a message waiting for him in the MSO and that it is from K4KOZ. The MSO will not accept duplicate file names, so if it is necessary to .WRITE a second message to the same station (while the first one is still on file in the MSO), then make the second file name distinctive by adding a number or letter, e.g., .WRITE KØVKH2 DE K4KOZ (CR/LF).

Since file names are very distinctive, it is additionally important to send the exact information to the MSO when using the .READ or .DELETE commands, even if it is misspelled in the directory. Without the correct file name, the system will return the "file not found" statement.

In conclusion, the MSOs are providing a very satisfactory service on RTTY, CW, and ASCII, both on the HF and the VHF bands. MSO owners derive a lot of personal pleasure in providing these mailbox services and, speaking for myself, I encourage all those who have need for this service to use my MSO at their leisure. I maintain it on 14,085,625 Hertz during the daylight hours and my access code is MSOVKH (no spaces between letters). Hope to see you on RTTY soon! ■

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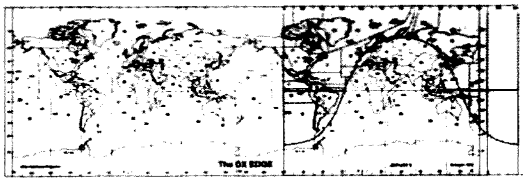

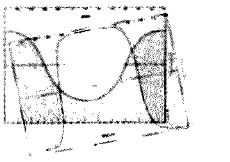

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Octal Ingenuity

It's an old radio. You can't find a replacement tube. Now what do you do?

One day my mother-in-law handed me an old Philco "antique radio" and said, "Franklin, you're a ham. How about fixing my radio?" I took one look at that old ac/dc battery thing and was about to say I was too busy, but then those words, "you're a ham," shook me up. If I didn't fix it, ham radio would be defamed and I would be one degraded Extra-class amateur. If I did fix it, both ham radio and I would still be highly esteemed, at least in her mind.

"Sure, I'll give it a try," I said. And the fun began.

Now this old thing was typical for its day. (See the block diagram in Fig. 1.) There were no doubt millions of these sets built, and this particular one looked well-built, mechanically. Electrically, too, it must have been pretty good to survive this long.

After plugging it in and getting not a peep out of it, I decided to use the usual plan of attack for these jobs. Check the tubes first.

This had to be done without the help of a tube tester. Time to think. If the set is completely dead, a tube fault causing this would probably be catastrophic. Most common in this category is an open filament; then come short circuits and open elements.

It's a good thing I kept that old beat-up RCA tube manual. A check for which pins to test with the ohmmeter didn't take long, and neither did finding the problem. The 3Q5 audio power amplifier filament was open. What luck! I'll just walk right down to my nearby radio store and get a new one.

What, no 3Q5?! And still no 3Q5 three days later, with a telephone bill to raise my wife's ire. Say, this thing *is* an antique radio. Oh, I found a place where I

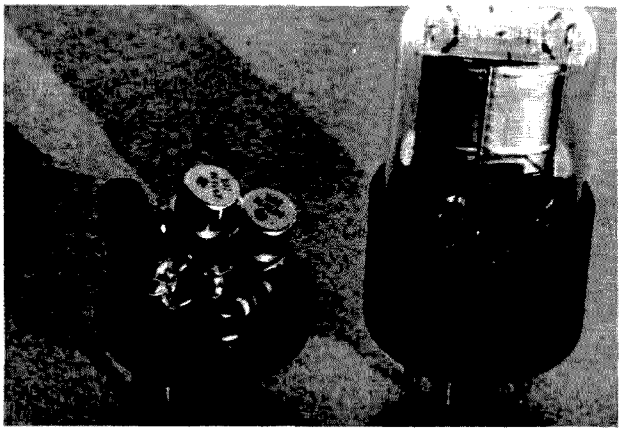

Photo A.

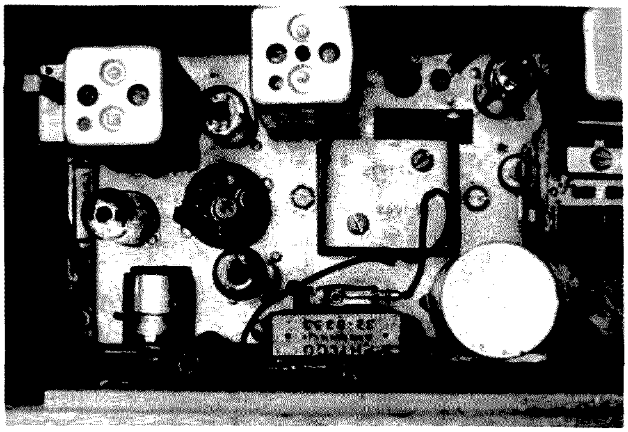

Photo B.

could get a 3Q5 for $4.00, but minimum orders were for $25.00.

Why sweat the small stuff? I'll simply transistorize the stage.

Now here begins my story for fellow hams. Not being of the mathematical type, but having a good supply of parts and test equipment, I'll use the tried and proven practical approach.

First, we'll want to know as much as needed about the tube to be replaced. The RCA tube manual gives the essentials: filament 2.8 V at 0.05 A, maximum plate current 8.5 mA, maximum power output 330 mW at 8.5% THD. Obviously, we are not working with high power or high fidelity, so the replacement job looks easy so far.

Next, we'll need to determine what circuit characteristics must be known. Remember, this is an ac/dc battery-type radio. This type had some strange circuitry which was not well standardized. No schematic is available, so an hour or so must be spent in tracing out what is required of the circuit.

The power supply circuit as traced out is shown in Fig. 2. Notice how the filaments of all but the 117Z3 rectifier are supplied from the B+ through suitable dropping resistors R1 and R2. The 3Q5 cathode resistor (680 Ohms) must be viewed as both shunted by the series string of filaments and as affecting the division of B+ current supplied to the filaments. Notice the 30-uF capacitor at pin 7 of the 3Q5 to common. If this is shorted, it could be the cause of open filaments in the 3Q5. Now is the time to check this. (It was OK in this set.)

Further circuit checks show this amplifier as a straightforward pentode power-amplifier stage (see Fig. 3). The main features to note here are associated with the power supply of Fig. 2. The grid resistor is returned to common through the 1R5 filament. This places the grid 1.4 V dc above common. The 3Q5 filaments are above common by four 1.4-V filaments. This places the 3Q5 cathode potential at about 7 V dc above common. Grid bias was about $1.4-7=-5.6$ V.

Now we should decide on what type of transistor amplifier circuit to use. Here is where past experience and a general knowledge of transistor amplifier circuits comes in handy. For this case we'll use Darlington-connected, high-voltage transistors such as the 2N5058 (Radio Shack RS-2008); see Fig. 4. This circuit provides a high input impedance as needed for the first af amplifier stage and more than enough gain and power output capability. The choice of transistors meets or exceeds the voltage and power needs.

Resistor R1 is the base bias resistor. It will be determined by experimentation and added as part of the transistor amplifier plug-in module. Resistor R2 is the base bias divider resistor, which may be the 2.2-meg resistor already in the radio. Resistor R3 is added to control the division of current

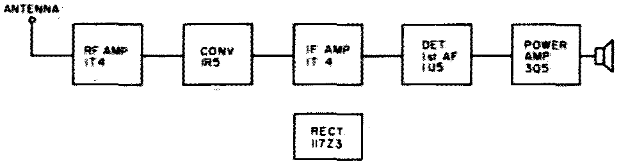

Fig. 1. Block diagram.

between Q1 and Q2. Resistor R4 is the emitter swamping resistor used for temperature stability. It is shown entirely bypassed by C2, but we will experiment with the circuit to determine how much we need or want bypassed. Capacitors C1 and C3 as well as the output transformer are already in the radio. These are used as is.

Let's begin the design and construction. First, use *CAUTION*. Use an isolation transformer as you always should when working on ac/dc equipment not having its own transformer.

Make up an octal plug with wires out to a breadboard setup. This can be done nicely in this case because we are working with low frequencies and relatively low gain. The octal plug is inserted into the 3Q5 socket and the breadboard set up near by.

Initially, calculate or determine component values by Ohm's Law and past experience examples. The resistor replacement for the 3Q5 filament, for example, is determined by Ohm's Law as $R=E/I=2.8/0.05=56$ Ohms. Power is $P=EI=2.8\times0.05=0.14$ Watts. So use some value near 56 Ohms having a power of at least ¼ Watt to start with.

Resistor R3 in Fig. 4 is calculated to guarantee at least 250 uA in Q1 by assuming that this amount of current will be through it when the Q2 normal V_{BE} of 0.65 V is present. $R=E/I=0.65/250\text{ uA}=2.7\text{k}$. Power in this resistor is insignificantly low.

Install the 56-Ohm and 2.7k-Ohm resistors on the breadboard. Use resistor substitution boxes or junkbox resistors for R1 and R4. Initially, set R1 for its highest value (10 meg). Set R4 at 1k Ohms initially. Capacitor C2 may have a starting value of 10 uF at 10 V or more. Try all of the three possible near common pins (2, 8, and 7) of the 3Q5 socket one at a time for the circuit common.

Check radio operation for output at about 1/3 volume-control setting. Also check and record filament voltage at pin 7 relative to common, dc current through R4 (via voltage drop and Ohm's Law), and

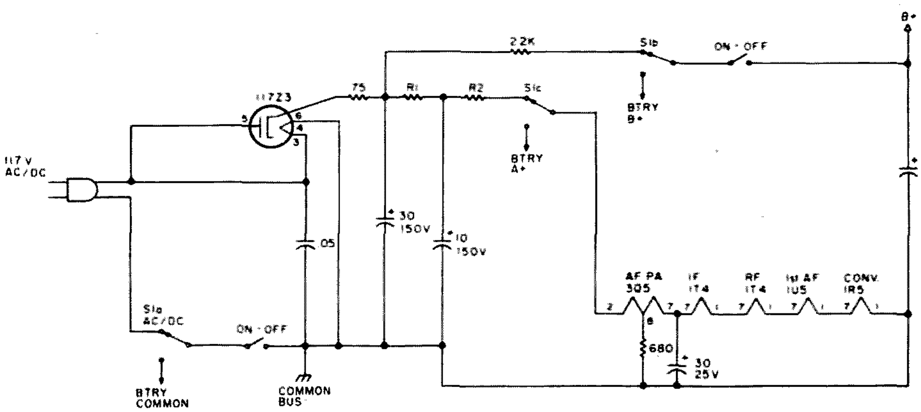

Fig. 2. Power supply.

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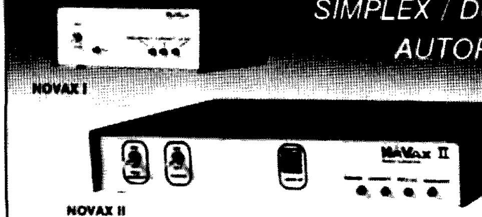

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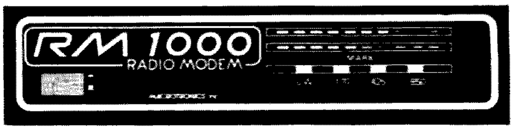

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feel the transistors for heat. *Caution:* Remove voltage just prior to touching the transistors, as up to 100 volts may be present. Change values of components in small steps until you obtain correct filament voltage (5.6 V), less than maximum current (8.5 mA), sufficient output volume with low distortion, and operation with neither transistor more than slightly warm to the touch.

My final circuit was easily constructed on an octal plug (see Photo A) and provided what seemed to Mother more volume and clearer tones than she had ever heard from this set.

The final circuit is shown in Fig. 5. The original 680-Ohm resistor was disconnected inside the set so that pin 8 could be used as a tie point on the plug. The final filament resistor value was 150 Ohms (not the calculated value of 56 Ohms). This also was wired inside the set although it could have been placed on the octal plug. Final amplifier current was a surprisingly low 2 mA. Both transistors were at only body temperature or less.

Notice that the 2.2k-Ohm resistor is bypassed with a 0.5-uF capacitor, but connection to pin 2 for the common return effectively places the 150-Ohm filament resistor in the circuit unbypassed. This helped to raise input impedance as well as to lower distortion. The increased input impedance must have offset gain reduction in this stage because gain was still more than enough.

The 220-pF capacitor was added to eliminate high-frequency hiss. The source of this may have been a poorly filtered signal from the detector or a parasitic oscillation in the transistor stage.

For the last two years now, my mother-in-law hasn't had one bad thing to say about ham radio. She seems well satisfied as she sits in her rocking chair listening to those far-away stations. ■

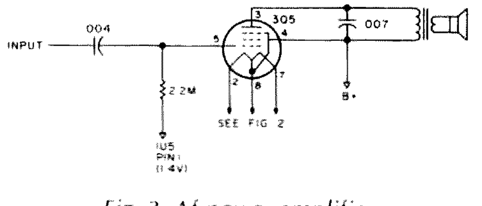

Fig. 3. Af power amplifier.

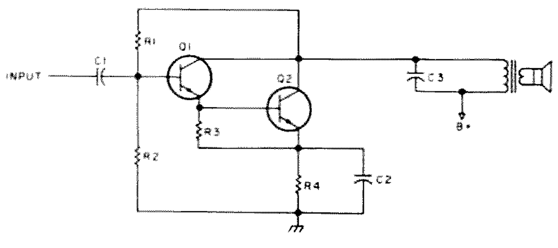

Fig. 4. Transistorized af power amplifier.

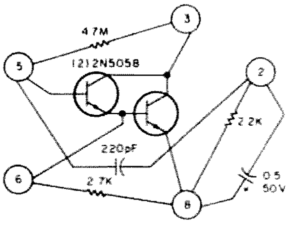

Fig. 5. Final circuit. (Top view of octal plug.)

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

SOUTH GREENSBURG PA
NOV 5

The Foothills ARC will hold its fifteenth annual hamfest on Saturday, November 5, 1983, at St. Bruno's Church, South Greensburg PA. Tickets are $2.00 or 3 for $5.00; indoor flea-market tables are $5.00. Refreshments and food will be available. Talk-in on 146.07/.67. For further information, advance tickets, or tables, contact WA3HOL, or write FARC, PO Box 236, Greensburg PA 15601.

STONE MOUNTAIN GA
NOV 5-6

The Alford Memorial Radio Club, Inc., will host its 11th annual Hamvention on November 5-6, 1983, at Stone Mountain Park, Stone Mountain GA. Hours on Saturday are 9:00 am to 5:00 pm and on Sunday, 9:00 am to 3:00 pm. The admission fee of $3.00 includes a Saturday night cookout for the entire family and variety entertainment. There will be FCC exams, seminars, dealers, a gigantic flea market, and free parking. Camping will be available in the park. Talk-in on 146.16/146.76. For further details, send an SASE to Lew Howard W4LHH, 4132 Creek Stone Court, Stone Mountain GA 30083, or phone (404)-292-5469.

TAYLOR MI
NOV 6

The RADAR seventh annual hamfest, flea market, and swap will be held on Sunday, November 6, 1983, from 8:00 am to 3:00 pm, at Kennedy High School, Kennedy Drive, corner of Northline, Taylor MI. Admission is $2.00. Tables are $1.00 per foot (8-foot tables) and reserved tables must be paid for in advance. Dealers may set up at 7:00 pm on Saturday and 6:00 am on Sunday. Send check or money order to RADAR, Inc., PO Box 386, Taylor MI 48180. Talk-in on 147.93/.33 and 146.52. For more information, phone Bea Johnson at (313)-561-3911.

WEST MONROE LA
NOV 12

The Twin City Ham Club will hold a hamfest on Saturday, November 12, 1983, from 8:00 am through 5:00 pm, at the West Monroe Convention Center, West Monroe LA. There will be a variety of dealers as well as plenty of space for swap tables. Talk-in on .25/.85 and .52/.52. For further information, contact Benson Scott AE5V, 107 Contempo, West Monroe LA 71291.

MT. PROSPECT IL
NOV 13

The Mt. Prospect Amateur Radio Club and Tri-County Emergency will sponsor RA-COM '83 on November 13, 1983, beginning at 8:00 am, at Prospect High School, 801 W. Kensington, Mt. Prospect IL. Features will include a large indoor electronics flea-market area, commercial exhibits, and seminars. Talk-in on 146.52. For more information and flea-market or commercial booth reservation forms, send an SASE to RA-COM, PO Box 452, Mt. Prospect IL 60056.

NORTH HAVEN CT
NOV 13

The Southcentral Connecticut Amateur Radio Association (SCARA) will hold its 4th annual electronics show and flea market on Sunday, November 13, 1983, from 9:00 am to 3:00 pm, at the North Haven Recreation Center, Linsley Street, North Haven CT. Admission for all events all day is $1.50; children under 12 accompanied by an adult will be admitted free; tables are $7.00 in advance and $10.00 at the door. Features will include the latest in ham radio, computer, and domestic electronics and software. There will be free technical seminars, ARRL information and programs, a bake sale, and a Christmas/Chanukah gift bazaar featuring non-electronic gifts. Tables for the gift bazaar will be available only in advance. Doors open for vendors at 8:00 am. Food will be available all day. For reservations, send a check, payable to SCARA, to Ed Goldberg WA1ZZO, 433 Ellsworth Avenue, New Haven CT 06511, and include an SASE for confirmation and directions. For further information, phone (203)-773-0646 (home) or (203)-852-7876 (work).

FORT WAYNE IN
NOV 13

The Allen County Amateur Radio Technical Society (AC-ARTS) will hold its 11th Fort Wayne Hamfest on November 13, 1983, at the Allen County Memorial Coliseum, Fort Wayne IN. Tickets are $2.50 in advance and $3.00 at the door; children under 12 will be admitted free. Regular tables are $6.00, premium tables are $20.00, and parking is $1.00. There will be forums on OSCAR, fast- and slow-scan TV, 10m FM, audio, computers, and traffic handling. Talk-in on .88 and .52. For advance tickets (include an SASE with your request and send before the November 1st deadline) and more information, write to Hamfest Chairman, AC-ARTS, Inc., PO Box 10342, Fort Wayne IN 46851.

SELLERSVILLE PA
NOV 13

The R. F. Hill Amateur Radio Club will hold its annual Winterfest Amateur Radio Flea Market and Exhibit on Sunday, November 13, 1983, at the Sellersville National Guard Armory, PA route 152, Sellersville PA. Take Sellersville or Perkasie exits from PA route 309. The location is approximately halfway between Philadelphia and Allentown. Admission for buyers is $2.00. Rates for sellers for indoor space is $4.00 and for outside tailgating space, $3.00. Refreshments will be available on site and there are many good places to eat nearby. Flying hams should land at Pennridge Airport in Perkasie PA. Talk-in on 144.71/145.31 (Almont PA), 146.28/146.88 (Souderton PA), and 146.52 simplex (local area). For additional information, write PO Box 29, Colmar PA.

MASSILLON OH
NOV 13

The Massillon Amateur Radio Club will present the ARRL-approved Auction Fest '83 on Sunday, November 13, 1983, at the Massillon Knights of Columbus Hall, 988 Cherry Road NW, Massillon OH. Tickets are $2.50 in advance and $3.00 at the door, and children under 12 will be admitted free. Each 8-foot table is $5.00. The flea market will begin at 7:00 am, doors will open at 8:00 am, and the auction will begin at 11:00 am. Food will be available and the hall is easily accessible for the handicapped. Talk-in on 147.78/.18. For advance reservations and tickets, send an SASE to Massillon ARC, 920 Tremont Avenue SW, Massillon OH 44646.

ALPINE NJ
NOV 19

The Stateline Amateur Radio Club of New York and New Jersey will hold Radiosport '83 on Saturday, November 19, 1983, at the Alpine Boy Scout Campgrounds, Alpine NJ (just off exit 2 of the Palisades Interstate Parkway). Children under 12 will be admitted free. The demonstrations, technical discussions, and dealer and commercial displays will be in a large, indoor, well-lit, heated facility with ample parking, including spaces for tailgating (weather permitting). A refreshment stand will be available, as well as an engineering table with special test equipment available for checking deviation, output, swr, etc. Talk-in on 146.235/.835 and 146.52. For further information and/or table or booth reservations, contact Abel David, Jr. KX2F, 82 Lexington Avenue, Dumont NJ 07628, or phone (201)-387-8129.

BILLERICA MA
NOV 19

The Honeywell 1200 Radio Club and the Waltham Amateur Radio Association will hold their annual amateur radio and electronics auction on Saturday, November 19, 1983, beginning at 10:00 am, at the Honeywell Plant, 300 Concord Road, Billerica MA (exit 27 off route 3). There will be a snack bar, a bargain parts store, and free admission and parking. Talk-in on 147.72/.12 and 146.04/.64 (club-sponsored repeaters). For more information, contact Doug Purdy N1BUB, 3 Visco Road, Burlington MA 01803.

VERO BEACH FL
NOV 19

The Treasure Coast Hamfest will be held on November 19, 1983, at the Vero Beach Community Center. Admission is $2.50 in advance and $3.00 at the door. Features will include tailgating and a QCWA luncheon. Talk-in on 146.13/.73, 146.04/.64, and 222.34/.94. For more information, write PO Box 3088, Beach Station, Vero Beach FL 32960.

CLEARWATER FL
NOV 26-27

The Florida Gulf Coast Amateur Radio Council will sponsor the Florida State ARRL Suncoast Convention on November 26-27, 1983, from 9:00 am to 4:00 pm both days, at the Sheraton Sand Key Resort, Clearwater FL. Registration is $3.00 in advance (until November 18th) and $4.00 at the door. Saturday will feature a QCWA luncheon ($7.00 per ticket), the ARRL forum hosted by Frank Butler W4RH, and a luau in the evening ($15.00 per ticket). Sunday will feature a ladies' luncheon ($7.00 per ticket). Activities will include a flea market ($12.00 for both days for swap tables), technical talks, and demonstrations. Talk-in on .37/.97, .96/.36, and in Tampa, .16/.76. For hotel room reservations, write Sheraton Sand Key Resort, 1160 Gulf Boulevard, Clearwater FL 33515, or call (813)-595-1611 (mention the Sun-

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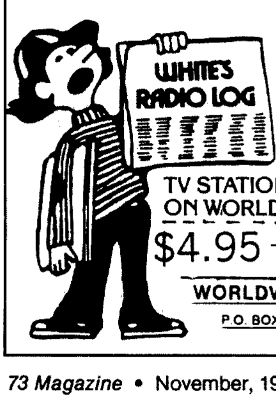

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coast Convention). For advance tickets or swap-table reservations, send an SASE and check to the order of FGCARC to Florida Gulf Coast Amateur Radio Council, Box 157, Clearwater FL 33517. For more information, write FGCARC at the above address.

GREENSBORO NC
NOV 26-27

The Guilford Amateur Radio Club will hold its annual Hamfest/Computerfest on November 26-27, 1983, beginning at 9:00 am each day, at the National Guard Armory, Greensboro NC. Pre-registration is $3.50 and registration at the gate is $5.00. Tailgating is allowed with the price of admission. An equipment check-out booth with test equipment and a technician will be available as a free service for those wishing to check used equipment prior to purchase. Food and free parking will also be available. Talk-in on 144.65/145.25 and 146.52 simplex. For more information and advance tickets (checks to be made payable to GARC), send an SASE to GARC, PO Box 7007, Greensboro NC 27407.

OAK PARK MI
NOV 27

The Oak Park High School Electronics Club will hold its 14th annual Swap-n-Shop on Sunday, November 27, 1983, from 8:00 am to 4:00 pm, at the Oak Park High School, Oak Park MI. The east and west doors will open at 6:00 am. Admission is $2.00 and 8-foot tables are $6.00. Refreshments will be available. For more information, send an SASE to Herman Gardner, Oak Park High School, 13701 Oak Park Boulevard, Oak Park MI 48237, or phone (313)-968-2675.

STONY BROOK LI NY
NOV 27

The Radio Central ARC will sponsor its 5th annual Ham-Central, 1983 edition. This ARRL hamfest will be held on Sunday, November 27, 1983, from 9:00 am to 3:00 pm, in the social hall of Temple Isaiah, 1404 Stony Brook Road, Stony Brook LI NY. General admission is $3.00; children under 12 and XYLs will be admitted free. An 8-foot table space is $7.00 and includes one free admission. Doors will open at 7:30 am for dealers and sellers (ham-related items only). There will be food, drinks, and free parking available. Seminars will feature speakers Art Greenburg W2LH and Madeline Greenburg W2EEO on antennas and Harry Dannals W2HD on the future of ham radio. Talk-in on 144.550/145.150 and 146.52. For reservations and additional information, contact Scotty Policastro KA2EQW, 80 7th Street, Bohemia NY 11716, (516)-589-2557, or Bob Yarmus K2RGZ, 3 Haven Court, Lake Grove NY 11755, (516)-981-2709.

FARIBAULT MN
DEC 3

The annual Handi-Ham Winter Hamfest will be held on Saturday, December 3, 1983, at the Eagles Club in Faribault MN. Registration will begin at 9:00 am. There will be a Handi-Ham equipment auction and a dinner at noon. Talk-in on .19/.79. For more information, contact Don Franz W0FIT, 1114 Frank Avenue, Albert Lea MN 56007.

HAM HELP

I need the schematic for a Digi Scan 8 by Unimetrics. This is an 8-channel scanner.

Dan Quinn KA4CJE
Rt. 3, Box 818
Palatka FL 32077

Does anyone have a spare range selector switch for the Heath MM-1 VOM? It is no longer available from Heath.

Charles Guthy
24 Pinewood Ave.
Sudbury MA 01776

Wanted: maintenance manuals for the Aida 103 and 103A HF transceivers. I want to convert the 103 to include 15 meters.

Fr. Joseph Vaughan KC2LJ
Frontier Rd.
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I need manuals and schematics for the following equipment: the Eico model 323 VTVM and model 324 signal generator; the Heath model IM-18 VTVM; and the DuMont 401-A oscilloscope. I also need a spare power transformer for the DuMont 401-A. I am willing to purchase originals, copy and return the original, or reimburse your copying and mailing costs.

H. W. Hall WB4OGM
492 Selfridge Drive
Colorado Springs CO 80916

I have been searching for the service manual, schematic, and parts list for the Telequipment S-54A oscilloscope. I will gladly pay copying costs.

Raymond L. Wood WB4MOM
Rt. 5, Box 93
Elizabeth City NC 27909

I need modification information for the Yaesu FT-2 (B or F version). I am especially interested in frequency-synthesis modifications.

Richard Metro KA2QWH
201-D Springmeadow Drive
Holbrook NY 11741

I need a copy of the manual for the Heath model QF-1 Q-multiplier.

Robert Schlaget N7BH
2302 288th St. East
Roy WA 98580

I need the schematic and operating manual for the Heath HX-11 CW transmitter. I will pay for copying and mailing costs.

Carl Walczewski KB1EH
141 Booth St.
New Britain CT 06053

I need help in locating the wiring diagrams for the Hewlett-Packard model 150 oscilloscope and model 152-B dual-trace amplifier.

Charlie Weiss
3825 Lochlane
North Little Rock AR 72118

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SATELLITES

INITIAL ORBITAL TIMES FOR STS-9

Any given orbit begins as the spacecraft crosses the equator traveling west to east. The following orbital operating times are based on an 11:30 AM EDT launch on October 28th. If the launch is delayed for any reason, you must add the amount of the delay to the times stated here to obtain new orbital track timing for an operating pass. Also, what we are listing here are only the "official operating periods" scheduled as of September 3rd. Dr. Garriott says he will attempt to provide other "unofficial" operating periods as well, but these will have little advance notification. Whenever possible, advance notice of these extra operating times will be made available over W1AW, in bulletins issued by NASA-affiliated radio clubs (such as W5RRR in Houston), and on the daily updates of the Westlink Radio Network Hollywood newsline: (213)-465-5550. All North American passes are listed in local time, while those for foreign contacts with the spacecraft are in UTC. All times are approximate for the start of a given pass. You may calculate the specific time over your QTH by adding the forward speed of the space vehicle, which is 17,000 miles per hour.—*Thanks to Roy Neal K6DUE and the* Westlink Report.

Orbit #	Date	Ground Track	AOS Time
39	10/30	Spokane, Denver, Dallas, Houston, New Orleans, S. America	2000 CDT
40	10/30	N. California, down Pacific coast E. of San Francisco and LA, Mexico	1930 PDT
47	10/31	W. Australia, S. America, Europe	1430 UTC
		NOTE: Standard Time begins this date	
63	11/1	S. America, USSR, India, Australia	1330 UTC
64	11/1	Iran, Scandinavia, USSR	1555 UTC
77	11/2	NW Africa, E. Europe, Poland, China	0850 UTC
79	11/2	N. tip of S. America, Caribbean, N. Europe, USSR, India	1250 UTC
80	11/2	Caribbean, all E. Coast states, Newfoundland, UK, central Europe	0815 EST

AMSAT SYMPOSIUM

AMSAT will hold an Amateur Radio Satellite Symposium in conjunction with its annual meeting on Saturday, November 12, 1983, at the Johns Hopkins University Applied Physics Laboratory just off I-95, between Baltimore and Washington. The planned programs include: how to get on the new OSCAR 10 satellite, tracking OSCAR 10 with/without a computer, a report on the W5LFL Space Shuttle operation, PACSAT, and, much, much more! Admission is free but advanced reservations are required. For further information and reservations, contact AMSAT, PO Box 27, Washington DC 20044, or call (301)-589-6062.

Amateur Satellite Reference Orbits

	OSCAR 8		RS-5		RS-6		RS-7		RS-8		
Date	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
Nov 1	0059	103	0129	155	0113	157	0153	163	0018	135	1
2	0103	104	0123	155	0058	154	0143	162	0015	136	2
3	0108	106	0118	155	0043	152	0134	161	0012	137	3
4	0112	107	0113	155	0027	150	0124	161	0009	138	4
5	0116	108	0107	155	0012	147	0114	160	0006	138	5
6	0121	109	0102	156	0155	175	0105	159	0003	139	6
7	0125	110	0057	156	0140	173	0055	158	0001	140	7
8	0129	111	0051	156	0124	170	0045	157	0158	171	8
9	0134	112	0046	156	0109	168	0036	156	0155	172	9
10	0138	113	0041	156	0054	166	0026	155	0152	173	10
11	0142	114	0035	156	0038	163	0016	154	0149	173	11
12	0004	90	0030	157	0023	161	0007	153	0146	174	12
13	0008	91	0025	157	0007	159	0156	182	0143	175	13
14	0012	92	0019	157	0151	186	0147	182	0141	176	14
15	0017	93	0014	157	0135	184	0137	181	0138	177	15
16	0021	94	0009	157	0120	181	0127	180	0135	178	16
17	0025	95	0003	158	0104	179	0118	179	0132	178	17
18	0030	96	0158	188	0049	177	0108	178	0129	179	18
19	0034	98	0152	188	0034	174	0058	177	0126	180	19
20	0038	99	0147	188	0018	172	0049	176	0124	181	20
21	0043	100	0142	188	0003	170	0039	175	0121	182	21
22	0047	101	0136	189	0146	197	0029	174	0118	182	22
23	0051	102	0131	189	0131	195	0020	174	0115	183	23
24	0056	103	0125	189	0115	193	0010	173	0112	184	24
25	0100	104	0120	189	0100	190	0000	172	0109	185	25
26	0104	105	0115	189	0044	188	0150	201	0107	186	26
27	0109	107	0109	190	0029	186	0140	200	0104	187	27
28	0113	108	0104	190	0014	183	0131	199	0101	187	28
29	0117	109	0059	190	0157	211	0121	198	0058	188	29
30	0122	110	0053	190	0142	208	0111	197	0055	189	30
Dec 1	0126	111	0048	190	0126	206	0102	196	0052	190	1
2	0130	112	0043	190	0111	204	0052	195	0050	191	2
3	0135	113	0037	191	0055	201	0042	195	0047	191	3
4	0139	114	0032	191	0040	199	0033	194	0044	192	4
5	0000	90	0027	191	0024	197	0023	193	0041	193	5
6	0004	91	0021	191	0009	194	0013	192	0038	194	6
7	0009	92	0016	191	0152	222	0004	191	0035	195	7
8	0013	93	0011	192	0137	220	0153	220	0033	195	8
9	0017	94	0005	192	0122	217	0144	219	0030	196	9
10	0022	95	0000	192	0106	215	0134	218	0027	197	10
11	0026	96	0154	222	0051	213	0124	217	0024	198	11
12	0031	97	0149	222	0035	210	0115	216	0021	199	12
13	0035	99	0144	223	0020	208	0105	216	0018	200	13

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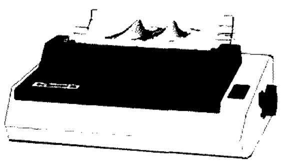

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Practically every mode of communication used by an amateur-radio operator makes use of sound. Obviously, in voice communications, sound is directly processed by our brains. In CW communications, unless you are using a code reader or a flashing light, the radio signal is converted into a tone for us to hear. What is not so obvious is that sound is also crucial for "digital" communications. The only way to send a digital signal over communications equipment designed for voice is to convert it into tone signals. On the receiving end, special hardware is needed to convert the tone signals back into digital pulses.

All modern computers employ digital circuitry; they can only deal with signals that are either "high" or "low" (commonly represented with +5 V and 0 V in TTL-based computer systems). Since sound is of an analog nature, computers cannot deal with it directly. One way of dealing with sound is with circuitry adjusted to respond to certain frequencies. This method is useful if only a small number of sound frequencies needs to be detected. A common example of this is a RTTY decoder. Usually a pair of tuned circuits (or sometimes phase-locked loops) is used—one circuit is tuned to the "mark" frequency while the other is tuned to the "space." If, however, more than a few tones must be decoded, more sophisticated circuitry is needed. For applications such as speech digitizing (recording speech in digital computer memory), usually an analog-to-digital converter circuit is used. These are available as integrated circuits. Some of the more expensive A/D converter chips are quite fast; conversion time is just a few microseconds.

I am a software oriented person. I will go to extremes to solve a problem by using fancy software techniques rather than hardware. Perhaps it's because I am the world's worst solderer, or maybe because I am totally uncoordinated when it comes to handling small electronic components, that I have developed my distaste for electronic construction projects.

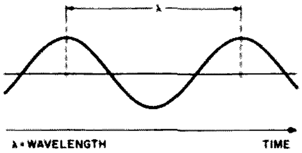


Fig. 1. How a wavelength is measured.

Because of my software vs. hardware attitude, I use software to deal with sound problems. Using some surprisingly simple algorithms, it is possible to analyze audio information with a microcomputer.

Before I go into software techniques for dealing with sound, let's review what the phenomenon of sound is all about. As you probably know, sound is carried by waves in some sort of a medium. When a reed, for instance, is set vibrating, it compresses the air immediately surrounding it. Due to the elastic nature of air molecules, the compressed air spreads out and compresses its neighboring molecules. It is this "bucket-brigade" effect that causes sound to travel. (Note that the molecules themselves aren't being compressed, it is the space between them.) In a denser medium, such as water, steel, or air at a higher pressure, sound will travel faster because the elasticity is greater. Conversely, less dense media will carry sound at a slower rate.

Sound frequencies that human beings can hear range from about 16 Hertz to about 25,000 Hertz, a *Hertz being* a cycle per second. Another way of measuring the frequency of a sound is by wavelength. Fig. 1 shows a diagram of a wavelength: a measure of the distance from one point on a wave to another corresponding point. The example I used shows it being measured from peak to peak. A wavelength can be expressed in terms of length in linear units (e.g., inches) or in time units (e.g., milliseconds). When working with a computer, it is convenient to measure wavelength in time units. After all, everything in a computer is clocked to a stable reference frequency.

Last month, we discussd a circuit known as a zero-cross detector. This simple circuit, consisting of an operational amplifier and a few additional components, makes it possible to do a number of things with sound waves. While you can only measure frequency information with such a circuit (any waveshape information is undetected), that is enough for many applications. Besides, the Apple II, II+, and *IIe* computers have the zero-cross detector built in; it is what the cassette interface uses. This means with an Apple or Apple-compatible computer, no additional interface hardware is needed to measure the frequency of a tone.

When writing software to process audio signals, it is necessary to use assembly language; high-level languages are just too slow to be useful. Also, with assembly language, it is possible to know exactly how much time an instruction takes to execute. This is critical when accurate timing loops are needed. Since the Apple II computer uses a 6502 microprocessor, the programs here will be written for that microprocessor. The algorithms, however, will be the same for any microprocessor.

Perhaps the simplest way to measure frequency is to have the computer count from one state change of the cassette port (zero cross detector) to another. Looking at Fig. 2, we see that the state changes every half-cycle. Using this information, an algorithm to measure frequency would be:

1. Wait for the port to become negative.
2. Increment a counter by 1.
3. Check the port.
4. If negative, go to step 2; if not, stop.

Now, to determine frequency from the result in the counter, some things need to be calculated. Take a look at Program 1. Notice the numbers in parentheses after some of the instructions; these are the execution times (i.e., the amount of time it takes for the computer to perform the instruction) measured in clock cycles. The Apple computer runs at a speed of 1,023,000 clock cycles per second. Once around the loop in the program takes 9 clock cycles. If, after exiting the loop, the counter has counted to 50, this means that 50 × 9 × 1/1023000 seconds have elapsed, or that one half-cycle takes 0.0004399 seconds. Since these are half-cycle, we multiply this by 2 to get 0.0008798 and take the reciprocal. This leaves us with 1138.66667 as the frequency in Hertz.

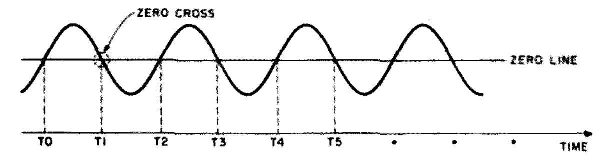
This method of counting a time interval between half-cycles is simple and quick, but not very accurate. The resolution (i.e., the closest frequencies that can be distinguished) is poor, and gets worse at higher frequencies. Some ways of improving this would be to raise the clock frequency of the computer, or count for a number of cycles. The problem with counting for a number of full cycles, as opposed to one half-cycle, is that the counting loop gets more complex and takes more clock cycles to execute. If the loop takes a longer amount of time to execute, frequency resolution is lost. Still, this is probably the best method when high speed is needed and close resolution is not. Certainly this method would be useful for decoding wide-shift RTTY, or even the tones needed for SSTV if you are only testing for a limited number of gray levels. The program in listing 1 has some limitations. Perhaps its greatest one is that it uses an 8-bit register to store the count. Because of this, low frequencies cause it to loop around to zero and start again. One possible solution, at the cost of 2 clock cycles per iteration, would be to add a BEQ OUT instruction after the INY. This way, if a result of zero is returned from the subroutine, you know to ignore it. Of course, one can make use of the counter "wraparound" to measure low frequencies.

The most accurate way of measuring frequencies on a microcomputer is to actually count the cycles for 1 second. The result would be directly in Hertz, and resolution would be to 1 Hertz. If a computer has an interrupt timer, it can be used to ensure that the count program runs for one second and then stops. Unfortunately, due to the way the Apple's sytem ROM is configured, it makes it very difficult to deal with interrupts.

The way around this problem is to have run through the program that counts cycles a fixed number of times. It is essential that the cycle-counting portion of the program take exactly the same amount of time to execute each time it runs. This is

```
CASS    EQU   $C060
        ORG   $0302
        LDY   #0
BACK    LDA   CASS
        BPL   BACK
LOOP    INY               ;(2)
LDAC    LDA   CASS        ;(4)
        BNE   LOOP        ;-(3/2)
OUT     RTS
```

Program listing 1.



TIME	*CASSETTE PORT VALUE*
T0	POSITIVE
T1	NEGATIVE
T2	POSITIVE
T3	NEGATIVE
T4	POSITIVE
T5	NEGATIVE

Fig. 2. Apple cassette-port operation.

```
SOURCE FILE: PROG4
0000:              1 ;
0000:              2 ;
0000:              3 ;
0000:              4 ;
C0A0:              5 CASS     EQU  $C060
00FC:              6 TZP      EQU  $FC
00FD:              7 ZP       EQU  $FD
00FE:              8 CH       EQU  $FE
00FF:              9 CL       EQU  $FF
----- NEXT OBJECT FILE NAME IS PROG4.OBJ0
0302:             10          ORG  $302
0302:AD 60 C0     11 INIT     LDA  CASS
0305:29 80        12          AND  #$80
0307:8D 4B 03     13          STA  LAST
030A:A9 00        14          LDA  #0
030C:A8           15          TAY
030D:AA           16          TAX
030E:A9 7C        17          LDA  #124
0310:85 FD        18          STA  ZP
0312:20 28 03     19 MLOOP    JSR  LOOP
0315:98           20          TYA
0316:A0 00        21          LDY  #0
0318:18           22          CLC
0319:65 FF        23          ADC  CL
031B:85 FF        24          STA  CL
031D:29 00        25          AND  #$00
031F:65 FE        26          ADC  CH
0321:85 FE        27          STA  CH
0323:C6 FD        28          DEC  ZP
0325:D0 EB        29          BNE  MLOOP
0327:60           30          RTS
0328:E8           31 LOOP     INX                 ; (2)
0329:F0 1E        32          BEQ  LEAVE          ; (2/3)
032B:AD 60 C0     33          LDA  CASS           ; (4)
032E:29 80        34          AND  #$80           ; (2)
0330:85 FC        35          STA  TZP            ; (3)
0332:4D 4B 03     36          EOR  LAST           ; (4)
0335:30 09        37          BMI  ADD1           ; (2/3)
0337:4E 4A 03     38          LSR  WASTE          ; (6)
033A:AD 4A 03     39          LDA  WASTE          ; (4)
033D:4C 28 03     40          JMP  LOOP           ; (3)
0340:A5 FC        41 ADD1     LDA  TZP            ; (3)
0342:8D 4B 03     42          STA  LAST           ; (4)
0345:C8           43          INY                 ; (2)
0346:4C 28 03     44 GOBK     JMP  LOOP           ; (3)
0349:60           45 LEAVE    RTS
034A:             46 WASTE    DS   1
034B:             47 LAST     DS   1

*** SUCCESSFUL ASSEMBLY: NO ERRORS

 0340 ADD1        C060 CASS      FE CH       FF CL
?0346 GOBK       ?0302 INIT    034B LAST   0349 LEAVE
 0328 LOOP        0312 MLOOP     FC TZP    034A WASTE
   FD ZP
```

Program listing 2.

trickier than it sounds; if a conditional branch takes place, the entire routine must execute in the same amount of time as it would if the branch did not occur. Also, to measure reasonably high frequencies, the counting loop must take as little time as possible.

Program 2 shows a frequency-counting subroutine that counts zero crossings on the Apple cassette port for a fixed amount of time. When used with Program 3, a Basic program to do some floating point calculations, it can measure frequencies with a resolution of 1 Hertz. If your Apple's clock is running at the proper frequency, it should give you fairly accurate results.

Lines 10 through 18 of Program 2 initialize various memory locations. The current status of the cassette port is examined and stored in memory location LAST. The X and Y index registers are set to zero, and the zero-page memory location ZP is set to 124. ZP controls the number of iterations that the LOOP, starting at line 31, is executed. As each iteration of LOOP takes 8192 clock cycles, the timing portion of the program will take 1,015,808 clock cycles—just a little bit under a second. (The difference is corrected in Program 3.) Now look at the LOOP portion of the program (line 31). I have indicated the number of clock cycles that each instruction takes in parentheses. (The 2/3 means that the instruction can take 2 or 3 cycles, depending on whether the branch is taken.) This routine will always take 32 clock cycles to execute, while it is performing the actual counting. The time spent before it starts to count is irrelevant. Notice that whenever the iteration counter goes through 256 iterations, it returns to MLOOP at line 20. MLOOP clears the registers, accumulates the zero-cross count, and calls the subroutine LOOP again. It does this 124 times (remember lines 17 and 18) and then exits, returning control of the computer to the Basic interpreter. By using the technique of "emptying" the counting register every so often, one can overcome the problem of the 6502's 8-bit register. (Remember that an 8-bit register can only hold 256 different values.) The frequency information is contained in memory locations 254 and 255. These zero-page locations (so called because they are on the bottom 256-byte memory page) take less time for the computer to use: one less clock cycle per instruction.

```
]LIST

5  HOME
10  POKE 254,0: POKE 255,0
20  CALL 770
30 ZC =  PEEK (254) * 256 +  PEEK (255)
40 TF = ZC / 2
50 FRQ = TF * 1.0070801
60  VTAB 4: HTAB 27: PRINT "          "
70  VTAB 4: PRINT "THE FREQUENCY IN HERTZ IS "; INT (FRQ)
80  GOTO 10
```

Program listing 3.

Listing 3, the Basic program, clears the zero-cross count locations (line 10). It then calls the routine and calculates the number of zero crosses detected in the counting period. This figure is divided by 2 (line 40) to convert from zero crosses to cycles and multiplied by 1.0070801 to correct the count for a 1-second sampling period. Finally, since the fractional portion of the number isn't accurate, it is discarded, and the integer portion is displayed on the screen as the frequency in Hertz.

To enter the assembly-language portion of the program into the computer, enter the monitor with the command CALL-151 from Basic and enter the hexadecimal data from address 0302 to 0349 hex. After the information is typed in (consult the reference manual if you don't know how to enter hex data), save the information with the command: BSAVE PROG4.OBJ0,A$302,L79. You might wish to add the statement: 7 Print"BLOAD PROG4.OBJ0" to the Basic program in listing 3. This will ensure that the machine-language routines are loaded in each time the program is run. (Remember to put a CTRL-D before the BLOAD.)

I found this frequency-counting program to be quite useful. One of the first things I did with it was to measure receiver drift. With the program running, I turned my receiver's calibrator on and tuned the vfo until I heard a tone, which I fed into the Apple's cassette port. By noting the frequency of the tone when the rig was first turned on, and comparing it after a half hour, I was able to determine how many Hertz the receiver had drifted.

If the 1-second sampling time is too long for your needs, you can shorten it, sacrificing some resolution. For example, if you use a 1/100-second sampling rate, the result would be accurate to 100 Hertz. To accomplish this, change the 124 in line 17 of listing 2 to 12. This would make the sample time equal to 12 × 8192 clock cycles, or .00960938 seconds. Multiply by the reciprocal, 10.406494, and divide by 2 (or multiply by 2 and divide by the reciprocal) to get the frequency in Hertz. Obviously, any sampling time can be selected in steps of 8192 clock cycles. (Remember that the LOOP portion of the program always takes 32 × 256 or 8192 clock cycles to execute.)

Next month, we'll take a look at tone and waveform generation on computers. Keep the letters coming in—just remember to include an SASE.

REVIEW

THE KENWOOD MULTI-MODE TR-9500 TRANSCEIVER

Are those declining sunspot numbers making you think about a new challenge in the hobby for the coming years? Have you wondered about all that talk of the new OSCAR satellite and its fantastic DX potential? Or possibly a friend has told you about how interesting and sunspot-proof VHF/UHF propagation can be.

Well, a number of manufacturers have now extended the multi-mode-radio concept to the 70-cm band (420-450 MHz). These radios are ideal as a satellite uplink/downlink or for terrestrial DX as well. Kenwood's latest offering is the TR-9500 transceiver. This radio covers the frequency range of 430-440 MHz and provides FM, CW, and SSB modes.

(A word of caution to US and Canadian amateurs: Although the radio is accurately described as being multi-mode, the FM capabilities will not find much use here since present band plans place FM use in the 440-450-MHz portion of the band above the radio's band edge. Don't blame Kenwood for this, however; in most areas of the world, only the 430-440-MHz segment is allocated for all modes of amateur use, and most other radios on the market are similarly designed.)

The TR-9500 is a microprocessor-controlled unit complete with scanning, memories, and 10 Watts of rf power output. An optional base unit which includes a memory backup function, an external PS-20 power supply, and SP-120 speaker make it equally at home under the dash or on the operating table. It can be moved quickly from either thanks to its slide-in-type mobile mounting bracket. The 9500's 2m cousin is the very popular TR-9130, which makes an ideal companion radio, especially for OSCAR users.

In an approach similar to many state-of-the-art transceivers on the market, the TR-9500 employs a dual-vfo frequency-control system. For example, you could use vfo A for the 432-MHz portion and vfo B for 435-MHz and OSCAR activities. The radio does permit you to change frequency while transmitting—an important consideration for OSCAR users which has been overlooked on some other radios. Either vfo can be used to program the six memory channels. Once programmed, each memory channel can be recalled with a multiple-position switch or scanned automatically by the unit's microprocessor.

The Kenwood TR-9500.

Although such features are usually associated with FM operation, I found it useful both for OSCAR and terrestrial QSOs to keep tabs on band activity. During an OSCAR pass, you can program the beacon frequency in one memory and use the other memories for busy stations you hear and want to work. Just switch between channels and wait for the first QSO to end. I also used this technique during a contest.

For those who can make use of the FM capabilities, the TR-9500 is well equipped. Two standard repeater offsets, 5 MHz and 1.6 MHz, are provided as well as a programmable offset for the frequency programmed into memory channel 6. In this case, both transmit and receive frequencies are individually programmed for those odd split repeaters.

Now that we are familiar with some of the basics, let's sit down and actually go through the operation.

I push on the combination power switch and volume control and the bright green LED display shows 3.000.0 (for 433.000 MHz). This is the normal power-up frequency for vfo A. If the vfo B button were pushed, the unit would power up on 430.000 MHz.

I want to look around 432.1 MHz, so I depress the MHz button. This allows me to move one whole MHz for each click of the main-tuning knob. One complete revolution is 50 clicks, so I can move around the band pretty quickly. One click down puts me on 432.000, but now I have to move 100 kHz up in frequency. I push out the MHz button and now each click moves me 100 Hz. This will take a long time. The manual says that the FM2 position on the mode switch will provide steps of 1 kHz and the FM1 position, steps of 25 kHz. Hmmm. . . maybe this FM mode will be of some use after all. I quickly switch from USB to FM1; four clicks of the main-tuning knob and I'm on 432. 1 MHz. Sounds pretty quiet, so I try a CQ.

As I let go of the push-to-talk button on the mike, the back-light meter jumps to nearly full scale. It's my friend Glen K1GW. He sounds just a bit off frequency, so I depress the RIT button. A red LED lights to let me know the RIT is on and I tune him in a little better on the combination RIT/rf-gain control. We quickly get our frequencies netted and off goes the RIT. Glen gives me an excellent report both signal strength and audio.

I depress the power switch to the 1-Watt low-power position with equal readability at his end. We decide to QSY up 10 kHz to get off the calling frequency, but before I do I want to put the frequency into memory. I set the memory switch to position 1 and press the button right under it marked M. The radio beeps at me. I guess it wants to tell me I've done something important.

Let's see now, I have to move up to 432.110 MHz. If I tune the main-tuning knob, I should be there in about two revolutions (about 100 steps), or I can switch to the FM2 mode and be there in 10 steps. I opt for the latter. There's Glen and this time there are no netting problems.

We try it on CW for a while. The sidetone sounds good and is just about the

right level. My keyed signal is reported as clean. The TR-9500 uses the same filter for both SSB and CW. It also switches from a slow agc characteristic on SSB to a fast one on CW.

After we finish, I decide to explore further the scanning and memory features. First, I program in several channels at random. I depress the MR (Memory Recall) button and the channel selected on the memory switch is displayed. A green LED lights to tell me I'm in memory mode. Now I can switch between six channels just like on those old-fashioned radios from way back in the 1970s. Without crystals, of course. I depress the MS (Memory Scan) button and now I don't even have to touch the memory selector. The radio automatically steps through the channels, carefully jumping over those channels which are not programmed. When a signal is heard, the radio stops or stays put until you reinstate scan mode.

Next, we'll try scanning the vfo frequencies. I push out the MR button and the last frequency set on the vfo is displayed. Push the button marked SCAN and the vfo begins scanning up the band continuously in the normal steps according to the mode selected. I can stop it by pushing the HOLD button or the push-to-talk (PTT) button on the mike. Or it will stop automatically when it comes across a signal.

Speaking of the microphone, Kenwood has included an up/down remote-tuning feature which is especially useful for mobile use. Each push of the appropriate button moves you 1 step and lets you know with a beep. To QSY several steps, just count the beeps. Hold down either the up or down button continuously and the tuning rate increases—and so do the beeps.

During the evaluation period, I became quite proficient in using all those buttons and dials on the 9500 and found the radio to be functionally well thought out and a pleasure to use. On-the-air reports have been consistently good and no problems were encountered.

The manual provided is clear and concise, but it does not cover details of circuit design and repairs. There is an optional service manual available which presumably covers these details for those so inclined. I recommend to new owners of the radio that they thoroughly familiarize themselves with the operating manual in order to get the most out of the radio. Although operation is relatively simple, there are some sophisticated features which are not immediately obvious.

Only a couple of minor suggestions for future product revisions: There is no squelch function for SSB or CW operation, and although it's not a necessity as it is on FM, it would be handy. Also, I personally prefer the fast agc time constant even in SSB mode, and the automatic-switch feature did not allow me the option. I did appreciate the use of a type-N antenna. In a number of 70-cm radios on the market, this feature has been overlooked.

For more information, contact *Trio-Kenwood Communications, 1111 West Walnut, Compton CA 90220.*

Dave Mackey K1KA
Amherst NH

THE AEA INC. AMTOR TERMINAL UNIT

New modes of communication have always intrigued me. In past years, I have tried them all: RTTY, SSTV, high-speed CW, fast-scan TV, and even FAX. My favorite mode, by far, has been RTTY. If you are using a CRT, this mode can be completely silent. It also doesn't require continuous concentration, as does CW. One can step out of the shack for a minute and not miss a thing—every word will still be on the CRT.

Photo A. The AMTOR terminal unit from AEA, Inc.

While RTTY signals are fairly QRM resistant, noise and fading still can distort the copy, leaving a number of "hits" (the RTTY op's term for errors) in the printout. Now that computer-controlled circuitry has become more affordable, it only makes sense that someone would try to come up with a solid-state solution for detection and correction of transmission errors in RTTY communication. One method of accomplishing this is to use the AMTOR protocol.

AMTOR originally was developed for commercial users of RTTY. The AMTOR code is based on the Murray (Baudot) code and has the same character-set restrictions. Each AMTOR letter consists of seven bits arranged so that each letter has four 1 bits and three 0 bits. If, on the receiving end of the teletype circuit, a character is received that does not have the 4:3 ratio, an error has been detected.

AMTOR has two modes. In the first mode (ARQ), data are transmitted in blocks of three characters. If an error is detected by the receiving computer, it sends a control signal back that means "send the 3-character block again." If no errors were detected (all the characters had that 4:3 ratio), the receiving RTTY computer sends a character telling the sender to send the next three letters.

The second mode (FEC) has each letter sent twice. If an error is detected in one character, it ignores it and copies the other one. This mode does not require the transceiver to be constantly switching from transmit to receive.

AMTOR was implemented originally using mechanical devices, but as computer technology improved, it made sense to use microprocessors. Earlier this year, AMTOR was approved for use on the low bands (any digital code is legal above 50 MHz, but below it only AMTOR, ASCII, and the Baudot code), and various companies have started to support it.

The AMTOR AMT-1 terminal unit by AEA (Advanced Electronic Applications, Inc.) was designed to make it easy for a ham to use the AMTOR standard for RTTY. Consisting of a terminal unit, microcomputer, ROM software, and control circuitry in one integrated package, it makes AMTOR operation fairly automatic; all you have to do is add a computer with a serial port. When I first saw it, I was impressed by the modern design—there are absolutely no switches to be found on the unit! All control of the AMT-1 is accomplished by sending special character combinations through the serial port. The AMT-1 indicates its status via the LED display on the front panel and by sending special information back to the computer.

Setting the unit up takes a little while. In AMTOR operation, it is essential that the transceiver being used can switch from transmit to receive in 50 ms or less. (Remember that the TU takes care of T/R switching and has to switch back and *forth between every three characters.)* The shorter the T/R switching time, the better: Maximum distance is limited by too long a switching time. My TS-520S just made it. I would imagine that most new solid-state rigs would have absolutely no problems. The AMT-1 connects to the rig's microphone jack, the PTT lines, and the audio output (Photo A). It is convenient to tap the audio from the rig at a point before the volume control. This allows adjusting the rig's audio without disturbing the AMT-1.

Connecting a computer to the AMT-1 requires an RS-232-compatible port set to either 75 or 110 baud, full duplex. It is important to have the full-duplex mode because the unit echoes back as soon as any characters are typed (this can be disabled, but it is better to use the AMT-1 echo feature). AEA included two DIP jumper plugs which bypass the TTL to RS-232 conversion circuitry. While this is mainly for VIC-20 and Commodore-64 computers which use TTL level signals in their serial ports, it can be used in conjunction with other micros. I was able to write a program for my Apple II which "converted" the game port to a full-duplex serial port. After wiring up an appropriate connecter, I plugged in the AMT-1 and it worked flawlessly.

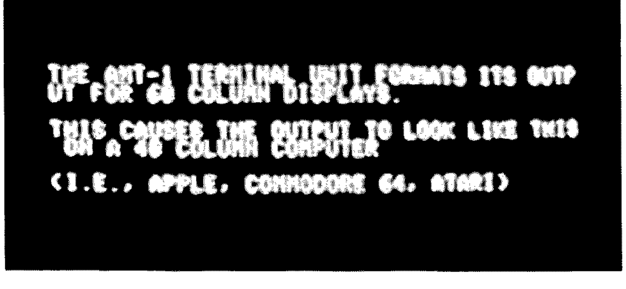


Photo B. AMT-1 output display sample on a 40-column computer.

The AMT-1 provides for word wraparound, but only for terminals that are over 60 columns wide. On a 40-column computer, the display looks a bit strange. (See Photo B.) Fortunately this can be disabled, causing the text to go from one end of the screen to another. If you want word wraparound for a 40-column machine, you can provide for it easily in software. Many terminal control programs incorporate this feature already. While a custom program might provide the most flexibility for using the AMT-1, any terminal communications package that allows control characters and escape characters to be transmitted should do the trick.

When first turned on, the AMT-1 goes through a testing sequence that causes all the LEDs to turn on and off in a pattern. (I don't know if that accomplishes anything, but it looks nice.) It then enters the "escape mode" and is ready to accept a command from the computer. Typing a Q gives the unit's status:

V:03 I:???? T:30 B:45 S:20 L:1 N:1

The V is the revision number of the software. Mine is revision #3. I is for the selcal code. When nothing has been entered, it shows question marks. T is the AMTOR ARQ timeout: how long the unit should wait to receive the confirmation character before indicating an error. B is the baud rate for conventional RTTY operation (the unit also works nicely for "regular" RTTY). S is the CW sending speed, and L and N refer to word-wrap and echo-back modes.

To change a parameter, one types an ESC character followed by the proper letter. For example, to put the selcal code AFTM (no numbers are allowed) in memory, type ESC I. The unit will prompt with a *colon, after which you enter a four-letter* code of your choice. All the other parameters are changed in much the same way.

After I got through the 16 pages of documentation and wired up all the necessary cables, I tried it out on the air using the Baudot mode. One thing about this TU that took a bit of getting used to is the fact that it copies "upside down"; the receiver must be set for USB instead of the more traditional LSG. There is no disadvantage to doing things this way; it's just different from the way most terminal units operate.

Tuning around 20 meters, I found the TU to be fairly good. It uses an unconventional design: The audio is fed through a 4-stage active 300-Hz bandpass filter and then to a frequency-to-voltage converter. This is to facilitate a bar-code-tuning display. Tuning in a signal is easy; the receiver is tuned until one sees a centered pair of flashing LEDs on the display.

Before actually trying an AMTOR QSO, I decided to try copying the ARRL AMTOR bulletin. The League transmits their RTTY bulletin in the FEC (forward error-correction) mode—the one where each letter is transmitted twice. Absolutely flawless copy was the result; the same bulletin I copied using the Baudot mode did have a number of hits.

Most AMTOR activity is centered around 14.075. I went to this frequency and called CQ in the FEC mode. (It is usual practice to call CQ in the FEC mode and switch to the ARQ mode once communi-

cation has been established.) There was no reply. I tried again in a few days when the band conditions improved and met with success—I contacted WB2VTN running AMTOR on an IBM-PC using a home-brew interface.

The copy was flawless. Not a single error (except typographical ones) appeared on the copy. The ARQ mode—the one which waits until the other station's computer acknowledges correct reception of the data before sending more data—makes it very difficult for an error to creep through. Of course, if the band dies out completely, both stations will be waiting forever for the other station to reply (although, I would imagine, one would catch on after a little while). Just as with any other mode, if the signal isn't there, it can't be copied. But if conditions are bad and copy would be rough with conventional RTTY, AMTOR can get through—it would just slow down a bit.

Unfortunately, there isn't (as of this writing) much in the way of software support for the unit. Although one can probably get by nicely with a standard modem control program, it is nice to have a custom-tailored ham-radio communications program. Be sure you have the necessary programming skills to control your computer's RS-232 serial port (this can often be done easily in Basic). I was able to get the AMT-1 running on an Apple II, an Atari 400, and an IBM-PC without too much difficulty. Certainly, the necessary computer programming is well within the abilities of even the most casual computer hobbyist.

Based aroung a 6800 microprocessor, the AMT-1 is of sound design. All the parts are off-the-shelf TTL and linear. The metal enclosure effectively shields out any RFI that the TTL circuitry might generate. I was able to dectect absolutely no RFI on a receiver a few inches from the unit.

I found the AEA AMT-1 a pleasure to use. Not only did it make the transition to AMTOR easy to implement, but also it made conventional RTTY more enjoyable. Because the unit controls T/R switching, you can run KOX (Keyboard-Operated Transmitter). All you have to do to switch from transmit to receive is start typing. Oh, yes . . . the unit also sends CW at any speed from 1 to 100 wpm for those of you who still like to do things the "old-fashioned" way.

For further information, contact *AEA, Inc., PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.*

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ELECTRONICS IN YOUR POCKET

When I think of all the books I used to study for my "ticket," I just marvel at the fact that anything worthwhile ever happened. I used several college texts, license study guides, reference books, and stacks of back issues of *73*. I really wanted to be successful in my venture. One thing I immediately learned is that too much information can be just as bad as too little. This idea is universal, whether you are studying to pass a test or just want to build a simple circuit. The main key is in limiting your resources to a few that you can really study; forget the library approach.

There are literally hundreds of good reference books on the market. The real problem is that the total number of these books is growing at an alarming rate. This leaves the average, uninformed, "I-want-to-learn-ham-radio-on-my-own" person with a very difficult problem. How does a person cut through the glut of electronic reference books and select the one which will do the most good? Well, one thing which I will not attempt is to tell everyone which is the best. Instead, I will tell you about one text which has helped me in my work as an engineering technician and as a ham.

The book to which I'm referring is *Electronics Pocket Handbook*, by Daniel L. Metzger. I will briefly describe this book, pointing out various aspects, good and bad, which I've encountered while using it. The *Electronics Pocket Handbook* is exactly that. It is just slightly longer than a 3" × 5" index card and not quite as wide. The size makes it ideal for briefcase, coat pocket, or purse. You don't have to worry about all the pounds of books usually associated with study.

The book is sectioned into seven separate chapters and an index. Chapter 1, "Definitions, Formulas, and Charts," contains information very similar to that found in the *ARRL Handbook*. It gives you information on Ohm's Law, inductors, capacitors, complex notation, power-supply formulas, etc. Other information which isn't so typical in this section is on Boolean formulas and thermal, geometric, and bridge formulas. These latter formulas can be very difficult for the lay person to pin down when needed.

Some very needed component information is contained in Chapter 2. The title, "Component Data and Characteristics," says it all. This chapter contains information on wire insulation, wire characteristics, popular connectors, conductivity of various conductors, color codes for resistors, capacitors, and inductors, etc. You will learn how to read component values from any passive component, whether vintage 1932 or 1983. You also will learn how to read MIL-STD resistor designations such as those used on NASA surplus boards. This chapter can provide the individual with new knowledge which can help refine his ability as a scavenger. If the information in this chapter is actively applied when purchasing from the surplus market, a great savings should be realized.

In Chapter 3, "Simplified Circuit Analysis and Design," we start getting into the meat of electronic theory. You will work with resistive circuits, learn about several popular network theorems such as Thevenin's, Norton's, and Millman's, and the reciprocity theorem. You also will get into general circuit analysis, nodal analysis, and ac circuit analysis. In spite of the fact that some of these names may sound a bit scary, don't worry. The author has tried to make these as painless as possible and still maintain some authority in the text. If this information is not enough, you will also find transistor-biasing formulas and a small section on op-amp design. This is a good section to work through to help prepare your mind for any type of circuit analysis. *Especially on tests!*

In Chapter 4, "Units, Conversions, and Constants," we are introduced to the international system of units—Systeme Internationale d'Unites (SI). This is the system which the international engineering community has adopted as a standard. This chapter goes into detail on the various aspects of the system. You will learn shortcuts and keys which will enable you to use the system more efficiently. In addition to this, you will learn how to perform various unit conversions, such as quarts to liters or meters to feet. There is also a section on the most-frequently-used constants from science. These aren't all pertaining to electronics. This particular chapter has quite an appeal to all students of the sciences.

In Chapter 5, "Standards, Symbols, and Codes," you will learn about broadcasting frequency standards, wavelengths, electrical wiring practices, hardware standards, etc. Included in the mechanical section is information on drill sizes, metal gauges, and general hardware tidbits. There is also a review (briefly) of teleprinter codes such as Baudot and ASCII. Sorry, no SITOR or AMTOR in this section. If some readers are still latent CB hounds, then the 10-code listing should prove useful for them. This chapter, especially the hardware information, should be interesting to the avid home-brewer.

In Chapter 6, "Test Procedures," you will learn how to test meters, batteries, inductors, capacitors, inductor Q, and resistors. You will learn the ins and outs of semiconductor testing and even get into the mechanics of amplifier testing. If home-brew isn't really your bag, you still could do well to read this even if you only occasionally service your rig.

Finally, in Chapter 7, "Glossary of Electronic Terms," we have a very comprehensive listing containing most of the commonly-used technical terms. This should be especially appealing to the newcomer. This will help give everyone an understanding, even if only rudimentary, of a term and its various associations. Several popular books neglect including this kind of information. They treat it as an unnecessary option. I disagree with that line of thinking totally. This little text has a full sixteen pages of definitions and terms which are extremely useful as well as educational.

Another aspect of this book which I like is the index. Most people, including several new technical writers, take this section of a book for granted. It is very frustrating when you need to find something in a hurry and it takes an hour. The lack of an index is a good indication that the author really doesn't care about the readers at all. This isn't the case with this book. The index could stand to be a little more comprehensive, but the book is organized in such a manner that finding most subjects is easy anyway.

Electronics Pocket Handbook is published by Prentice-Hall, Inc. In case you want your local bookstore to order you a copy, the ISBN number is: 0-13-251835-X. (This usually is needed when they have to place a special order.) You can expect to pay about nine dollars for this. In my opinion, it is probably the best nine-dollar investment I've made in quite a while. Now I can think about upgrading no matter where I may be. This is an excellent companion on trips when you can't carry tons of regular references with you.

Samuel G. Williams WB5YNI
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THE PRIVATE PATCH BY CONNECT SYSTEMS

The Private Patch II, by Connect Systems, is perhaps the most sophisticated simplex autopatch yet to hit the market. Hook the Private Patch up to an FM transceiver and a telephone and you're on the air with your own autopatch. It puts a simplex patch, control system, and CW IDer all in one box.

This patch is different from the other simplex patches on the market because it uses a VOX circuit for control rather than a sampling system. Most simplex patches are designed to switch the transmitter off every few seconds to quickly sample the receiver input. Since the system is simplex (it's either talking or listening, but not both at once), that's the only way they can tell if a mobile station wants to talk—if a carrier is present during the sampling period, the system stays in receive mode to allow the mobile to talk.

The sampling method works, but it has two disadvantages. First, it's annoying to listen to the squelch tails that are generated every time the unit samples. Second, and more important, the transceiver used with a sampling system has to be able to switch between transmit and receive very rapidly. That means that radios with relay switching won't work, and most radios will need modifications to speed up the action of the squelch circuit.

The Private Patch II avoids these problems by using a sophisticated VOX circuit to control T/R switching. If the party on the telephone stops talking for more than about a half second, the unit switches from transmit to receive. The mobile unit can break in during the normal pauses that occur in conversation. To provide backup control, if the unit stays in transmit mode for more than about 20 seconds, it automatically goes back to receive for about 3 seconds. Thus, the mobile user will never be locked out for more than 20 seconds.

The VOX switching system also allows the Private Patch to work through repeaters since the repeater carrier won't lock the system into receive mode. Because the transceiver switches less often and stays in the receive mode longer, the stringent T/R-switching requirements of sampling-type patches are avoided.

The only disadvantage of the VOX switching system in the Private Patch is that mobile access is also VOX controlled. In other words, you can't capture the system merely by mashing down on the mike button. You actually have to say something before you're in control

The Private Patch II works very well. It took only a few minutes to get everything hooked up to my Midland 220-MHz radio, and no internal modifications to the radio were necessary—all the connection points were available on the back panel of the Midland. The Private Patch needs only microphone, keying line, and speaker audio connections.

I did have one problem with the unit—the Midland T/R relay draws over 100 milliamps, and a power surge when the relay closed fried the switching transistor in the Private Patch the first time the transmitter switched on. The Midland relay probably draws more current than the average, so this problem shouldn't commonly occur, and the factory reports that they know of no other such failures. My solution was to use the keying circuit to drive a smaller reed relay which in turn drives the T/R relay.

Once the keying problem was taken care of, the Private Patch played well. It was very easy to adjust the audio-level controls to get the proper volume levels, and everyone who used the unit (both radio and landline users) commented on the good audio quality.

The patch has a built-in tone decoder, and control codes are provided for access, disconnect, and timer-reset functions. Front-panel switches allow long-distance dial restriction (by shutting the patch off if the first number dialed is a 1 or 0) and ringback enable and disable.

If the ringback circuit is enabled, the unit will operate as a reverse autopatch. When the telephone rings, the Private Patch will identify once and the telephone can be answered by sending the timer-reset code. The system then works as if a normal autopatch call had been placed.

A lot of thought went into the design of the Private Patch II. Many features that

aren't strictly necessary but are sure nice to have are included. For example, the IDer operates during the last minute before timeout so that the mobile operator has plenty of advance warning to reset the timer. The access codes can be changed to protect system security.

The reverse-patch ringback is disabled if a QSO has been in progress on the channel within the last few moments (so you won't get other users of the channel upset with your machine). A tone-to-rotary converter is built in so that the patch will work on any phone line.

All in all, the Private Patch II is quite an amazing box. The VOX switching system makes it unique, and it has all the other features necessary to make it a thoroughly practical machine. For more information, contact *Connect Systems, PO Box 4155, Torrance CA 90510; (213)-540-1053.*

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THE TR-720 VHF TRANSCEIVER

Many hams and readers of *73* are pilots and aircraft owners. Therefore, this month we present a review that deals with an AM transceiver for use on the 118-136-MHz aircraft band. We think that this unit will find much favor with pilots because of its small size, light weight, and extreme portability, providing a versatility seldom seen in aircraft equipment, with little if any sacrifice in performance.

One of life's nicer surprises is to find a piece of equipment that performs *better* than you expected. The TR-720 aircraft-band VHF transceiver is one of these; it is a joy to own and operate.

Although Communications Specialists is well known for its line of amateur and commercial encoders and decoders, it is less well known for its other products...including this new venture into two-way communications equipment for the aircraft owner and pilot...and it is a real pleasure to find that the equipment is almost ideally suited to fill a real need.

The VHF aircraft band extends from 118 MHz to 136 MHz and—unlike other VHF communications services—it is AM, not FM. In the frequencies encompassed by this band, there exist 200 navigation "channels" and 720 communications "channels."

The navigation channels are occupied by VORs (ground-located VHF Omni Ranges), stations which permit a pilot to home in from any point of the compass by means of an instrument mounted on the instrument panel. All the pilot needs to do is tune in the station, center the needle by turning the OBS (Omni Bearing Selector), and then fly the plane on that bearing so that the needle remains centered.

This, of course, is an oversimplification, but it will serve to describe one general way in which the VOR system is used. The instrument tells the pilot whether the radial that he is on is *To* or *From* the station (there are 360 radials...one for each full degree of the compass). When the plane passes over the station, the "To-From card" flips over.

While the pilot flies the needle, he also can listen to the VOR station itself and receive the Morse-code indentifier plus voice transmissions of weather and other information needed to fly safely to his destination.

The 720 communications channels are used for the purpose of talking to airport control towers, Unicom stations, other aircraft, Flight Service Stations, and the like. It was the advent of equipment having superior selectivity and frequency stability that made possible the increase in the number of communications channels from 90 to 360 and then to 720...permitting expansion and growth of the system to meet current needs.

SPECIFICATIONS

Model	TR-720 airband transceiver
Frequency range	118.000 MHz-135.975 MHz (Com band), receive and transmit 108.000 MHz-117.975 MHz (Nav band), receive only
Number of channels	720 (Com band) with 25-kHz spacing 200 (Nav band) with 50-kHz spacing
Frequency determination	Microprocessor-controlled CMOS phase-locked loop
Frequency stability	±.001% (−10° C to +60° C) ±.002% (−30° C to +80° C)
Power consumption	39 mA squelched 185 mA @ 300 mW audio output 650 mA transmit
Antenna type	Flexible rubber 50-Ohm unbalanced type
Battery type	9.6-V/450-mAh nicad battery pack (CS-15), or 9.6-V/750-mAh nicad battery pack (CS-18), or 12-V, 8 AA alkaline batteries (CS-19)
Size	6.6" (169 mm) x 2.6" (64 mm) x 1.5" (38 mm)
Weight	1.2 lb. (19 oz./.544 kg) with battery
RECEIVER	
Receiver type	Dual conversion superheterodyne
Sensitivity	Less than .5 uV for 10 dB (S+N)/N (Com band) Less than 2 uV for 10 dB (S+N)/N (Nav band)
Selectivity	60 dB at 25 kHz
Squelch sensitivity	.5-uV threshold, FM noise type
Audio output	500 mW maximum, less than 10% THD
I-f image rejection	Greater than 60 dB
Spurious response	Greater than 60 dB
TRANSMITTER	
Rf output power	1 Watt nominal, 800 mW minimum, 3 Watts PEP into 50-Ohm load
Frequency stability	±.002% (−30° C to +60° C)
Spurious & harmonics	Greater than 60 dB below carrier
Modulation type	6A3, high level Class B collector modulation (AM)

Most of the users of larger aircraft, including the airlines, corporate fleets, and the like, have several sets of VHF communications and navigation radios on each airplane. Some are redundant, for safety's sake, while others are needed for simultaneous reception/transmission and navigation. All of the equipment is expensive, and much of it is beyond the financial reach of many private pilots and aircraft owners who fly for fun. As a consequence, many smaller airplanes have only one radio: a Navcom unit that combines both functions of communications and navigation. Often, these radios are older tube types and are limited in channel spacing to only 90 or 360 channels, thus limiting—or even prohibiting—many smaller, privately-owned aircraft from full use and enjoyment of the national air-traffic system.

Pilots of sailplanes (gliders), balloons, experimental and home-built aircraft, firefighters, ultralights, and other types of aircraft may have a sometime need for VHF communications and navigation radios and often cannot or will not spend the larger amounts of money required for permanent installation of expensive equipment.

Communications Specialists, recognizing the need in this area for small, lightweight, inexpensive rigs, has introduced to the marketplace its new TR-720, a handheld transceiver of outstanding performance. Here is a unit that is crystal-synthesized to cover all 720 communications channels and 200 navigation channels; it operates on an internal nicad battery pack which can be recharged from either an automobile or aircraft dc supply of between 12 and 28 volts or from the 115-volt-ac house mains. Further, and still more convenient, the TR-720 has the standard aircraft BNC connector for its antenna. Thus, a coaxial cable may be connected from the aircraft antenna, or the standard flexible (rubber ducky) supplied with the unit may be used.

Just a tiny handful, weighing only 1.2 pounds with the standard nicad battery pack, and measuring 6.6 × 2.6 × 1.5 inches, the TR-720 has giant-size performance. Receiver sensitivity is exceptional, and power output on transmit is nominally 1 Watt dc or 3 Watts PEP, voice modulated. An adapter for an external microphone and headset is provided for those who prefer them for use in the cockpit. One of the prime advantages of a transceiver operated from its own supply is the obvious backup capability it provides in case of failure of the aircraft radio system. Almost as important is the capability of portable operation, where FAA (Federal Aviation Agency) personnel may need to direct traffic from an emergency runway, a helicopter landing pad, or another location where no permanent radio installation exists.

The pilot of a sailplane, which often has no permanent battery or radio setup, would find the TR-720 ideal for his purposes...for contacting the tower at a controlled airport, for example, when wishing to land. The TR-720 is easily and handily carried aboard and mounted by means of its belt loop on the leather carrying case. It can be suspended from the belt, of course, and carried portable in that manner as well. One can visualize stuffing the hand-held into an available glove box (it fits into the glove compartment on my Cessna 150 with plenty of room to spare) or mounting it temporarily somewhere in the vicinity of the instrument panel for quick reference and use.

I was very surprised to find that the TR-720 was hearing stations in flight better than my standard aircraft radio—which, by the way, is one of the older 90-channel types, unable to receive or transmit on the split frequencies in common use today. Thus, for me, the TR-720 allows access to airports and FAA communications facilities that I could not otherwise use.

The TR-720 receives even distant stations on its flexible antenna *inside* the cabin of my all-aluminum Cessna. I have not yet found the need to use the aircraft external antenna for receiving, but I have discovered that it works best on the hand-held for transmitting to distant stations...as you would expect, considering the amount of output power.

Enjoying the TR-720's internal battery pack and its isolation from the aircraft electrical system, I find that much of the hash generated by my engine and its accessories is absent when I try to hear another station. This means that I don't have to ask for a repeat of the transmission, and it certainly saves wear and tear on the ears. I seem to be approaching the situation where I plan to use the TR-720 as my main transceiver for communications and my aircraft radio for navigation only!

I took the TR-720 on vacation with me and found that it attracted attention wherever I went. One FBO (fixed base operator) told me that it was "...the best-sounding radio on the field!" Another told me that he wanted to stock them for his local clientele and for transient visitors to his field. The pilots themselves are really interested, and two local pilots who fly a lot of formation with their Piper Cubs want a pair of them for plane-to-plane communications.

Civil Air Patrol personnel would find these units ideal for search-and-rescue operations. In particular, a recent airplane crash at a remote mountaintop site required ground search teams. Their work and coordination from aircraft in the area might have been greatly simplified and speeded up had some TR-720s been available.

One of the features you will like is the twist-off battery pack, permitting almost instant replacement by a fresh pack when needed, while the original pack is being recharged. Battery packs of 450-milliampere-hour capacity are standard, but 750-mAh packs are available. Supplied accessories include: flex antenna (rubber ducky), simulated leather case, 115-V-ac wall charger, dc charger (cigarette-lighter-adapter plug), earphone, and operating manual. Available accessories are: alkaline battery pack (batteries not supplied), nicad rapid charger (1 hour), desk-type drop-in charger, 220-V-ac wall charger, simulated leather case for use with larger battery pack, remote hand-held speaker/mike, cable adapter for PJ-068 and PJ-055 to TR-720, and cable adapter for U-174 to TR-720.

An outstanding feature of the TR-720 that I have not seen on similar units for aircraft-band use is the 3-position memory. You can store three different frequencies in the memory merely by setting them, one at a time, on the dial, switching to memory locations 1, 2, or 3, and pushing the memory-store button. This way, for example, you could set up in advance an ATIS frequency, a control-tower frequency, and a ground-control frequency. Perhaps you might want approach-control, tower, and

departure-control frequencies. Another possibility would be the split-frequency or half-duplex option where you set a Nav frequency (VOR, for example) into memory and a Com frequency on the dial. Then you can communicate with a Flight Service Station and hear its reply over the VOR station closest to your location.

Frequency selection is by thumbwheel dials, and a noise-type squelch circuit as used on FM equipment is incorporated so that you don't have to listen to "white noise" between transmissions. This saves the battery, too.

The TR-720 employs 1 microprocessor, 10 integrated circuits, and 50 transistors. Transmitter and receiver incorporate 12 varactor-tuned stages which track with the selected frequency for optimum performance from band-edge to band-edge. The TR-720 is FCC Type Accepted (US) and DOT Certified (Canada).

Communications Specialists places a 1-year warranty on the TR-720, with a guaranteed 72-hour turnaround for repair or replacement.

Aircraft owner's net price is $795, including the standard supplied accessories described above. For further information, call or write *Communications Specialists, 426 West Taft Avenue, Orange CA 92665-4296; (800)-854-0547; (714) 998-3021.* Dealer inquiries invited. Reader Service number 485.

Jim Gray W1XU
***73* Staff**

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

ARRL SWEEPSTAKES CW

Starts: 2100 GMT November 5
Ends: 0300 GMT November 7

Phone

Starts: 2100 GMT November 19
Ends: 0300 GMT November 21

US and Canadian stations work other US and Canadian stations using the 1.8- through 28-MHz bands, excluding 10 MHz. Operate no more than 24 of the 30 hours with on/off times noted clearly in your log. Listening time counts as operating time. Operating categories include single-operator and multi-operator with a single transmitter.

No cross-mode contacts will be allowed and each station can only be worked once, regardless of frequency band. A transmitter used to contact one or more stations may not subsequently be used under any other call during the contest period (with the exception of family stations where more than one callsign is assigned by FCC/DOC). One operator may not use more than one callsign from any given location during the contest period. The use of two or more transmitters simultaneously is not allowed.

EXCHANGE:

Consecutive serial number, precedence (A if you run 150-W output or less, B if more than 150 W), your callsign, check (last two digits of the year you were first licensed), and your ARRL section.

FREQUENCIES:

CW: 1800-1810, 3550-3650, 7050-7100, 14050-14100, 21050-21100, 28050-28100.

Novice: 3710, 7110, 21110, 28110.

Phone: 1855-1865, 3850-3950, 7200-7250, 14250-14300, 21300-21400, 28550-28650.

SCORING:

Count 2 points for each completed 2-way QSO. Multipliers are each ARRL section plus VE8/VY1 (74 maximum). KP4, KV4/KP2, and KG4 stations are in West Indies section, while KH6 and other US possessions in the Pacific count as the Pacific section. Final score is QSO points times the number of ARRL sections (plus VE8/VY1).

AWARDS:

Certificates to the top single-operator CW and phone scorers in both the A and B categories in each ARRL section, and the top multi-operator entry in each ARRL Division.

ENTRIES:

Contest forms (log sheets, summary sheet, dupe sheet) are available from ARRL HQ for an SASE. Official forms are recommended. Any entry claiming more than 200 QSOs must submit duplicate checking sheets. Incomplete or late entries will be classified as checklogs. Logs should include dates, QSO times, exchange sent/received, band, and mode. Postmark your entry for either mode by December 21 and send it to: ARRL, Newington CT 06111.

Each entrant agrees to be bound by the provisions as well as the intent of the official ARRL rules, the regulations of his licensing authority, and the decisions of the ARRL Awards Committee. The usual disqualification rules apply.

INTERNATIONAL POLICE ASSOCIATION CONTEST

0000-0300, 0700-1000, 1400-1800 GMT
November 5-6

Sponsored by the IPARC, this contest will be conducted on both CW and phone.

EXCHANGE:

Signal report and serial number. US stations also send state; IPA member send "IPA."

FREQUENCIES:

Phone: 3.650, 3.775-3.8, 7.075, 14.295, 21.295, 28.650.

CW: 3.575, 7.025, 14.075, 21.075, 28.075.

SCORING:

Non-IPA stations can work IPA members only, and each station can only be worked once per band. 4 points per QSO on 20, 15, and 10 meters. Each QSO on 40 and 80 meters counts two points, except DX, which is worth 8 points per QSO.

ENTRIES:

Mail entries by December 31 to: Anton Kohten DK5JA, PO Box 40 01 63, 4152 Kempen 1, Federal Republic of Germany.

CALENDAR

Nov 5-6	International Police Assn. Contest
Nov 5-7	ARRL Sweepstakes—CW
Nov 6	DARC Corona 10-Meter RTTY Contest
Nov 12	OMISS QSO Party
Nov 12-13	Delaware QSO Party
Nov 12-14	CQWE Contest
Nov 12-14	Rhode Island QSO Party
Nov 19-21	ARRL Sweepstakes—Phone
Dec 3-4	ARRL 160-Meter Contest
Dec 10-11	ARRL 10-Meter Contest
Jan 7	*73* 40-Meter World SSB Championship
Jan 8	*73* 75-Meter World SSB Championship
Jan 14-15	*73* 160-Meter World SSB Championship
Jan 14-15	Hunting Lions In The Air Contest
Feb 4-5	South Carolina QSO Party
Feb 18-19	America Radio Club International DX Contest
Feb 18-19	YL-ISSB Commo System QSO Party—Phone
Feb 25	RTTY World Championship Contest
Mar 17-18	YL-ISSB Commo System QSO Party—CW

RESULTS

1983 RESULTS
WORLD CHAMPIONSHIP RTTY CONTEST
Sponsored by *The RTTY Journal* and *73*

Indicated are callsign, points, multipliers, and total score.

***World champion
**DX champion
*W/VE champion

State, provincial, and DX country awards will also be given in recognition of this year's accomplishments.

Single Operator, Multi-Band

***G3ZRS	164	96	15,744
**SM6ASD	167	92	15,364
XT2AU	163	85	13,855
I4JXE	158	84	13,272
*W3BE	163	66	10,758
W3FV	147	73	10,731
SM5FUG	123	74	9,102
IT8EAI	101	87	8,787
K4AGC	118	66	7,768
TO6AUS	101	62	6,262
N7AKO	139	45	6,255
G4NJW	96	58	5,568
K6WZ	89	55	4,895
K0BJ	88	55	4,840
AE5H	88	55	4,400
W0LHS	80	40	3,200
I2DJX	76	38	2,888
SM7LSU	68	38	2,584
JA1BYL	61	41	2,501
W2DNO	61	40	2,440
I6YPK	64	38	2,432
N5DSK	62	46	2,352
GW3EHN	64	36	2,304
NN6F	52	44	2,288
SM3EZD	72	31	2,232
SM5AAY	63	34	2,142
ON7EP	55	37	2,035
VE3ZX	52	39	2,028
K4JAF	51	37	1,887
TO6HKR	45	38	1,710
OK1AWC	51	24	1,224
VE7VP	42	28	1,176
W7CBY	36	30	1,080
VK2BQS	40	17	1,080
TI2DO	45	22	990
SM6AEN	35	27	945
KE6T	31	27	837
G4KHX	40	17	680
G4OJJ	34	12	408
KJ2N	15	14	210
LU3DSU	13	9	117
SM3GT	27	4	108
YB3ON	41	1	41

Single Operator, 20 Meters

***KJ8N	71	35	2,485
**YB2BLI	65	22	1,430
GM4KHE	54	22	1,188
PY6ACP	43	27	1,161

Single Operator, 15 Meters

***K7NO	141	59	8,319
**OH5YW	83	24	1,992
JA3EOP	50	28	1,400
I5AZX	58	17	986
YO3RF	26	12	312

Single Operator, 10 Meters

***OH5IY	10	10	100

Multi-Operator, Multi-Band

***OH8TA	143	70	10,010
*KA4MKG	113	57	6,441
W8UPU	69	39	2,628
VE3NEX	52	37	1,924
**OK3KGI	57	29	1,653
OK3RJB	48	27	1,296
OK3RMW	45	22	990
OK1OAZ	26	23	598
OK3KII	34	21	522
OK3KXM	11	8	88

Multi-Operator, 20 Meters

***K8EX	195	62	12,210
**SL5AR	78	29	2,262

Check Logs

DL1VR, OZ6SM, N6ELP, W6JOX

RESULTS

I5NPH, 4M3AZC, K3TUP, AND KC5NQ: 1983 WORLD 40-METER CHAMPS

Multi-band contests are won or lost on the 40-meter band! All the top contest stations will admit that a decent score on 7 MHz may spell the difference between first- and second-place finishers. Why is it, then, that 40 seems to be the forgotten band by so many? The answer is *congestion!*

Broadcast signals make for a very hectic experience if one is to roost on 40. That is why *73* recognized the rare opportunity to prove that 40 meters can in fact be the born-again band it used to be. With all the elements against you, the top contester would be the one who could survive the strong carriers of AM broadcast stations overseas, the sometimes unbearable QRN that even the best filter cannot overcome. To top that, to obtain those necessary multiplier points, here's a band that tests your skill in crossband operation once and for all.

The majority of contestants indicated that the DX paths were excellent to most parts of the world, particularly to Europe and Asia. Stations added a host of new countries to their DX tallies! Stateside conditions were reported to be the best they had been in many weeks.

After all the smoke had cleared and the entries were received and tallied, KC5NQ led the pack for single-operator stations. This championship station managed 756 QSOs in less than 16 hours of 40-meter operation and worked 61 states and provinces and 45 DX countries. A distant second was afforded Florida contester N4BAA, who accumulated 559 QSOs, 55 states and provinces, and 48 countries. For single-operator DX stations, our good friend 4M3AZC of Venezuela became the world champ with 578 QSOs, 53 states and provinces, and 56 DX countries for his total. K3TUP took top honors for all W/VE multi-operator stations with a super tally of 1214 QSOs, 58 states and provinces, and 56 DX countries. DX multi-operator honors went to I5NPH, who worked 667 QSOs, 43 states and provinces, and 64 DX countries.

Of all the classes and categories in the 40-meter contest, the W/VE multi-operator final heat was the closest. Close on the heels of champion K3TUP was 160-meter contest winner K8ND with 1129 QSOs, 57 states and provinces, and 37 DX countries. Only 85 QSOs and roughly 6,500 points separated these first- and second-place finishers.

In the W/VE single-operator class, stations with 500 or more QSOs were KC5NQ (756), KA1XN (718), KC3N (702), KG1E (676), KM9P (618), K4HAV (617), KC8JH (600), WA0IDK (590), N4BAA (559), KA1GHR (523), WA4SVO (506), and KA1WJ (503). DX single-operator stations with 400 or more QSOs included 4M3AZC (578), IO3MAU (478), IO6NOA (438), OK1TN (438), and CT4NH (426). In the multi-operator class, 500 or more QSOs were obtained by K3TUP (1214), K8ND (1129), K5LZO (813), KC0SZ (764), I5NPH (667), I4OUT (648), N8EKE (592), and KB0QA (584).

Well over 50% of the 40-meter contestants worked 40 or more states and provinces, many stating that they worked all states in the 24 hours of the contest period. KC4NQ managed to get a clean sweep of 61 state and provincial multipliers, the only one in the contest to get all W/VE multipliers possible. KA1XN lacked only 2 to match KC5NQ's feat, while KC8JH, VE3ICR, K3TUP, and KC0SZ all recorded 58 out of the 61 possible states and provinces.

In DX, the following stations worked 30 or more DX countries: I5NPH (64), I4OUT (62), OK1TN (59), 4M3AZC (56), IO6NOA (56), IO3MAU (50), N4BAA (48), CT4NH (47), KC5NQ (45), VE3ICR (42), PY5EG (41), DL8NBE (41), OK1AYP (38), K8ND (37), DA1TN (37), KG1E (36), K5LZO (35), KC0SZ (33), VO2CW (32), KA1GHR (32), KA1WJ (32), and KA2CDE (31).

With January just around the corner, it's time to prune those dipoles and inverted vees and get ready for the 3rd annual event. If propagation is in our favor and we can get the word out to as many DX stations as possible, we expect to see some fantastic scores and some new world records!

You still have time, so send in your 1984 contest forms today! Enclose an SASE and send your request to Dennis Younker NE6I, 40-Meter Contest Chairman, 43261 Sixth Street East, Lancaster CA 93535.—*Bill Gosney KE7C*

40-METER CONTEST SOAPBOX

KG1E: "Will try a beam next year instead of a dipole at 50 feet!"

KA1RC: "A great contest. New delta loop worked well on DX. Blew the linear halfway through the contest though. Will definitely be back next year despite problems this time around."

KC3N: "Working 35 DX stations split frequency without an external vfo gives one fast fingers! Loads of fun but couldn't the broadcast stations QSY? Age 16. See you next year."

K3TUP: "24 hours is a perfect amount of time for any contest."

WA3SPJ: "Enjoyed both 40- and 80-Meter Contests a lot."

N4BAA: "Great contest again! Next year will have 4 elements at 140 feet."

WC4E: "Thank you, *73*, for the opportunity to participate in such a fine contest."

WD4RCO: "Most enjoyable contest. Good representation of DX, most of whom willingly listened up."

W4TMR: "This is my first 40-Meter Contest, can't wait until next year!"

KC5NQ: "The DX was better this year and the band was in extremely good shape. Thank you, *73* and the contest bunch."

N7BUP: "Had a great time—wish I had better prepared to go the distance overnight."

KC7PA: "Next year, I definitely am getting a second vfo. Hate to miss the rare DX. Got five new countries, however. How about a low-power category next year? Otherwise, I'll need an amp."

K9GDF: "My wife (N9DIJ) almost beat me in this contest."

KC0SZ: "Would have been nice to have Europeans listening upband. We had several openings but no one would listen up frequency, it seemed."

EA1QF: "A great opportunity to work new states or countries."

HI8GB: "Thanks very much for an interesting phone contest—it's long overdue!"

IO6NOA: "I expected more participation from Europeans. Many asked what contest was going on."

VE3ICR: "Didn't expect to be so involved in the contest. However, once I started, it was hard to quit!"

40-METER ANTENNA SURVEY

	1982	1983			
			Delta loop	9.3	3.8
Dipole/inverted vee	39.8%	44.6%	2-element wire beam	2.3	.0
¼- or ½-wave vertical	13.9	4.8	3-element yagi	2.3	3.8
Trap vertical	9.3	11.5	4-element yagi	.0	5.7
2-element yagi	7.0	9.6	Longwire	.0	4.9
¼-wave sloper	4.6	.9	Log periodic	.0	.9
½-wave sloper	2.3	6.7	2-element quad	2.3	.0
2-element delta loop	4.6	2.8	Bobtail curtain	2.3	.0

DARC CORONA 10-METER RTTY CONTEST

Starts: 1100 GMT November 6
Ends: 1700 GMT November 6

This is the last of four tests during the year sponsored by the DARC eV to promote RTTY activity on the 10-meter band. Use the recommended portions of the 10-meter band. Each station can be contacted only once. Operating classes include single-/multi-operator and SWL printer.

EXCHANGE:

Each completed 2 x RTTY QSO is worth 1 point. Multipliers include the WAE and DXCC lists, each US state, and each district in VE/VO and VK. The final score is the total QSO points times the total multiplier.

AWARDS:

Appropriate awards to the leading stations in each classification, assuming reasonable scores.

ENTRIES:

Logs must contain name, call, and full address of participants. Also show class, times in GMT, exchange, and final score. SWLs apply the rules accordingly. Logs must be received within 30 days after the test. Send all entries to: Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

DELAWARE QSO PARTY

Starts: 1700 GMT November 12
Ends: 2300 GMT November 13

Sponsored by the Delaware ARC. Stations may be worked once per band and mode for QSO and multiplier credits.

EXCHANGE:

CW—1805, 3570, 7070, 14070, 21070, 28070.

SSB—1815, 3975, 7275, 14325, 21425, 28650.

Novice—3710, 7120, 21120, 28120.

SCORING:

Delaware stations score 1 point per QSO. Multiply total by the number of ARRL sections and DX countries worked.

Others score 5 points per Delaware station worked. Multiply total by the number of Delaware counties worked on each band and each mode (maximum of 36 multipliers possible).

ENTRIES AND AWARDS:

Appropriate awards will be given to the top scorers. In addition, a certificate will be given to all stations working all three Delaware counties. If you work all three counties and want the WDEL Award, send two 20-cent stamps and an address label.

Mail logs by December 16 to: Charlie Sculley AE3H, 103 E. Van Buren Avenue New Castle DE 19720. Send an SASE for a copy of the results.

OMISS QSO PARTY

Starts: 0000 GMT November 12
Ends: 2400 GMT November 12

Sponsored by the Old Man International Sideband Society. Work stations once per band. Exchange RS, name, state, and OM number (if any). Count 5 points per OMISS member, 2 points per nonmember. Multiply by total states, VE provinces, and DX countries. Plaque to top-scoring member and nonmember. Certificate to top-scoring members in each US call district. Mail logs and cover sheet within 15 days to: Rich Besitka KA1HGY, 480-B Radmere Road, Cheshire CT 06410. Include an SASE for further information.

CQWE CONTEST

Starts: 1900 GMT November 12
Ends: 0500 GMT November 14

Sponsored by the Bell System Amateur Radio fraternity, the contest contains various sessions during the period. The contest is open to present and retired employees of Bell, Western Electric, AT&T, and subsidiaries of AT&T. Contact your local interworks coordinator for logs and complete rules, or write to: Phil Pearson WA1LXY, Bell Telephone Laboratories, 1600 Osgood St., North Andover MA 01845, Room 3E-46. Telephone: (617)-681-6179 (work) or (603)-362-4297 (home).

RHODE ISLAND QSO PARTY

1700 GMT November 12 to 0500 GMT November 13
1300 GMT November 13 to 0100 GMT November 14

Sponsored by the East Bay Amateur

Wireless Association. RI stations work other RI stations and the rest of the world. All others work only RI stations. The same station may be worked twice on each band, once on phone and once on CW.

EXCHANGE:

RS(T) and state, province, country, or RI city.

FREQUENCIES:

Phone—3900, 7260, 14300, 21360, 28600, 50.110, 144.2, 146.52.

CW—1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110.

Use FM simplex, no repeaters.

SCORING:

All stations score 2 points per phone QSO, 3 points per CW QSO, and 5 points for QSOs with Novices and Technicians. RI stations multiply QSO points by the number of states, provinces, and countries worked. Others multiply total QSO points by the number of different RI cities and towns worked (39 maximum).

AWARDS:

Certificates awarded to top-scoring station in each state, province, country, and RI county, plus top-scoring Novice and Technician in RI and out of state.

ENTRIES:

Logs must show date/time in GMT, call, exchange, band, and mode. Include your name, call, mailing address, club affiliation if any, total QSO points, multipliers claimed, and final score. Entries must be postmarked no later than December 15 and addressed to: East Bay Amateur Wireless Association, PO Box 392, Warren RI 02885. Include an SASE for results.

1983 RESULTS
40-METER WORLD SSB CHAMPIONSHIP

Indicated are callsign, QTH, QSOs, states/provinces worked, DX worked, and total score.

**World champion

*State/province/country champion

W/VE Single Operator

**KC5NQ	—TX	—756	—61	—45	—86,496
*N4BAA	—FL	—559	—55	—48	—65,714
*KA1XN	—MA	—718	—59	—27	—65,188
KG1E	—MA	—676	—52	—36	—64,592
*KC3N	—PA	—702	—55	—27	—60,926
*VE3ICR	—ONT	—467	—58	—42	—57,200
*KC8JH	—OH	—600	—58	—29	—57,072
*K4HAV	—GA	—617	—55	—22	—50,127
*WAØIDK	—MN	—590	—56	—23	—48,901
KA1GHR	—MA	—523	—52	—32	—43,932
KA1WJ	—MA	—503	—55	—32	—43,761
*KM9P	—IL	—618	—55	—12	—42,612
*W5JW	—NM	—452	—56	—29	—42,245
N8ATR	—OH	—485	—54	—25	—41,080
WA4SVO	—FL	—506	—53	—19	—38,880
*KI7M	—OR	—463	—55	—15	—33,880
*KA2CDE	—NY	—341	—52	—31	—32,370
*VO2CW	—LAB	—268	—54	—32	—29,326
*WB4UFL	—IA	—453	—55	— 6	—29,169
*W9UP	—WI	—377	—53	—13	—26,136
WD8IVL	—OH	—397	—53	—12	—25,805
*W4TMR	—NC	—300	—53	—24	—25,718
*KBØC/4	—VA	—503	—46	— 3	—24,990
*KA1RC	—VT	—287	—55	—21	—24,528
*W9RE	—IN	—300	—51	—21	—24,192
*W3USS	—MD	—321	—55	—15	—24,080
*N1BFS	—CT	—467	—46	— 4	—23,550
K4JPD	—GA	—295	—48	—20	—22,440
KO2W	—NY	—293	—43	—23	—21,714
K3GYD	—PA	—328	—35	—24	—21,181
*W8FGA	—MI	—372	—50	— 3	—19,875
WD4RCO	—GA	—212	—49	—28	—19,327
N4FKF	—IN	—351	—47	— 0	—16,497
KU2W	—NY	—263	—49	— 7	—15,176
W1WEF	—CT	—263	—51	— 1	—13,728
NØDQS	—IA	—220	—48	— 7	—12,485
*VE4RP	—MAN	—154	—41	—15	— 9,576
KA2EAY	—NY	—212	—42	— 2	— 9,416
*N7BUP	—AZ	—150	—41	—14	— 9,350
*NF4F	—TN	—170	—42	— 8	— 9,050
KA8PPJ	—OH	—217	—36	— 0	— 7,812
W3ARK	—PA	—225	—34	— 0	— 7,650
KA4MTK	—VA	—160	—42	— 4	— 7,544
WA1TCA	—CT	—138	—40	— 7	— 6,768
KC8HJ	—OH	—150	—42	— 1	— 6,493
*K3OX	—NJ	—106	—43	—11	— 6,480
*N5BMD	—LA	—119	—40	— 7	— 6,345
K8CV	—MI	—144	—36	— 5	— 6,232
*WA1YXL	—ME	—157	—36	— 2	— 6,040
*W8VEN	—WV	—129	—39	— 4	— 5,719
*KC7PA	—UT	—114	—40	— 7	— 5,687
WA3JXW	—PA	—172	—32	— 0	— 5,504
KF1B	—CT	— 95	—35	—13	— 5,280
W2FTY	—NY	— 92	—36	—12	— 5,040
*WB8ZRL/Ø	—NE	—106	—41	— 4	— 4,950
*W7CB/6	—CA	— 81	—25	—17	— 4,326
W2GKZ	—NY	— 72	—29	—17	— 4,324
*K4VB	—AL	—104	—38	— 2	— 4,280
K2MK	—NJ	—120	—35	— 0	— 4,200
KS5S/4	—AL	—103	—34	— 0	— 3,502
WB8YEW	—OH	— 97	—35	— 0	— 3,395
K1NCD	—CT	— 81	—35	— 2	— 3,071
KA2CDJ	—NY	— 93	—33	— 0	— 3,069
N5ACP	—NM	— 59	—33	—10	— 2,967
W9LYN	—IL	— 62	—34	— 4	— 2,546
N8EOH	—MI	— 87	—28	— 0	— 2,436
KJ2N	—NJ	— 48	—23	—13	— 2,376
*NL7D	—AK	— 58	—34	— 3	— 2,257
KC8P	—MI	— 66	—31	— 0	— 2,046
W1LUG/4	—VA	— 71	—25	— 0	— 1,775
*W5EIJ	—AR	— 57	—30	— 0	— 1,710
KD4PP	—TN	— 49	—29	— 3	— 1,664
*WØIZV	—CO	— 59	—27	— 0	— 1,593
KB9PB	—IL	— 52	—29	— 0	— 1,508
WC4E	—FL	— 52	—22	— 1	— 1,219
K9GDF	—WI	— 39	—19	— 0	— 741
KB7M	—WY	— 30	—20	— 0	— 600
KH6IJ	—HI	— 21	—13	— 0	— 546
KI7F	—OR	— 24	—16	— 1	— 425
AA6EE	—CA	— 7	— 4	— 0	— 28

DX Single Operator

**4M3AZC	—Venezuela	—578	—53	—58	—124,805
*IO3MAU	—Italy	—478	—41	—50	— 83,447
*OK1TN	—Czech.	—438	—31	—59	— 77,940
*CT4NH	—Portugal	—426	—41	—47	— 74,888
*PY5EG	—Brazil	—389	—48	—41	— 69,064
IO6NOA	—Italy	—438	—17	—58	— 68,558
*DL8NBE	—W. Germany	—351	—16	—41	— 42,408
OK1AYP	—Czech.	—298	—30	—38	— 39,916
*HI8GB	—Dom. Rep.	—202	—44	—17	— 24,583
*CN8CO	—Morocco	—248	—37	—27	— 20,800
*LX1JX	—Luxembourg	—108	—15	—24	— 8,424
*EA1QF	—Spain	—108	—35	— 0	— 7,560
*VK5BW	—Australia	—101	—20	—18	— 7,486
I4CSP	—Italy	— 54	—12	—22	— 3,434
*F8WE	—France	— 79	— 0	—22	— 3,388
OK1AOZ	—Czech.	— 68	— 2	—23	— 3,250
*JM1NKT	—Japan	— 55	—17	— 9	— 2,808
I8ZLW	—Italy	— 57	— 0	—22	— 2,158
ZS6WB	—S. Africa	— 34	— 3	—17	— 1,260
OK3CRH	—Czech.	— 24	— 0	—12	— 732
EA3DMP	—Spain	— 25	— 3	—11	— 700
LA2TO	—Norway	— 18	—10	— 0	— 360
YU7SF	—Yugoslavia	— 18	— 0	— 9	— 306
OZ4ZT	—Denmark	— 12	— 0	— 5	— 120
OK3YK	—Czech.	— 22	— 0	— 5	— 110
DL7QG	—W. Germany	— 4	— 0	— 4	— 32
JL1EJO	—Japan	— 8	— 0	— 1	— 8
OZ1ACB	—Denmark	— 2	— 0	— 2	— 8

W/VE Multi-Operator

**K3TUP	—PA	—1214	—58	—35	—120,063
*K8ND	—OH	—1129	—57	—37	—113,646
*K5LZO	—TX	— 813	—57	—35	— 81,512
*KCØSZ	—CO	— 764	—58	—33	— 76,713
*KBØQA	—SD	— 584	—55	—18	— 42,742
*KD4TQ	—KY	— 445	—55	—28	— 39,840
*N8AKY	—MI	— 454	—54	—24	— 38,064
*KF2X	—NY	— 311	—48	—29	— 32,802
*WA3SPJ	—PA	— 498	—51	— 7	— 29,290
N8EKE	—OH	— 592	—44	— 0	— 26,048
*KØUR	—OH	— 297	—46	—25	— 23,288
*KW7Y	—WA	— 295	—47	—13	— 19,380
*WB1GMH	—VT	— 192	—41	— 8	— 9,898

DX Multi-Operator

**I5NPH	—Italy	— 667	—43	—64	—149,051
*I4OUT	—Italy	— 648	—32	—62	—126,524
*DA1TN	—W. Germany	— 381	—31	—37	— 47,738
*JI1QQI	—Japan	— 51	—12	— 9	— 1,806

SWL Station

DL-104	—W. Germany	— 183	— 1	—23	— 8,784

3RD ANNUAL 40-METER WORLD SSB CHAMPIONSHIP
0000Z to 2400Z
January 7, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on 40-meter phone during the specified times of allowable operation. The same station may be worked *once*. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

OPERATOR CLASSES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the continental 48 United States and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contacts with W/VE stations located within the continental 48 United States and Canada. All other contacts score 10 points each. List points for each contact on your log sheet(s).

MULTIPLIERS:

1 multiplier point is earned for each US state, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the continental US and Canada).

FINAL SCORE:

Total QSO points times total multiplier points equals *claimed score.*

CONTEST ENTRIES:

Each entry must include a contest log, a dupe sheet, a contest summary, and multiplier checklist. We recommend that contestants send for a copy of the contest forms. Send an SASE to the contest address listed below.

CONTEST DEADLINE:

Each entry must be postmarked no later than February 12, 1984.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each

RESULTS

YV3BRF, I5NPH, KG1E, AND N4TY: 1983 WORLD 75-METER CHAMPS

The 1983 World 75-Meter Championship is now history. The scores have been tabulated, checked, and cross-checked. There are four clear-cut winners.

In the W/VE single-operator class, it was definitely a photo finish. Only 48 points separated the first- and second-place stations. World Champion KG1E took top honors with 722 QSOs, 98 multipliers, and a total score of 83,104 points. Close on his heels with 777 QSOs, 94 multipliers, and 82,156 points was second-place finisher N5AU of Texas with K5ZD at the helm. Whowee...I wonder if each of them knew how close they were to each other in the closing hours of the contest?!

The single-operator class for DX stations was practically no contest for world-championship station YV3BRF of Venezuela. With 655 QSOs, 101 multipliers, and 132,108 total points, this station led second-place contestant IO3MAU of Italy by nearly 44,000 points.

In the W/VE multi-operator category, we had another close finish. Here again, if the two stations had known how close they were to each other, would we have seen different strategy in the closing hours? N4TY of Kentucky becomes the World Champ with 655 QSOs, 62 multipliers, and 41,106 points. Second place goes to K1WW of New Hampshire, who trailed the leader by only 1,073 points. Though the winner had 212 more contacts than his opponent, the scoring gap closed rapidly as K1WW accumulated 81 multipliers compared with only 62 for the champion. Next year, I'm sure both stations will monitor each other's activity more closely.

In DX, I5NPH and crew became the 75-Meter World Champions for DX multi-operator stations. Scoring 520 QSOs and 91 multipliers, they tallied a grand total of 101,092 points.

The following stations worked 500 or more QSOs: N5AU (777), N8II (730), KG1E (722), N4TY (655), YV3BRF (655), WB0NCR (606), KC8JH (600), KA4JNC (571), W3USS (563), IO3MAU (548), I5NPH (520), and K9EC (516).

In the contest, stations could work a total of 61 US states and Canadian provinces and territories. N5AU came the closest to the maximum with 60 worked, closely followed by YV3BRF with 59. Other stations with 50 or more W/VE multipliers included N8II (58), KC8JH (57), KG1E (57), K9EC (56), W3USS (56), KB3A (56), WB0NCR (55), N4TY (55), N1BFS (54), KI0F (54), KV0I (53), K1WW (53), HI8GB (52), N8AKY (52), WA1ZAM (52), C6ADV (51), KI7M (51), K5LZO (51), KA4JNC (50), K2GKK/5 (50), and K0UR (50).

Working DX countries on 75 meters is a challenge all its own. From the looks of the DX multipliers claimed, propagation played a big roll in the outcome of contest scoring. Naturally, European stations logged the most countries worked due to their close proximity to one another (as compared with their North American counterparts). IO3MAU had the most countries worked, with a total of 54. He was closely challenged by multi-operator champion I5NPH, who tallied 52 total DX countries. Other stations logging 25 or more included YV3BRF (42), KG1E (41), N5AU (34), W3USS (31), HI8GB (29), CT4NH (29), K1WW (28), and K8MNG (25).

Of all the contests sponsored by *73*, this 75-meter event has got to be the toughest. It has become an event participated in largely by Advanced- and Extra-class operators within the States. This, of course, is due to the band allocations and the fact that General-class licensees are extremely limited in available frequencies for contesting purposes. Adding to this dilemma is the fact that DX countries for the most part all have different parts of the spectrum in which to operate, making simplex operation rather difficult for the majority. In view of these obstacles, FCC action in the future which would further expand phone privileges for American amateurs on this band would greatly enhance the capability stations would have to maneuver. The 75-Meter Contest would see a dramatic increase of activity as a result.

With the rules changed slightly to encourage more DX participation, we expect to see even greater scores and a much larger turnout in the 1984 contest. The sunspot cycle promises to make 75 even more exciting than it has been in the past. It'll be your chance to get another "new one," so plan to attend. Obtain your forms as soon as possible by sending an SASE to Jose Castillo N4BAA, 75-Meter Contest Chairman, 1932 Highland Drive, Amelia Island FL 32034.—*Bill Gosney KE7C.*

75-METER CONTEST SOAPBOX

KA1DZV: "Enjoyed the contest—very unique!"
KG1E: "Excellent test! Propagation to all parts of the world was fantastic! Sure was a great contest."
WA1ZAM: "A great time again for the second year in a row. I'll be back."
KB3A: "Had the best of both worlds, multi-op for 40 and single op for 80."
KI3S: "Nice contest. Next year, I will plan to spend more time on the air."
W3USS: "Tremendous conditions and turnout!"
4BAA: "Wish I had had more time this year. See everyone next year for sure."
K4JPD: "I really enjoyed the contest!"
N4TY: "This was a super contest!"
W4TMR: "Can't wait until next year!"
AA6EE: "Learned that I need a better DX antenna than an inverted vee."
K8MNG: "This contest surpassed my expectations; worked 8 new countries on 75."
K9GDF: "Great contest!"
KI0F: "FB contest. Glad to be part of it. Where was Mississippi?"
JA2YKA: "Nice contest indeed. See you again next year."
VY1DV: "Too cold to stay in the shack even with the heater going. Outside temperature was 40° C. Conditions were poor, to say the least!"

75-METER ANTENNA SURVEY

Dipole/inverted vee	65.9 %	W3DZZ array	2.2
Vertical	10.0	3-element yagi	1.1
Sloper (¼- and ½-wave)	7.7	18 AVT	1.1
Delta loop	5.4	Windom	1.1
Longwire	2.2	Phased vertical	1.1

TOP O'THE ROCK

NEWSLETTER OF THE MONTH

From the top of Georgia's Stone Mountain and the heart of Atlanta comes this month's newsletter contest winner, *Top O' The Rock*. Printed with pride by the Alford Memorial Radio Club, this newsletter has undergone an amazing metamorphosis in recent months.

Though once it was just another no-name newsletter, shortly after becoming *Top O' The Rock* the publication blossomed. Now it is stuffed with feature articles, news, and humor. The large number of letters to the editor received by Faye Gamer N4HLE attests to the interest club members have in their publication.

In addition to the well-designed cover, *Top O' The Rock* sports a table of contests, monthly calendar, and, of all things, advertising. Though many clubs moan and groan about the expenses of printing and distributing a newsletter, the Alford Memorial Radio Club has found a way to support its product. In addition to the supplemental income, the newsletter benefits from a dedicated staff including Alan Langford N4HUD, Production Manager; Jim Gamer KE4BI, Advertising Manager; Cary Dingler N4GPL, Circulation Manager; Reed Kreen WA3JBQ, US Post Office Liaison; and, last but not least, Big Willie GO4KILL, Master of Broken Arms.

Congratulations to Faye and her crew for an outstanding publication.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

3RD ANNUAL 75-METER WORLD SSB CHAMPIONSHIP
0000Z to 2400Z
January 8, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on 75-meter phone during the specified times of allowable operation. The same station may be worked once. Crossmode contacts will not count. Single operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are ***no less than 30 minutes each.***

operator class in each of the continental 48 United States, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms or to submit an entry, contact: 40-Meter Contest, Dennis Younker NE6I, 43261 Sixth Street East, Lancaster CA 93535.

OPERATOR CLASSES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the continental 48 United States and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contacts with W/VE stations located within the continental 48 United States and Canada. All other contacts score 10 points each. List points for each contact on your log sheet(s).

MULTIPLIERS:

1 multiplier point is earned for each US state, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the continental US and Canada).

FINAL SCORE:

Total QSO points times total multiplier points equals *claimed score.*

CONTEST ENTRIES:

Each entry must include a contest log, a

1983 RESULTS
75-METER WORLD SSB CHAMPIONSHIP

Indicated are callsign, QTH, QSOs, states/provinces worked, DX worked, and total score.
**World champion
*State/province/country champion

W/VE Single Operator

**KG1E	MA	722	57	41	83,104
*N5AU (K5ZD, op.)	TX	777	60	34	82,156
*N8II	WV	730	58	21	61,146
*W3USS (K3ZJ, op.)	MD	563	56	31	54,984
*KC8JH	OH	600	57	12	42,297
*WB0NCR	IA	606	55	6	37,332
*N1BFS	CT	482	54	19	37,011
*K9EC	WI	516	56	13	36,501
*K4JPD	GA	437	48	22	32,480
*KB3A	PA	522	56	5	32,147
*KV0I	NE	479	53	7	29,160
KB3ND	PA	445	47	11	26,448
*WA1ZAM	MA	406	52	9	25,376
*KI7M	OR	356	51	10	24,095
*K2GKK/5	OK	360	50	10	22,814
*NR4S	TN	379	45	12	22,572
*K0UR	KS	291	50	18	21,148
*KI0F	MN	323	54	3	18,582
*W4TMR	NC	256	49	12	16,592
*W8UVZ	MI	298	48	5	16,059
N8ATR	OH	281	47	5	15,158
N8TN	OH	262	43	3	12,190
KB8WB	OH	240	45	3	11,664
*K4ADI	SC	200	44	7	10,557
KC3AF	PA	225	42	4	10,350
W3ARK	PA	181	39	1	7,684
*KA2CDJ	NY	163	41	4	7,515
*KN1M	ME	156	35	11	7,176
K8CV	MI	147	42	4	6,946
*KS5A/4	AL	134	43	6	6,860
*N5ACP	NM	121	47	6	6,731
KB9S	WI	144	42	4	6,716
*N4BAA	FL	150	40	3	6,600
*K2MK	NJ	155	36	4	6,440
*VE4RP	MAN	149	38	3	6,191
WA1TCA	CT	151	39	1	6,080
KA1DZV	CT	169	34	0	5,746
*KC7PA	UT	124	41	2	5,418
K8MNG	OH	98	19	25	5,405
W8VEN	WV	131	37	2	5,187
WB2TKD	NY	129	36	2	4,978
*N4ARO/6	CA	93	45	3	4,560
*N0CMC	ND	103	38	3	4,346
KI3S	PA	108	33	5	4,332
*KT4U	VA	115	32	4	4,284
W2FTY	NY	108	35	3	4,218
N5AF	TX	92	35	7	4,200
KB5DQ	NM	109	36	2	4,142
W2GKZ	NY	80	34	7	3,567
*KV7L	WY	80	38	4	3,528
KJ2N	NJ	90	29	4	3,135
W7CB/6	CA	79	35	2	3,071
N1SR	MA	75	32	3	2,765
*KB8KW/7	MT	75	32	0	2,400
KA2EAY	NY	94	23	0	2,068
W3BGN	PA	41	24	13	2,035
W1LUG/4	VA	67	26	1	1,836
VO2CW	LAB	41	15	9	1,320
K1NCD	CT	60	21	0	1,260
WB8ZRL/0	NE	47	26	0	1,222
K9GDF	WI	46	26	0	1,196
KB7M	WY	36	28	0	1,008
KB9PB	IL	38	23	0	874
VE4AKN	MAN	36	24	0	864
WA4LDU	SC	29	28	1	600
W5SOD	TX	30	18	1	589
AA2Z	CT	16	8	3	231
W6LFB	CA	15	11	0	165
VY1DV	YUK	16	5	1	102
AA6EE	CA	8	7	0	56
N9DIJ	WI	2	2	0	4

DX Single Operator

**YV3BRF	Venezuela	655	59	42	132,108
*IO3MAU	Italy	548	30	54	88,284
*HI8GB	Dom. Rep.	466	52	29	75,330
*C6ADV	Bahamas	398	51	24	32,550
*CT4NH	Portugal	129	21	29	10,700
*EA3CCN	Spain	81	17	22	6,123
*OK3CRH	Czech.	57	0	23	2,622
I4CSP	Italy	55	7	14	2,376
*HA8IE	Hungary	51	0	19	1,938
*F8WE	France	39	8	15	1,794
EA2AQW	Spain	54	0	14	1,442
*DH0FAV	W. Germany	55	0	12	1,296
OK3FON	Czech.	26	1	10	550
YU7SF	Yugoslavia	9	0	7	126

W/VE Multi-Operator

**N4TY	KY	655	55	7	41,106
*K1WW	NH	443	53	28	39,933
*K5LZO	TX	446	51	16	31,088
*KA4JNC	VA	571	50	4	31,050
*N8AKY	MI	381	52	12	25,216
*WA3SPJ	PA	380	49	8	21,660
*KF2X	NY	355	47	20	20,703
*WB1GMH	VT	245	44	3	11,656

DX Multi-Operator

**I5NPH	Italy	520	39	52	101,092
*JA2YKA	Japan	51	8	7	1,185

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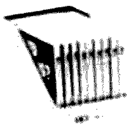

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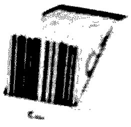

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RESULTS

K8ND AND KC8JH: 1983 WORLD 160-METER CHAMPS

"Keep this line gentlemen's contest on the agenda forever"..."the contest support was overwhelming"..."it's the best 160-meter contest going!" This was the general feeling of contestants about this year's World 160-Meter Sideband Championship!

If you participated this year and are from Ohio, we don't need to tell you how devastating the competition was there. Out of the top four scores in the contest, three stations were from the state of Ohio. Between K8ND, WB8JMB, and KC8JH, a total of 2,798 contacts were made totaling 898,930 contest points. That's 160-meter contesting at its best—championship-style!

In the single-operator class, KC8JH (Ohio) accumulated 900 QSOs to become the 1983 World Champ. K8ND earned the same distinction with 1001 OSOs in the multi-operator category.

Stations achieving 500 or more single-operator contacts included KC8JH (900), AA1K (796), KØHA (710), K9QLL (663), KVØG (627), N5CG (605), N5JB (597), KC8P (591), K6SE (590), W8FGA (588), W8GIO (564), K4AQQ (560), W8UP (558), and W4TMR (532). In the multi-operator class, 500 or more contacts were earned by K8ND (1001), WB8JBM (897), W4CN (890), WA2SPL (879), N7DF (664), KBØTJ (586), and KC5DX (523).

According to contestants, propagation was truly fantastic; the majority of entries cited 40 or more W/VE multipliers worked. Many indicated they were able to earn that last-needed state or two for their WAS award.

The greatest difference noted in the scores was the amount of DX multipliers earned by competing stations. Single-operator stations working 6 or more DX countries included EA3CCN (13), N4IN (13), OK1JDX (12), AA1K (11), K6SE (9), KØHA (7), KVØG (7), K4AQQ (7), W5GFR (7), WA4SVO (7), N5CG (8), W8GIO (6), KC8JH (6), WØCM (6), and K7VIC (6). Multi-operator stations with 6 or more DX multipliers were WA2SPL (18), YU7JDE (16), K8ND (9), and WB8JBM (7).

Tabulating all the entries and cross-checking all scores revealed that more than 1300 stations were logged during this weekend event. It also appears that over 20 DX countries were represented. 1983's contest was the best ever! If you were from Alabama, Arkansas, Connecticut, Idaho, Louisiana, Minnesota, Missouri, North Dakota, or Utah, sending an entry to our contest manager would have made you an award winner from your state. Though there were many stations participating in all states, not a station from the states listed above submitted an entry. That's unfortunate. Likewise, no entries were received from Alberta, Prince Edward Island, Yukon Territory, Northwestern Territories, Labrador, or Newfoundland. With the 1984 event just around the corner, stations from these states and provinces will get a second chance to represent their areas.

Of particular interest every year is the opportunity to prove to our readers that most hams can in fact get on 160 without owning a lot of real estate. Every style of inverted vee, delta loop, and wire beam has been tried—even on small city lots! Here are some statistics extracted from contestants' entries.

160-METER ANTENNA SURVEY

	1981	*1982*	*1983*
Dipole/inverted vee	54.9%	59.6%	64.2%
1/4-wave vertical	9.1	15.8	3.8
Trap vertical	19.8	9.3	16.0
Full-/half-wave vertical	2.2	.5	1.2
Wire beam	2.1	.9	2.4
Delta loop	1.7	.9	.0
2/3-element yagi	1.4	.9	.0
1/4-wave sloper	4.4	9.3	7.4
1/2-wave sloper	4.4	2.8	5.1

Awards for the 1983 contest are being prepared at this time and should be to recipients shortly. We congratulate all the winners for their dedication to this year's effort and all the participants who made it all possible. It's been great!

As for 1984, it's promised to be the biggest year ever in 160-Meter Contest history. With the sunspot cycle in our favor, the band should be filled with new ones for the deserving DXer. Just who will be the new World Champs for 1984? Will K8ND and KC8JH retain their titles? Will former champs W9RE, W8NGO, W8LRL, or W4CN regain top honors or will it be someone from the west coast this time? Mark the dates on your calendar; the 5th annual 160-Meter World Championship is slated for January 14 and 15, 1984.

If you intend to enter this year's event, why not send for your contest entry forms today? Foreign stations especially should obtain their forms as soon as possible due to delays in mail-handling between countries. Send your SASE to: Harry Arsenault K1PLR, 160-Meter Contest Chairman, 603 Powell Avenue, Erie PA 16505.—*Bill Gosney KE7C*

160-METER CONTEST SOAPBOX

K1LPS: "Did not hear any nasty remarks or complaining in spite of very crowded conditions, although there were a few instances of deliberate jamming...something that is thankfully rare on 160."

K3MO: "Was handicapped with a sore throat. Elixia of Kentucky eased the pain."

K4IN: "The present rules discriminate against the DX station. It is much harder to work a second G or VY than another W2 in New Jersey, yet all count the same!" (Editor's note: 1984 rules will allow 5 points per W/VE contact and 10 points for all others.)

N8AKY: "Was able to work my last state for WAS! Keep this fine gentlemen's contest on the agenda forever."

W8GIO: "Could have had a couple more multipliers but refused to operate in the window."

W9LNQ: "Glad to be back on 160 after a 25-year absence. The band sounds absolutely great!"

K9QLL: "The spirit was willing but the flesh went to sleep."

dupe sheet, a contest summary, and multiplier checklist. We recommend that contestants send for a copy of the contest forms. Send an SASE to the contest address listed below.

CONTEST DEADLINE:

Each entry must be postmarked no later than February 12, 1984.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each operator class in each of the continental 48 United States, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms or to submit an entry, contact: 75-Meter Contest, Jose A. Castillo N4BAA, 1832 Highland Drive, Amelia Island FL 32034.

5TH ANNUAL 160-METER WORLD SSB CHAMPIONSHIP 0000Z January 14, 1984 to 2400Z January 15, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal.

OBJECT:

To work as many stations as possible on 160-meter phone in a maximum of 32 hours allowable contest time. Multi-operator stations may operate the entire 48-hour contest period. Stations may be worked only once.

ENTRY CATEGORIES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the continental US and Canada transmit RS report and state or province/territory. All others transmit RS report and DX country.

POINTS:

5 QSO points for contact with W/VE stations contacted within the continental 48 United States and Canada. All other contacts earn 10 points each.

MULTIPLIERS:

1 multiplier point will be earned for each of the continental United States, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each of the Canadian provinces/territories (13 maximum), and each DX country outside the continental 48 United States and Canada.

FINAL SCORE:

Total QSO points times total multiplier points equals *claimed score.*

CONTEST ENTRIES:

Each entry must include log sheets, dupe sheet for 100 or more contacts, a contest summary, and a multiplier check sheet.

ENTRY DEADLINE:

All entries must be postmarked no later than February 19, 1984.

DX WINDOW:

Stations are expected to observe the DX window from 1.825-1.830 MHz as mutually agreed by top-band operators. Stations in the US and Canada are asked not to transmit in this 5-kHz segment of the band. During the contest, all W/VE stations are requested to utilize only those frequencies from 1.808-1.825 and 1.830-1.900 MHz.

DISQUALIFICATIONS:

Disqualification may result if a contestant omits any required entry form, operates in excess of legal power authorized for his/her given area, manipulates operating times to achieve a score advantage, or fails to omit duplicate contacts which reduce the overall score more than 2%. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each entry category in each of the continental United States, each Canadian province/territory, and each DX country. A minimum of 100 QSOs must be worked to qualify.

CONTEST ADDRESS:

To obtain information or entry forms (enclose an SASE) or to submit a contest entry, contact: 160-Meter Contest, Harry Arsenault K1PLR, 603 Powell Avenue, Erie PA 16505.

3RD ANNUAL RTTY WORLD CHAMPIONSHIP 0000Z to 2400Z February 25, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal and *The RTTY Journal.*

OPERATOR CLASSES:

(A) Single operator, single transmitter. (B) Multi-operator, single transmitter.

ENTRY CATEGORIES:

(A) Single band. (B) Allband, 10-80 meters.

EXCHANGE:

Stations within the 48 continental United

1983 RESULTS
160-METER WORLD SSB CHAMPIONSHIP

Indicated are callsign, QTH, QSOs, states/provinces worked, DX worked, and total score.
**World champion
*State/province/country champion

W/VE Single Operator

**KC8JH	OH	900	56	6	279,000
*AA1K	DE	798	58	11	266,860
*K0HA	NE	710	56	7	223,850
*KVØQ	CO	627	55	7	194,370
*K6SE	CA	590	58	9	191,750
*K9QLL	IL	663	55	1	185,640
*N5CG	OK	607	55	6	185,135
*N5JB	TX	597	56	4	180,600
*KC8P	MI	591	57	3	177,300
*K4AQQ	FL	560	55	7	173,600
*W8GIO	WV	564	55	8	172,020
*W9UP	WI	558	56	5	170,190
W8FGA	MI	588	54	1	161,700
W5GFR	TX	497	54	7	153,720
*W4TMR	NC	532	54	5	148,385
*W9CM	KS	472	55	8	143,960
*K7VIC	MT	469	53	6	138,355
*KØSTI	SD	480	54	1	132 000
*K3MO	PA	448	53	5	130,210
WA4SVO	FL	438	52	7	129,210
*VE3ABG	ONT	449	52	4	125,720
WØDQS	LA	421	54	2	117,880
VE3CVX	ONT	445	51	1	115,700
*N8CGK	OH	463	48	0	111,090
N8AKY	MI	424	52	0	110,240
N4IN	FL	326	52	13	105,950
W3ST	PA	374	53	3	104,720
*KA1PE	ME	349	50	5	95,975
WØPJV	IA	335	54	3	95,475
*W9RE	IN	383	46	2	91,920
K6HNZ	CA	353	52	0	91,780
*AF1T	NH	363	46	0	83,490
*W2FJ	NJ	328	46	1	80,360
*KD4NI	VA	338	46	0	77,740
*VE7CRU	BC	301	51	0	76,755
*W1YN	MA	310	44	4	74,400
*K4CNW	SC	311	46	1	73,085
*NF4F	TN	318	44	0	69,960
VE3INQ	ONT	264	51	2	69,960
*VE1YX	NS	249	47	9	69,720
WA1UJU	WI	296	46	0	68,080
K8AQM	MI	282	48	0	67,680
*WB7FDQ	AZ	286	45	1	65,780
W3BGN	PA	305	41	2	65,575
*AE5H	MS	248	52	1	65,190
W8ILH	OH	286	48	2	65,170
*W3USS (K3ZJ, op.)	MD	316	39	2	64,780
W2FCR	NJ	283	43	0	60,845
WA9TZE	WI	222	53	1	55,920
W9RAO	FL	207	48	5	54,855
WD5CSK	OK	245	50	0	54,500
*KA7AUH	WA	221	49	0	54,145
KØDVY	KS	212	50	0	53,000
*WD2AFA	NY	254	38	3	52,070
WAØTKJ	KS	200	51	1	52,000
*K1LPS	VT	213	47	1	51,120
KA3DRO	MO	230	39	5	50,600
KA6CHE	CA	215	44	3	50,535
*W7FT	WY	202	50	0	50,500
K3LGC	DE	208	45	2	48,800
K2DWI	NY	202	41	0	43,460
N7CKD	WA	179	41	5	41,170
W3DHM	PA	177	45	0	39,825
*VE5XU	SAS	183	43	0	39,345
K8SVT	OH	182	43	0	39,130
KB9Q	WI	161	45	0	36,225
WBØUFL	IA	169	44	0	34,980
KA7BRE	NV	169	40	0	33,800
W4TWW	SC	136	41	2	31,240
W8VEN	WV	142	41	0	29,110
WD8LXA	OH	160	35	0	28,000
*VE4WR	MAN	122	44	0	26,840
WA1ZAM	MA	140	38	0	26,600
*W1LOV	RI	170	31	0	26,350
N4MM	VA	128	41	0	26,240
N5AFV	TX	126	37	0	23,310
*N7AEH	OR	111	41	0	22,755
KC8A	MI	128	36	0	22,680
VE4RP	MAN	110	40	1	22,550
VE7ERY	BC	110	40	1	22,550
K2FL	NJ	128	34	1	22,400
*N5ACP	NM	106	42	0	22,260
VE4QZ	MAN	114	39	0	22,230
*VE1BPY	PEI	113	29	1	22,035
WD8MRF	OH	120	36	0	21,600
K8HF	OH	113	38	0	21,470
WA9FTV	IL	100	39	0	19,500
*WD4RCO	GA	87	41	0	17,835
K8CV	MI	99	34	0	16,830
KI7M	OR	108	30	0	16,200
N9AW	WI	89	36	0	16,020
W3ASS	PA	94	32	0	15,040
W4KMS	VA	82	34	0	13,940
WD8LCN	MI	65	38	0	12,350
W3ICM	MD	74	33	0	12,210
N4ARO	CA	97	25	0	12,125
K8NJA	FL	72	31	2	11,880
N8QID	MI	69	34	0	11,730
VE3NBE	ONT	70	31	0	10,850
W5IRP	TX	69	29	1	10,350
W7CB	CA	73	25	0	9,125
KB8RH	MI	54	30	1	8,100
W9LNQ	IL	50	30	0	7,500
WA2TKD	NY	55	27	0	7,425
N8TN	OH	78	19	0	7,410
W1LUG	VA	60	24	0	7,200
K1HI	NH	57	22	0	6,270
N9KS	WI	50	25	0	6,250
W8AXA	OH	58	20	0	5,800
KB8UQ	MI	51	22	0	5,610
*VE1BRA	NB	52	21	0	5,460
KA9JDW	IL	49	21	0	5,145
K1GZM	RI	36	18	0	3,240
KB7M	WY	32	18	0	2,880
WA3YJA	MD	32	16	0	2,560
K8VNP	FL	30	17	0	2,550
W6PFE	CA	24	18	0	2,180
W1GCH	VT	23	15	0	1,725
KB8HW	MI	5	1	0	25

DX Single Operator

**YV3AZC	Venezuela	118	34	4	22,420
*YV2IF	Venezuela	62	25	4	10,005
*XE1HHA	Mexico	71	24	1	8,875
*EA3CCN	Spain	58	0	13	3,840
*OK1JDX	Czech.	28	0	12	1,580
*LU9EIE	Argentina	1	1	0	5

W/VE Multi-Operator

**K8ND	OH	1001	57	9	330,330
*WA2SPL	NY	879	56	18	325,230
*WB8JBM	OH	897	57	7	289,600
*W4CN	KY	890	57	4	271,450
*N7DF	KS	664	57	2	195,880
*KBØTJ	CO	586	56	4	175,200
*KC5DX	TX	523	55	1	146,440
WØECM	KS	398	53	1	107,460
*K9ZUH	IN	372	52	4	104,160
*WA1ZEB	RI	322	45	0	75,670
*NZ4B	VA	272	48	0	65,280
NØBSA	CO	258	48	0	61,926
*WB1GMG	VT	294	42	0	81,740
*VE2CAR	QUE	279	43	1	81,380
K5NA	NY	258	44	1	57,050

DX Multi-Operator

*YU7DJE	Yugoslavia	48	0	16	3,880

itates and Canada must transmit RST and tate or province/territory. All others must ransmit RST and consecutive contact umber.

AISCELLANEOUS RULES:

The same station may be worked once on ach band. Crossmode contacts do not ount. Single operator stations may work 16 ours maximum, while multi-operator staons may operate the entire 24-hour period. Off times are *no less* than 30 minutes each nd must be noted in your log(s).

ISO POINTS:

5 OSO points for contacts with W/VE staons located within the continental United tates and Canada. 10 OSO points for all othr contacts.

IULTIPLIER POINTS:

1 multiplier point is awarded for each of e 48 continental United States (a District of olumbia contact may be substituted for a laryland multiplier), Canadian provinces/territories, and DX countries worked on each band (excluding US and Canada).

FINAL POINTS:

Total OSO points times total multipliers equals *claimed score*.

CONTEST ENTRIES:

Entries must include a *separate* log for each band, a dupe sheet, a summary sheet, a multiplier checklist, and a list of equipment used. Contestants are asked to send an SASE to the contest address for official forms.

ENTRY DEADLINE:

All entries must be postmarked no later than April 15, 1984.

DISQUALIFICATIONS:

Omission of the required entry forms, operating in excess of legal power, manipulating scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each entry category and operator class in each of the US call districts and Canadian provinces/territories, as well as in each DX country represented. Other awards may be issued at the discretion of the awards committee. A minimum of 25 OSOs must be worked to be eligible for awards.

CONTEST ADDRESS:

RTTY World Championship, c/o *The RTTY Journal*, PO Box RY, Cardiff CA 92007.

HAM HELP

I desperately need QSL information for the following stations: P29NDX, ZK2DX, SVØAT, FY7BC, 9K2EW, TF3JB, VU2TF, 5N2ØDOG, TZ4AQS, FKØBW, and 3D2DB. All of the stations were contacted during 1980.

Kenneth Ramirez WB2KQO/KP4
RR 169, Carr. 307
Cabo Rojo PR 00623

I would like to have a schematic of the Southwest Technical Products (SWTPC) 6800 System interface circuit. The unit is designated MP-L and is used to interface parallel devices with the SWTPC 6800 computer.

John H. Davison WØZFN
318 N. Taylor Ave.
Kirkwood MO 63122

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 6

Now, getting back to education as a product, let's walk this through step by step so you can follow my reasoning. First, I hope you'll grant me that *73* has been educational. And perhaps you've noticed that it is fun to read. Well, that's a big key to what I have in mind. I figure that education can be made into a saleable product if it is fun. People will educate themselves if it is more fun to do that than other things. All of my computer magazines are educational and all are fun to read.

The concept of learning because it is fun instead of because one is a prisoner of the system is one which we will gradually have to get used to. I didn't like school much. I didn't like the idea of being forced to attend, whether I wanted to or not. And damned few of the courses were fun. Having enslaved students, the teachers and schools had no need to worry about whether the classes were fun. I was forced to be there by the government whether the classes were fun or not.

What was the most popular television program in England last year? If you missed all the fuss, it was Woodhouse teaching people how to train their dogs. Education—and fun. Got the idea?

Okay, now the next step. I've already written about my plans to start a high-tech college. This school is aimed at helping our country to get back into the high-tech race against Japan and will be set up as a pilot model of a new type of college, geared to the needs of the 80s. But once we have the college going, what better place to start developing the education/fun courses which we may eventually merchandise to the world?

The first step is to develop the new genre of education and put it on video tape. The next is to start selling this via an educational cable television network to get the ball rolling. Then, as video-disk technology is simpler and less costly, move to an interactive video-disk educational system which can be sold anywhere in the world in any language.

The courses should cover everything taught in grade, high, college, and graduate schools. They should go on to those courses which should be taught in school, but aren't. They should also cover business and industrial courses now being taught by businesses. They should cover all aspects of arts and crafts. Anything people may be interested in learning about should be available.

Just as we have several thousand small firms creating wealth for the entrepreneurs who are now producing software for computers, I expect we'll have thousands of small firms producing educational programs which can be distributed by larger firms, creating even more wealthy entrepreneurs.

We'll need larger firms to set up and run the distribution. That's where I think my early start with the concept may give me some leverage. In addition to having the major magazines in this new field to help it develop, I'm going to try to build IDG's present network of 42 magazines in 18 countries into an international educational distribution system.

When I think back on my time in college, I can remember one course that actually was fun. Most of them were dreadful bores, alternating memorization with written exams. Maybe it's significant that the teacher of that one exciting course eventually committed suicide. If a teacher can make accounting exciting, anything is possible.

The courses in my college will be modeled after those I took in the Navy, which were fun, and will be nothing like those I suffered in college. These will lay the groundwork for the interactive video-disk courses later on.

My recent editorials have encouraged quite a number of readers to send resumes. Obviously my plans are going to call for help from a large number of dedicated people—talented people, hard-working people. I have the ideas, know how to make them work, and have the money for it, but the end result still lies in the people I can find to make all this happen.

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RG8U 96% shield, mil spec	**$29.95/100 ft. or 31¢/ft.**
RG6A/U double shield, 75-ohm	**25¢/ft.**
RG58AU stranded mil spec	**12¢/ft.**
RG58 mil spec 96% shield	**11¢/ft**

LOW LOSS FOAM DIELECTRIC

RG8X 95% shield	**$14.95/100 ft. or 17¢/ft.**
RG59/U 70% copper braid	**9¢/ft.**
RG8U 80% shield	**18¢/ft.**
RG58U 80% shield	**07¢/ft.**
RG58U 95% shield	**10¢/ft.**
RG59U 100% foil shield, TV type	**10¢/ft.**
RG8U 97% shield 11 ga (equiv. Belden 8214)	**31¢/ft.**
Heavy Duty Rotor Cable 2-16 ga, 6-18 ga	**36¢/ft.**
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UG-255 (PL-259 to BNC)	**$2.95**
Elbow (M359)	**$1.79**
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UG-21D/U Amphenol Type N Male for RG8	**$3.00**
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UG273 BNC to PL-259	**$3.00**

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DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

SM3CXS, who handles the QSLs for SM0AGD on his far-flung travels, met some of the DXers he has helped over the years at the Dayton Hamvention. Photo via The DXers Magazine.

THE SOUTHERNMOST AMATEUR IN THE UNITED STATES

A DXer in Hawaii has some of the best of both worlds: He's a DXer himself and has a good DX location as well. Hawaii counts as a separate "country" for DXCC, and although not hard to work, Hawaiian amateurs *are* more rare than Texas stations, for example. And Hawaii is far enough south to make it one of the best radio locations in the United States. On the southern island of the Hawaiian chain, at the southernmost tip of the island, resides Dean Paterson KH6OA.

Dean Paterson KH6OA enjoys a beautiful condominium overlooking the black sand beaches of the island of Hawaii in addition to the excellent radio propagation associated with the tropics. On the other hand, Dean feels the same restrictions as other apartment-bound hams: no outside antennas and TVI complaints. His solutions might inspire some DXers whose antennas *weren't* big enough to come down last winter.

Dean's fascination with radio began at the age of 9 with his first crystal set. However, it was 1973 before he received his first amateur-radio license. At that time, his main interest was rebuilding ARC-5 military radios. A few years later, Dean found himself moving to Hawaii into a condominium complex managed by his wife.

As is common with such projects, the sale-and-lease agreements prohibit any outside antennas. So Dean took advantage of the isolated location of the complex and the unpredictable nature of Hawaii's volcanoes and volunteered to provide emergency communications for the complex if he could have an antenna outdoors.

The owners of the condominium complex agreed to an unobtrusive vertical right outside Dean's door in the bottom corner of the complex. That proved to be enough.

Dean pounded a steel stake a couple of feet into the hard lava and attached a Hustler vertical. A few radials stretch under the vegetation, but the building blocks many of the possible radial directions. Not the best antenna system, but adequate.

To provide true emergency communications, Dean assembled a 12-volt, 2-Amp solar panel with two batteries to give 18 hours of operation. 12-volt, 2-meter rigs and low-band gear complete the emergency station.

The two-meter antenna was another problem. The main repeater on Hawaii, the one that connects into the network which serves the entire Hawaiian chain, was on the other side of the island. Dean could hit the repeater with an 11-element beam, but he couldn't get permission to erect it. He finally settled for an indoor setup. The first four elements of the beam attach to the ceiling-fan support above his head. The four elements and an 80-Watt amplifier provide a copyable signal through the massive Mauna Loa volcano.

To complete his antenna farm, Dean stretched a 60' longwire along the edge of the property to improve signals on the Big Island Emergency Nets on 40 and 80 meters. You really have to look closely to spot it, so it probably falls into the "invisible-antenna" category.

But the antenna restrictions were not the only problems in Murphy's bag of tricks. Dean soon discovered that the combination of salt spray and tropical sun dissolves antennas in months. He recently installed his third vertical in 6 years. He says his present antenna, a Butternut, is "the best vertical I've ever had, by far!"

Even that was not the end of his problems, however. Dean suffers from a common problem among apartment-dwelling hams: lack of ground. Electrical ground, that is. The hard lava of Hawaii doesn't conduct at all, and the 3" layer of top soil trucked in to grow grass is not much help. Television interference (TVI) and radio frequency interference (RFI) were, and continue to be, a serious problem.

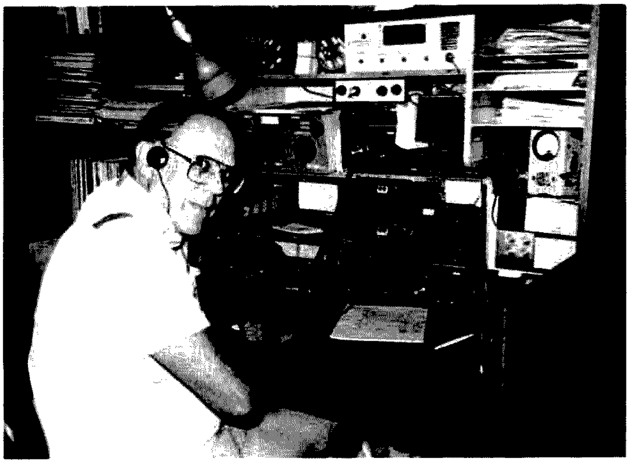
His remote location, miles from the only television transmitters on the island, means signals in the community cable-television system are marginal at best. Dean employs three Drake low-pass filters on his HF gear, and he uses toroids liberally on all power cords. But even so, he says, "If there's a football game on, I either have to go QRP or get off the air entirely."

Dean has turned this restriction into an avocation and has become a QRP enthusiast, using an Argonaut 515. He overcomes the difficult combination of apartment-style antennas and QRP power with two important advantages: his southern location and the KH6 callsign.

The low latitude means greatly enhanced radio propagation. Anyone who has operated from the tropics knows what this means: The bands open earlier in the day and close later at night. Signals from the north are much stronger than similar signals from the east or west. This tropical advantage helps to compensate for increased static and reduced grey-line communications.

And that KH6 callsign is good for a few decibels, Dean concurs. In a recent pileup on a Hong Kong station, Dean tried calling "QRP" in the pileup, without success. Then he tried "KH6" and got right through!

Dean's success with QRP shows in his results: Worked All States and Worked All Continents on QRP. He lacks only a few confirmations before earning his DXCC with 5 Watts or less.



Dean Paterson KH6OA, the southernmost amateur in the United States, operates this well-equipped station into a vertical, a longwire, and other hidden apartment-style antennas.

THE CARE AND FEEDING OF QSL MANAGERS

"Thanks for the contact, and please QSL through my manager, K1RH." How often have you received a DX QSL card through a QSL manager? These dedicated volunteers who facilitate the exchange of QSLs are the unsung heroes of the DX world. Treat them well, as they make the task of collecting DX QSLs more efficient and much less expensive.

Let's look first at how a QSL manager operates, and then we'll see what we can do to make his or her task easier to speed our return QSL.

A QSL manager serves as a go-between for the DX station and the hams who work that DX station. After an amateur works the DX station, he sends the QSL card and a self-addressed, stamped envelope (SASE) to the manager. The manager confers with the DX station, checks that the contact is in the log, and fills out and mails the DX QSL.

There are many advantages to this process over direct QSL exchange with the DX station. First, the QSL manager is usually a stateside ham, so the problems and expense of airmail overseas are greatly reduced. No matter how much you criticize the US Postal Service, they do a remarkable job, especially compared to POs in tiny, out-of-the-way DX locations. In the Galapagos Islands, for example, the mail is handed to any boat going in the right direction from the airport toward the only town. If that ship decides to change course, the mail could be delayed for months, if it ever arrives. QSL exchange with a stateside (or European or Japanese) manager eliminates this risk, is potentially faster than overseas mail, and is much less expensive.

The use of QSL managers simplifies the preparation of your own SASE. Stateside hams can usually use US postage, or, in the case of European or Japanese managers, can use a Green Stamp (US $1 bill), IRCs, or airmail stamps of that country from a DX stamp service.

So QSL managers make QSL exchange faster, cheaper, and more reliable for the DXer. QSL managers are also of benefit to the DX station. The DX station is relieved of the burden of handling volumes of mail, opening, sorting, etc., as well as the task of filling out the cards, stuffing the envelopes, and mailing. Also, the DX station's QSLs are safer in the States than in his own country. Bob YS9RVE once lost all his QSLs, including some excellent 80-meter DX, in a riot. And few DX stations want to trust several years worth of work in the form of DX QSLs to the international postage system. So when a DX station applies for an award (and they *do*, you know), the QSL manager can send in the cards, a much safer and more reliable procedure.

Are there any disadvantages to the use of a QSL manager? The major problem with QSL managers is that the logs are in one remote location and the cards are in another. Somehow the DX station must get his or her log information to the QSL manager to check the contacts. If the DX station mails the logs to the manager, you are right back to trusting the erratic Inter-

national postal system. Mail to Pitcairn Island, for example, depends on infrequent visits by yachts and cruise ships. Also, the logs can take months to reach the manager, who obviously cannot answer the QSL until he or she receives the logs.

Fortunately, there is another way the QSL manager can get the log information from the DX station: on the air. To take a typical example, let's look at how a stateside station would get a VP2ML QSL card. After the DXer works VP2ML and hears "QSL via K1RH," he fills out his QSL and puts it and an SASE in an envelope addressed to K1RH. When Ralph Hirsch K1RH receives the envelope, he opens it and sorts the contacts into date and time order, just like a logbook, until his next schedule with VP2ML.

During the on-the-air schedule, Ralph reads the date, time, and callsign. VP2ML checks his logbook and returns with the band, emission, and report, entering a checkmark in the log for "QSLed." Ralph confirms the band and emission and writes the report in pencil on the incoming QSL card. He then goes to the next card.

With practice, this procedure can be very fast. The on-the-air time to confirm the contact can be a matter of a few seconds, although Ralph still has more work after the contact with VP2ML. Ralph takes the stack of checked, incoming QSL cards and types out a stack of VP2ML cards, reading the reports from his note on the card. He then puts the blue VP2ML card into the SASE provided and drops it in the mail.

This procedure works so well that some DXers get their VP2ML cards within days of their contact. The DXer sends his card and SASE the same day as the contact with VP2ML. Ralph receives the card the next day, confirms the contact in the skad with VP2ML that night, and mails the return card later that evening. The DXer gets his VP2ML card back the next day, less than 48 hours after the contact!

Of course, all this supposes everything goes well. Reality seldom achieves this ideal. What can go wrong? The worst problem is poorly filled out incoming QSLs, especially those with bad dates and times.

VP2ML keeps his log in Coordinated Universal Time (UTC), as just about every DX station must. If the incoming QSL card has local dates and times or has miscalculated the UTC date or time, quick confirmation of the contact is impossible. VP2ML must search the log for the callsign, often over a span of several pages. If there are many other QSL cards awaiting responses, any card with incorrect information goes to the bottom of the pile for another day.

The most common date/time error is to forget to advance the day to the next UTC day during local evening operation. The next most common problem is miscalculating the time difference between UTC and local time, either adding the wrong number of hours or subtracting instead of adding.

This became so much of a problem for Ralph that he made a rubber stamp saying that he was unable to locate the contact in the VP2ML log at the date and time specified and suggesting the amateur check his QSO information again, especially the date and time.

There is really no excuse for date/time errors of this sort. Anyone interested in DX should have a clock reading UTC by the rig and keep their entire log in UTC. You can buy a tiny, stick-on digital clock for a couple of dollars. Set it to UTC and use it for all your amateur contacts. The QSL managers will love it.

Another problem which slows confirmation is multiple contacts on a single card. This card is first filed under the first contact time. But after this contact is checked, the card must be refiled into date/time order for the next contact. This increases the on-the-air time and increases the chance that interference or fading will end the schedule for that day.

Some QSL managers, including Ralph, handle cards for more than one DX station. The best way to address the envelope to the manager is to give both the DX station's call and that of the manager: VP2ML c/o K1RH QSL Manager. Then the manager can immediately sort the cards for the different stations he serves.

And finally, a short note thanking the QSL manager for his services would gladden the heart of many an under-appreciated manager. These volunteers receive nothing tangible for their efforts. They are not paid, and the few dollars which do arrive with the cards barely cover printing and postage.

So why would anyone want to handle the QSL card for a DX station? A QSL manager gets a modicum of publicity for his work, especially if he handles major DXpeditions, such as SM3CXS who handles the cards for Eric SM0AGD on his far-reaching travels. But the real satisfaction comes from the service these amateurs provide to the rest of the DX community.

Have you ever considered handling the cards for a DX station yourself? Consider these qualifications for a good manager: The QSL manager should not move around, so his or her address is good in old, new, and future callbooks. The manager should have a good enough station to maintain communication with the DX station under a variety of conditions, month after month. And the manager should be willing to work hard for remarkably little reward. Infinite patience, the ability to decipher hieroglyphic handwriting, a little ESP (for the QSL cards without date), and an understanding postman are useful but not essential additional qualifications.

Be kind to your friendly QSL manager; he or she makes your DXing a lot more pleasant.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

SPACE COMMUNICATIONS

This is shaping up to be quite a year for amateur radio and space communications. With the launch of Phase III OSCAR and W5LFL's little DXpedition into the final frontier, future ham historians may well peg 1983 as a turning point in the development of the hobby.

I, for one, can't wait until amateur space communications really take off. At age 28, I'm still hoping to see the day when hams collect planets and space settlements the way we currently chase after new countries. Imagine heading down to your local ham club to compare QSLs from Mars, Titan, and Europa. Think of the picture possibilities on those pasteboards!

Of course, some things won't change. We'll probably still be grumbling about slow QSL bureaus, DX nets, and pileups. But like today, the excitement will be worth all the hassles. At least the weather reports should be interesting, for a change.

Let's get going and leave the rest to squabble about code/no code.

ELEMENT 1 MULTIPLE CHOICE

1) A blue whizzer is:
   1) A meteor that creates a very strong ion trail
   2) The name of a new privately-funded amateur satellite
   3) The name of Phase III OSCAR's mode A transponder
   4) A type of space antenna

2) OSCAR 6's 10-meter antennas were made out of:
   1) Tin
   2) Silver
   3) Molybdenum
   4) A disassembled pocket rule

3) Owen Garriott's son has also made quite a name for himself. He is:
   1) Also an astronaut
   2) General Manager of the ARRL
   3) A best-selling computer game designer writing under the pseudonym, "Lord British"
   4) A pro tennis player

4) On which one of the following dates did amateurs first bounce a signal off of the Moon:
   1) July 4, 1976
   2) November 21, 1954
   3) December 4, 1934
   4) January 27, 1953

5) OSCAR 1 was launched from
   1) Cape Kennedy
   2) Cape Canaveral
   3) Edwards Air Force Base
   4) Vandenberg Air Force Base

ELEMENT 2 TRUE-FALSE

	True	False
1) OSCAR 1's output was 10 Watts.	____	____
2) OSCAR 5 was built in Australia.	____	____
3) A Technician-class amateur may be a satellite trustee.	____	____
4) The Leonids meteor shower occurs in November.	____	____
5) Meteors form an ionized trail in the troposphere.	____	____
6) The first successful EME transmission used the old 5-meter band.	____	____
7) No amateur satellites were launched in 1965 through 1970.	____	____
8) OSCAR 8 travels in a north-to-south orbit.	____	____
9) One needs to run at least 1000 Watts in order to access OSCAR.	____	____
10) In ham satellite terminology, LOS stands for "linked oscillator system."	____	____

ELEMENT 3 SCRAMBLED WORDS

Unscramble these space communication terms:

REOTEM	SASBPNDA
PLOPRED	YRTTELEME
KLINWODN	ETILLEAST
DEOM	NOCABE
ELTTUHS	TRHAE
LOPRA	GINP

THE ANSWERS

Element 1:

1—1 Some have been known to reflect signals for up to two minutes.
2—4 Cheap, but practical.
3—3 No, he didn't write Space Invaders.
4—4 Ross Bateman W4AO and William Smith W3GKP did the deed.
5—4 Personally, I've always had a soft spot for ol' Edwards.

Element 2:

1—False One-tenth of a Watt. Good antenna height helps.
2—True University of Melbourne, to be precise.
3—False Extras only, according to the FCC.
4—True November 14-18.
5—False Ionosphere.
6—False It was on 2 meters.
7—True Dry spell.
8—False Depends which side of the world you're on.
9—False Hardly. 100 Watts ERP is more like it.
10—False "Loss of signal."

Element 3:
(Reading from left to right): METEOR, PASSBAND, DOPPLER, TELEMETRY, DOWNLINK, SATELLITE, MODE, BEACON, SHUTTLE, EARTH, POLAR, PING.

SCORING

Element 1:
Six points for each correct answer.
Element 2:
Three and one-half points for each correct answer.
Element 3:
Three points for each term unscrambled.

Where do you stand in the radio space race?

1-20 points—Stuck on the launch pad
21-40 points—Still listening for Sputnik
41-60 points—Confuse OSCAR signals for a band opening
61-80 points—Satellite Communicator's Club member
81+ points—OSCAR DXCC certificate holder

NEW PRODUCTS

SOFTWARE-ONLY MORSE CODE INTERFACE

Gary Woodall has announced a new concept in amateur radio and computer interfacing. Comp-Code 1.0 is a software-only Morse code interface for the Radio Shack Models I, III, and IV microcomputers.

This program uses the standard TRS-80 cassette I/O ports for input and output connections to a communications receiver and transmitter or transceiver. The results obtained from this software-only interface have been found to equal those of other hardware and software interface packages.

This 12K + machine-language program has special routines that check the incoming signal to make sure it is valid code and not noise. Bursts of noise are disregarded and only code is processed and displayed on the video screen. There also is a routine that allows you to view the incoming signal and fine-tune your receiver. The program then samples the received code and automatically adjusts to the proper speed.

The transmitter mode features five programmable buffers for a 200-character total, a type-ahead buffer, and user-selectable sending speeds up to 70 wpm.

For more information, contact *Gary Woodall Software, Box 284, Plainfield IN 46168; (317)-271-2565.* Reader Service *number 482.*

NEW DAIWA/MCM MANUAL ANTENNA TUNER

Daiwa has announced its new CNW419 manual antenna tuner featuring continuous coverage from 1.8 to 30 MHz. It is rated at 200 Watts CW, 500 Watts PEP SSB. Input impedance is 50 Ohms, with the output impedance variable from 10 to 250 Ohms.

The CNW419 also features dual antenna outputs and a switchable tuner bypass option. The tuner comes equipped with Daiwa's cross-needle meter that simultaneously shows forward power, reflected power, and swr without the sensitivity adjustments commonly found in other meters.

For more information, contact *MCM Communications, 858 E. Congress Park Dr., Centerville OH 45459; (513)-434-0031.* Reader Service number 476.

ELECTRA'S FIRST SHORTWAVE RADIO

Electra Company, marketer of Bearcat® scanner radios, has announced that it is entering the shortwave-radio market with the Bearcat DX-1000, a radio that makes dialing in the BBC comparable to dialing a push-button telephone.

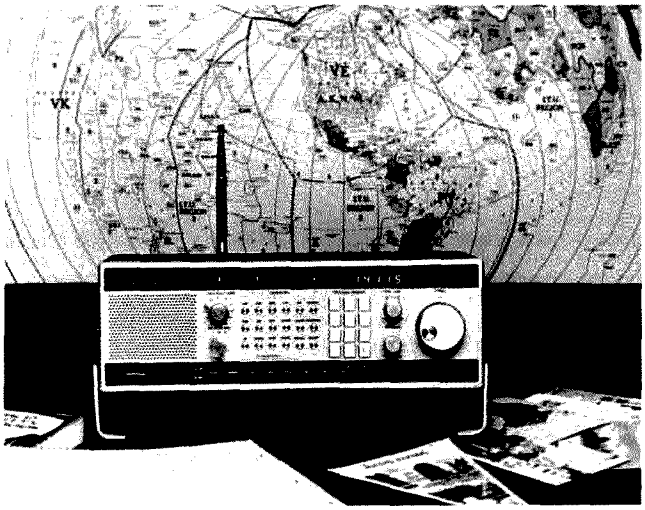
Utilizing the same microprocessor digital technology found in Bearcat scanner radios, the DX-1000 features direct-access keyboard tuning. This makes it simple to tune from the BBC (for example) to Radio Ghana without bandswitching. Covering 10 kHz to 30 MHz continuously, with PLL-synthesized accuracy, the Bearcat DX-1000 will monitor all shortwave bands, longwave, standard broadcast-band AM, amateur-radio broadcasts, and the marine band.

The DX-1000 has 10 memory channels, a digital display measuring frequencies to 1 kHz which, at the touch of a button, doubles as a two-time-zone, 24-hour digital quartz clock, and a built-in timer which can be programmed to activate peripheral equipment like a tape recorder to record up to ten broadcasts, in any frequency or mode, while the user is asleep or at work.

Other features include independent selectivity selection, with 12-, 6-, and 2.7-kHz i-f filters to help separate high-powered stations on adjacent frequencies, a two-position noise-blanking system that stops Russian pulse-radar interference, a two-position rf attenuator, FM squelch control, tone control, battery back-up system to hold memorized frequencies and time if power fails, LED indicators for modes and functions, a front-mounted speaker, fast/slow automatic gain control, and separate push-buttons for selecting AM, LSB, USB, CW, or FM modes. The unit comes with a built-in telescoping antenna for portable use and includes an SO-239 antenna connector for 50-Ohm leads and a screw-connector for "High Z."

The Bearcat DX-1000 can be operated with batteries (12 V dc) or from an electrical outlet (120/240 V ac). The unit measures 14-1/2" W × 5" H × 9-3/8" D and weighs 17 lbs. Each radio comes with a free shortwave information guide that includes listings of stations from all corners of the world.

Further details are available by contacting Electra Company, 300 East County Line Road, Cumberland IN 46229. Reader Service number 477.



Electra's new Bearcat DX-1000 shortwave radio.

WARC BANDS KIT FOR YAESU FT-101 SERIES

Fox Tango Corporation has announced a new kit which provides receive/transmit capability on all three WARC bands for all models of the FT-101 except the ZD. While only the 10-MHz band has been authorized for use to date, not much additional effort or expense is required to add all the bands while the circuit changes for 10 MHz are being made. In addition to making the old 101 ready when the new bands become available, the added capability increases the trade-in value of the set.

Based on a tried and tested design by G3LLL, the WARC bands kit is complete with all needed crystals, relay switch, and detailed instructions for moderately easy installation. For more information, contact *Fox Tango Corporation, Box 15944S, West Palm Beach FL 33416.* Reader Service number 480.

QUARTZ CRYSTAL GUIDE AND DIRECTORY

GSM, Inc., publisher of the *Quartz Crystal Industry Guide and Directory*, has announced availability of its 1983-84 edition. Companies engaged in the production of quartz-crystal products and frequency-control devices, as well as suppliers of goods and services to the industry, are listed. The directory describes the products, capabilities, and specialized services of hundreds of companies located in the United States, Canada, Europe, and Asia. Each company's key personnel, address, telephone number, TWX, and other pertinent information are detailed.

Features of this issue include expanded worldwide listings, used equipment for sale or trade, and technical publications pertinent to the industry that can be ordered from GSM.

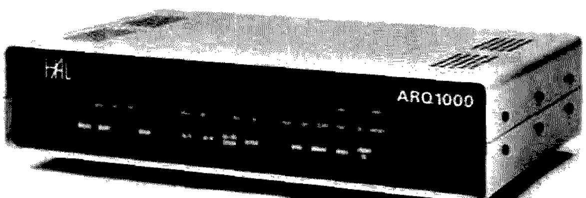
Lucille A. Hope, editor-in-chief, is now planning the *Mid-Year Update* scheduled for December. For information regarding advertising in the update or listing your company, contact the editor at *GSM, Inc., PO Box 10277, Fort Lauderdale FL 33334.* Reader Service number 481.

THE HAL ARQ1000 AMTOR TERMINAL

The ARQ1000 is a full send-receive terminal for the AMTOR ARQ code. All features of the CCIR 476-2 Recommendation are supported. Modes include: ARQ, FEC, SEL-FEC, and MONITOR. The ARQ1000 may be used with the Hal DS3100 and ST-6000, CT2200, CT2100, or CWR6850 terminals or any ASCII or Baudot terminal at baud rates from 45 to 300 baud. Non-volatile keyboard-programmable ARQ access code, selcal code, and WRU answer-back codes are included. The ARQ1000 is housed in a cabinet that matches the CT-2200 and CT2100. Available options include the DM170 internal demodulator and ARQX10 encryption module.

For further information, write *Hal Com-*

The Daiwa/MCM manual antenna tuner.



The ARQ1000 send-receive terminal from Hal Communications Corp.

munications Corp., Box 365, Urbana IL 61801. Reader Service number 479.

PHOTOVOLTAIC PANELS FROM ENCON

Encon Corporation has announced to the amateur-radio community two new photovoltaic panels, the SX-10 and the SX-20. The SX-10 is rated at 10 Watts and has different current/voltage selections, 8 V dc at 1.05 Amps and 17.3 V dc at .52 Amps, that the ham can wire himself. The SX-20 is 20 Watts, 8.6 V dc at 2.09 Amps and 17.3 V dc at 1.05 Amps.

According to Paul DeNapoli WD8AHO, Communications Director for Encon, these two new panels can be used for mobile QRP operations or mounted permanently to the roof for charging batteries.

The panels have a 30+-year life expectancy, an environmental survivability of wind loads over 160 mph and golf-ball-size hail stones, and are waterproof.

For more information, contact *Encon Corp., 27584 Schoolcraft Rd., Livonia MI 48150; (313)-261-4130.* Reader Service number 483.

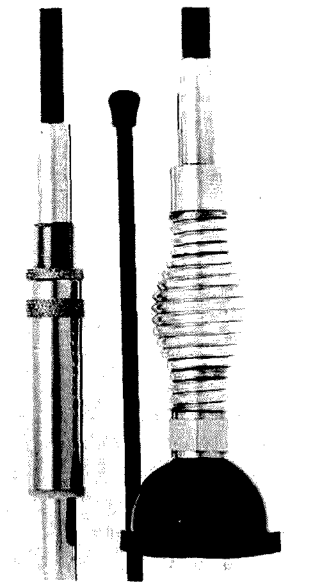
LAND MOBILE TUNABLE ANTENNAS

A land mobile antenna, available in either UHF or VHF, that's tunable over varied ranges was introduced by U. S. Fiberglass at the recent Land Mobile Expo in Denver.

The patented Stage 2 antennas utilize a voltage-fed system, differing from conventional current-fed antennas. The result is an efficient utilization of rf energy and a low angle of radiation that provides increased transmission and reception range.

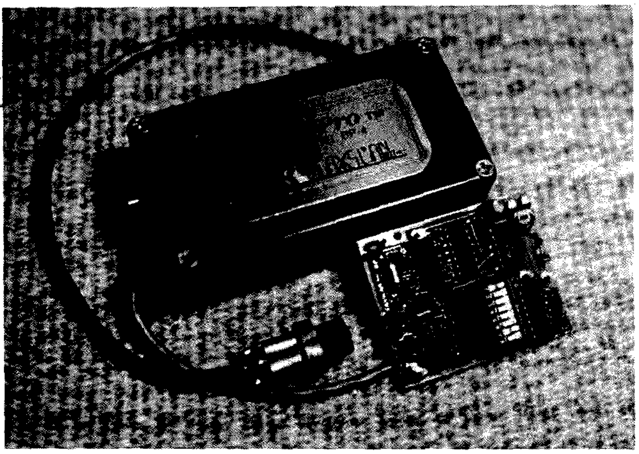
A patented reactance-canceling tuning sleeve allows the antenna to be tuned for optimum performance and then locked into position. The tuning section also allows the antenna to be tuned for a lower swr than conventional antennas.

The new antennas are suited to today's synthesized radio technology since they perform over a wide band range. They are available in eight different models, including mobile applications and base antennas.



Land mobile antennas from U. S. Fiberglass.

For further information, contact *U. S. Fiberglass, 5010 N.W. 36th Ave., Miami FL 33142; (305)-634-1115. Toll-free, nationally: 1-(800)-327-6790; Florida: 1-(800)-432-7142.* Reader Service number 478.



The Pro model BP-4 beeper from Faxscan, Inc.

THE PRO—FAXSCAN'S BP-4 BEEPER

Faxscan, Inc., has announced the introduction of their model BP-4 beeper, The Pro™. The Pro continues the concept of a "courtesy beep" to signal the beginning and end of each transmission by automatically injecting a gentle high-frequency beep into the mike line at the start of the transmission and a low one at the end. This basic idea has been used for years in commercial and military applications and NASA has used it for ground-to-space voice communications. The Pro is an upgraded version of Faxscan's model BP-3 which has been marketed to the amateur-radio community worldwide for the past three years.

The Pro adds several features not found in the BP-3. Most notable is the inclusion of a sophisticated digitally-programmable timer. The user may select timing periods from approximately 43 seconds to 10.5 minutes. Programming is accomplished by setting tiny DIP switches on the circuit board. The timer may be used as an ID timer or to warn you of impending time-out on a repeater. Time-out is noted by a unique double 4-beep sequence via a piezoelectric transducer; there is no speaker. Volume of this warning is also programmable and the warning is not transmitted.

Unlike the earlier BP-3, the beginning beep can be deleted by the setting of a switch. In this mode, a beep is added only to the end of your transmission.

Finally, The Pro incorporates a "slumber mode" to extend battery life. There is no on/off switch. Instead, the unit senses the lack of activity and shuts itself down. A single 9-V battery (not supplied) powers the unit continuously for up to a full year.

Faxscan includes a 5-page manual with The Pro, detailing theory of operation, instructions for programming the various functions, and a full-page schematic/layout along with interfacing tips. In general, The Pro will work with virtually all modern gear. Specifically, this beeper will interface directly to any rig employing a positive potential on the PTT line of less than +24 V dc and which transmits when the PTT line is pulled down to +0.7 V dc at less than 100 mA current.

The beeper comes in three versions. The A version includes a cast-aluminum enclosure, cable, and standard 4-pin mike connectors, installed. The B version is the same but without connectors. You simply add those of your choice. The C version is a circuit-board model for custom installation. For instance, the C version can be tucked inside your rig or is a perfect repeater accessory. The Pro is easily modified for most any application and the manual contains full details.

All units are fully assembled, tested, and carry a 90-day limited warranty. Faxscan ships all units postage-paid in the US.

For more information, contact *Faxscan, Inc., 3148 Dorf Drive, Dayton OH 45418; (513)-263-8475.* Reader Service number 484.

THE NEW HUSTLER TRIBAND VERTICAL

Hustler, Incorporated, has announced the addition of a new three-band vertical antenna for 10-, 15-, and 20-meter operation. A two-in-one trap design allows for excellent bandwidth while maintaining an overall height of only 12 feet.

Designated 3-BTV, the antenna is designed for permanent ground mounting with radials or for portable use on travel trailers, condo balcony railings, or wherever there is a sufficient groundplane. Construction is of high-quality aluminum with stainless-steel hardware; supplied is a heavy-duty bracket for pipe or bulkhead mounting.

For additional information on the 3-BTV or other Hustler amateur products, contact your dealer or write *Hustler, Inc., 3275 North B Avenue, Kissimmee FL 32741.*

KREEPIE-PEEPIE FOR AMATEUR TV

You may want to call it a handie-lookie rather than a kreepie-peepie, which was what the first cordless TV cameras were called. P. C. Electronics has come out with the KPA5, a 1-Watt UHF ATV-transmitter module board which will allow you to use any portable consumer color-TV camera.

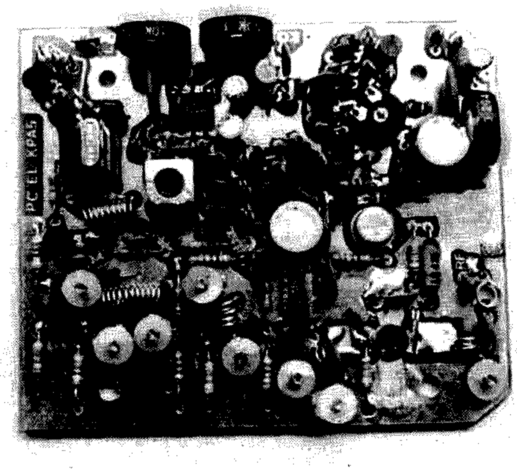
When mounted in an aluminum box above a portable color camera, the KPA5 allows freedom to move around to catch all the action at parades, races, and other such events. If you are into videotaping you won't have to lug around a portable VCR. In fact, a standard ac-powered home VCR can be used with just an ATV downconverter ahead of the tuner set to channel 3.

DX depends a lot on antennas, terrain, etc., but up to a mile is typical under most conditions and 50 miles has been done from an airplane. For base-station use or higher-power mobile, it can be matched to the Mirage D24N amplifier for 40 Watts output. Other applications include video from R/C model airplanes, robots, computer video, weather-radar video, or practically any case where cables become too long for composite video from any source.

The KPA5 is a wired and tested board capable of full color and sound. Output is a nominal 1-Watt PEP of amplitude-modulated rf with standard 4.5-MHz sound subcarrier into 50 Ohms. It comes standard with one crystal on either 439.25 (east), 434.0 (west), or 426.25 MHz. Two channels are available with the addition of a second crystal and an external SPST switch. Inputs are: composite video from a camera, VCR, or computer, low-Z microphone, and line audio from a VCR, camera mike, or computer. Power requirement is 13.8 V dc at 280 mA. Board size is 4 × 3.25 inches.

Buyers must hold Technician-class or higher amateur licenses to operate or purchase from the manufacturer.

For more information or a complete catalog of ATV products, call or write *P. C. Electronics, 2522 Paxson Lane, Arcadia CA 91006; (213)-447-4565.*



The P. C. Electronics portable ATV transmitter.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

WORKED ALL LA AWARD

The WALA Award is available to any amateur who can provide evidence of having the following requirements of the award:

Applicants in Denmark, Finland, Sweden, and Norway must have two contacts on separate bands with a total of 20 counties of Norway.

Applicants outside Scandinavia must work 20 different LA/LB stations on any amateur band. At least 6 of these stations must be located north of the Arctic Circle. Contacts with stations from JW (Svalbard), JW (Bear Island), and JX (Jan Mayen) count for this award.

All contacts must be made after January 1, 1950. Usual logbook information is required for claiming your contacts, along with the exact QTH of the station worked. Award fee is Nkr. 10, or 10 IRCs mailed to: NRRL Award Manager, Alf Almedal LA5QK, N-4052 Roeyneberg, Norway.

WORKED NORWEGIAN CITIES AWARD

This award requires applicants to work a minimum of Norwegian cities with no limit to date, band, or mode. It should be noted that this award will not recognize contacts with LJ, LF, or LH stations. The three classes are: Class 3—DX station work 5 cities, Europeans must work 10 cities; Class 2—DX station work 10 cities, Europeans must work 20 cities; Class 1—DX station work 15 cities, Europeans work 30 cities.

GCR apply. Send your completed list of contacts and application along with the award fee of 10 IRCs to: Larvik Society of NRRL, PO Box 59, N-3251 Larvik, Norway.

Valid Norwegian cities are: Alesund, Arendal, Bergen, Bodo, Drammen, Egersund, Fredrikstad, Gjovik, Halden, Hamar, Hammerfest, Harstad, Haugesund, Horten, Kongsberg, Kragero, Kristiansand S., Kristiansund N., Larvik, Lillehammer, Mandal, Mo i Rana, Molde, Mosjoen, Moss, Namsos, Narvik, Notodden, Oslo, Porsgrunn, Sandefjord, Sandnes, Sarpsborg, Skien, Stavanger, Steinkjer, Tonsberg, Tromso, Trondheim, Vardo.

From the Vadso Society of the Norwegian Radio Relay League come details about the worked all "communes" award for this Scandinavian country.

WORKED ALL NORWEGIAN COMMUNES AWARD

Licensed amateurs and SWLs worldwide are encouraged to pursue the requirements of this very challenging awards program. This award is issued for contact with 25 different Norwegian communes; an endorsement sticker recognizes each additional group of 25 communes. At present there are over 454 communes and 5 Norwegian arctic/antarctic areas which qualify for contacts. A special award will be issued to those who can work all communes and all arctic/antarctic areas. Only contacts on or after January 1, 1975, will count for WANCA.

All bands or modes may be used; no crossmode contacts or contacts via repeater will be allowed for credit. QSOs via OSCAR satellites do count. Minimum reports in all cases must be RST 338 or RS 33. Mobile or portable contacts count, but QTH must be stated on the QSL card.

QSL cards are not required. GCR apply. Award fee is Nkr. 30 for the basic award (10 IRCs) and Nkr. 10 (3 IRCs) for endorsement stickers. No fee for handicapped amateurs/SWL stations.

A record book listing all Norwegian communes and areas is available from the Award Manager for 15 Nkr. (3 IRCs).

Certificates are issued for mixed mode, CW only, SSB only, all RTTY, all SSTV, Novice, mobility (only contacts with mobile or portables), and All WANCA.

All fees are contributed to the LA5LG Fund for Norwegian Blind-Handicapped Amateurs. All inquiries should be accompanied with at least 2 IRCs for an expected reply.

All applications should be forwarded with the appropriate fee to: WANCA Award Manager, Sverre J. Schmidt LA1QK, PO Box 3, N-9801 Vadso, Norway.

DX AWARDS FROM NEW ZEALAND

I just received a very informative packet of information from NZART, the national amateur society of New Zealand. Jock White ZL2GX, as awards manager, indicates that all NZART awards are available for a nominal fee and QSL cards are not required where verified lists can be provided as an alternative. To qualify, all contacts claimed for NZART awards must be made on or after November 1, 1945. Special endorsements are given for single-band or -mode accomplishments. Send all applications to ZL2GX, 152 Lytton Rd., Gisborne, New Zealand.

Worked All Pacific Award

To qualify for the WAP Award, an applicant must confirm two-way contacts with 30 different Oceanic countries from the WAP list below. The cost of this award is 2 IRCs or US $.60.

Eligible Oceanic contacts: Port Timor, Philippines, Adelie Land, New Caledonia, French Oceania, Wallis Island, New Hebrides Baker/Howland/American Phoenix Islands, East Carolines, West Carolines, Mariana Islands, Marcus Island (Minami Torishima), Guam, Hawaiian Islands, Johnston Island, Midway Island, Palmyra, American Samoa, Wake Island, Marshall Island, Java, Sumatra, Borneo, Celebes, West Irian, Australia, Lord Howe Island, Willis Island, Macquarie Island, New Guinea, Norfolk Island, Papua, Nauru, Christmas, Cocos, Gilbert, Ellice, British Phoenix Islands, Fiji, Fanning and Washington Islands, Solomon Island, Tonga, Pitcairn, Sarawak, Brunei, North Borneo, North Cook Islands, South Cook Islands, Samoa, Tokelau Islands, Kermadec Islands, Niue Island, New Zealand, Chatham Island, Auckland and Campbell Island, Antarctica (ZL5 only).

New Zealand Award

The NZA is available to all radio amateurs other than ZL. A total of 101 contacts is required to qualify for this award. All contacts must be made after December 8, 1945.

Applicants must make the following contacts: 35 ZL1 contacts, 35 ZL2 contacts, 20 ZL3 contacts, and 10 ZL4 contacts, plus 1 contact with a ZL "territory" (either New Zealand, Antarctica, Chatham Island, or Campbell Island). This one contact may be substituted by 20 additional ZL contacts not already claimed.

Worked All New Zealand Award

The WAZL Award requires that contact be made with 45 different branches of NZART—except for overseas applicants, for whom only 35 contacts are required.

A special endorsement is given if the WAZL Award is accomplished within a 12-month period. Mobiles operating outside their regular branch area must sign the branch from which they are mobile while operating. Endorsements are also given for single-band or -mode operations. All contacts must be made after November 1, 1945, to qualify.

NZART branches are as follows: 01 Ashburton, 02 Auckland, 03 Western Suburbs, 04 Cambridge, 05 Christchurch, 06 Dannevirke, 07 Blank, 08 East Southland, 09 Egmont, 10 Franklin, 11 Gisborne, 12 Hamilton, 13 Hastings, 14 Hawera, 15 Hawke's Bay Central, 16 Horowhenua, 17 Huntly, 18 Hutt Valley, 19 Inglewood, 20 Manawatu, 21 Manukau, 22 Marlborough, 23 Marton, 24 Motueka, 25 Napier, 26 Nelson, 27 New Plymouth, 28 Northland, 29 North Shore, 30 Otago, 31 Pahiatua, 32 Rahotu Coastal, 33 Rotorua, 34 South Canterbury, 35 South Otago, 36 South Westland, 37 Southland, 38 Taumarunui, 39 Tauranga, 40 Te Awamutu, 41 Thames Valley, 42 Tita-hi Bay, 43 Waihi, 44 Matamata Radio Club, 45 Waimarino, 46 Wairarapa, 47 Waitara, 48 Wanganui, 49 Westland, 50 Wellington, 51 Eastern Bay of Plenty, 52 Wairoa, 53 Te Puke, 54 Patea, 55 Waitomo, 56 Hornby, 57 Tokoroa, 58 Helenville, 59 Mangakino, 60 Taupo, 61 Central Otago, 62 Reefton Buller, 63 Upper Hutt, 64 North Otago, 65 Papakura, 66 Auckland VHF, 67 Kawerau, 68 North Canterbury, 69 Kapiti, 70 Fielding, 71 Rodney, 72 Opotiki, 73 Hobson, 74 Western VHF.

New Zealand Counties Award

The Basic NZC Award requires contacts with 20 different New Zealand counties. Endorsements are made for 40, 60, 80, and 100 contacts, with a special certificate for 112. A map showing the counties is available by writing NZART (ZL2GX) directly. Enclose 10 cents or 1 IRC to cover handling.

The initial award with any or all endorsements costs 45 cents or 3 IRCs. Separate endorsements thereafter cost 10 cents or 1 IRC. The special NZC 112 Award costs 45 cents.

Contacts may be made single band or any mode to qualify. GCR apply. Applicants must provide a list of contacts detailing the usual logbook data.

5 × 5 Award

This premier award has been instituted to recognize the increasing interest in 5-band DX operation. The initial award requires that the same station be contacted on 5 bands repeated with 5 different countries.

A certified list with full QSO data and fee of $1.00 is required. The certificate is outstanding and is overprinted in embossed gold. Contacts must date from 1945.

ZLA Award

To qualify for this award, applicants must contact Auckland City ZL1, Wellington City ZL2, Christchurch City ZL3, Dunedin City ZL4, Antarctica ZL5, Campbell Island, Chatham Island, and Kermadec Island. There are endorsements given for single band or mode.

Award fee is 45 cents or 3 IRCs. GCR apply.

Individual ZL District Awards

All ZL district awards are 35 cents each or 3 IRCs. Later endorsements are accessed at 10 cents or 1 IRC apiece. All contacts must be dated post war.

ZL1 Award—Contact 125 different ZL1 stations. Endorsements are recognized for 175 and 250 contacts.

ZL2 Award—Basic award requires contact with 100 different ZL2 stations, with endorsements given for 150 and 200.

ZL3 Award—Basic award requires 50 ZL3 contacts, and endorsements are given applicants claiming 75 and 100.

ZL4 Award—This award requires only 25 ZL4s be worked, with endorsements given for 35 and 50.

Captain James Cook Award

The CJC award, as it is called, perpetuates the memory of this world famous navigator and seaman—in three classes. 1. The basic "Sailor" class requires contacts with G in Yorkshire, FO8, ZL2, VK2, and KH6. 2. For "Officer" class, applicant must first possess all the Sailor-class contacts plus ZL1, ZL3, ZL4, VK3, VK4, VK9 New Guinea, and any Antarctica station. 3. For "Command" class, both the previous classes must be earned plus five of the following: VE2, VO, A35, YJ8, FK8, CE0, and KL7.

Cost of this award is 45 cents in stamps or IRCs. GCR apply.

YL ZL Award

The Women Amateur Radio Operator Award (WARO) requires VK and ZL stations to work at least 12 members of the WARO. DX stations must work at least 5 members. All contacts must be made after June 1, 1969, and must include one each from ZL1, 2, 3, and ZL4.

Net contacts do not qualify. There are no band or mode limitations; however, all contacts must be made from the same QTH for all.

Unlike all the previous awards shown so far, send your list of contacts along with your QSL cards to the Award Custodian, Thelma Souper ZL2LO, 62 Kirk Street, Otaki, New Zealand.

There was no mention of an award fee, but to be safe and courteous, it is advisable to enclose at least an amount for sufficient postage to return your cards.

In the event you missed the address for all applicants for NZART awards, please forward your requests to Mr. Jock White ZL2GX, 152 Lytton Road, Gisborne, New Zealand. Be sure to tell Jock you heard about the NZART awards from *73* magazine.

CANADIAN AWARDS FROM CARF

The Canadian Amateur Radio Federation (CARF), Inc., is pleased to announce the following radio-amateur awards available to operators worldwide.

Canadaward

A colorful certificate will be issued to any amateur who confirms two-way contact with all Canadian provinces and territories. Awards will be issued for any band, six to 160 meters, and any mode via OSCAR satellite. Modes may be mixed, CW, SSB, RTTY, SSTV, or any other authorized emission.

All contacts must be made after July 1, 1977. To qualify, applicants must forward QSL cards with $2.00 or 10 IRCs plus sufficient funds for the safe return of your

cards. CARF members need only submit sufficient funds for returning QSLs. Mail your fee, application, and QSLs to: Canadawards, PO Box 78752, Vancouver BC, Canada V5R 5S7.

List of Canadian provinces and territories which qualify for this award: VO1/VO2 Newfoundland and Labrador, VE1 Prince Edward Island, VE1 Nova Scotia, VE1 New Brunswick, VE2 Quebec, VE3 Ontario, VE4 Manitoba, VE5 Saskatchewan, VE6 Alberta, VE7 British Columbia, VE8 Yukon Territory, VE8 Northwest Territories. Note: VO1 or VO2 count as one required contact.

5-Band Canadaward

A special plaque will be issued to any amateur who confirms two-way contact with all Canadian provinces and territories on each of five separate bands (12 cards per band for a total of 60 cards). All contacts must be made after July 1, 1977. Submit the 60 cards with $10.00 or 70 IRCs plus sufficient postage for the safe return of your QSLs. Should you work 6 or 7 bands using the same Canadaward criteria, special endorsements will be provided upon proof of your claim. As with the basic Canadaward, forward your applications to PO Box 76752, Vancouver BC, Canada V5R 5S7.

NIAGARA FALLS

The Niagara Falls Radio Club, Inc., will operate a special-event station during the Festival of Lights, from Niagara Falls, New York, seventh wonder of the world. The Festival of Lights is one of New York's top ten winter attractions. The callsign will be W2QYV. Dates are November 26th through January 8th; time will be from 1500 UTC to 0300 UTC. All contacts will be in the General portion of 20, 40, and 80. To apply for this award, send QSL card and $2.00 donation, along with an SASE (8½ by 11) with $.55 postage for the color photograph award, to: Awards Manager, Angelo Zino WA2UJR, 16 Council St., Niagara Falls NY 14304.

CW GROUP OF RIO DE JANEIRO CWRJ AWARDS PROGRAM

Important Notes: LOG-GCR apply. 1. All awards CW only, 2-way, or SWL. All bands mixed unless otherwise noted. 2. A single CWRJ Operator Team Member may be used for more than one CWRJ award, but only if worked on other bands, or on a different date. 3. CWRJ Associate Membership is available to foreign amateurs, see: WAMAW Award, below. 4. Endorsement seal fee: none, send an SAE and 1 IRC for surface mail.

CWRJ Operator Team Members (Oct. 82): PY1s: AFA, AFG, AJK, ASI, BFZ, BGI, BMF, BOA, BQQ, BUG, BUL, BVY, CBW, CC, CCX, CCY, DCG, DEA, DFF, DGB, DIN, DJY, DN, DPG, DUB, DUH, DWM, EBK, EWN, FB, HQ, LG, MHQ, MKA, RJ, TCJ, UET, URQ, VB, VEC, VKA, VLR, VMV, VOY, WDS, WO.

CWRJ Award: CWRJ

CW only. Work 20 different PY1 stations including 5 members of the CWRJ Operator Team. Endorsements: 6, total. Each 5 new PY1 stations, including 1 new Operator Team Member.

Log: complete. Fee: 6 IRCs. Valid: after Dec. 16, 1980. Manager: PY1EWN, PO Box 621, 24000 Niteroi, RJ, Brazil.

Brazilian Stations Award: BSAW

Work 75 Brazilian stations including 10 Federation Units (states/territories) and 2 CWRJ Operator Team Members. CW only. Each state/terr. has different prefix: PY1, PT2. Endorsements: 2. First: 50 additional Brazilian stations. Second: 25 additional Brazilian stations.

Log: call/date. Fee: 6 IRCs. Valid: after Jan. 1, 1982. Manager: PY1EWN, PO Box 621, 24000 Niteroi, RJ, Brazil.

Rio De Janeiro State Cities Award: RJCAW

Work 10 cities of Rio de Janeiro State (RJ)—PY1—including 2 CWRJ Operator Team Members. CW only. Endorsements: none (on initial application, any award will be endorsed QRP upon request and proof).

Log: call/date/cities. Fee: 6 IRCs. Valid: after Jan. 1, 1982. Manager: PY1DWM, PO Box 24039, 20522 Rio de Janeiro, RJ, Brazil.

Diploma Brasil Geografico: BGAW

Work 3 stations of each geographical region of Brazil, 15 total contacts, including 1 S.E. region CWRJ Operator Team Member. Endorsements: none (on initial application, any award will be endorsed QRP upon request and proof). CW only.

Geographic regions: Norte (NO-North): PP8, PT8, PU8, PV8, PW8, PY8. Nordeste (NE-Northeast): PP6, PP7, PR7, PR8, PS7, PS8, PT7, PY6, PY7. Sudeste (SE-Southeast): PP1, PY1, PY2, PY4. Sul (SU-South): PY3, PP5, PY5. Centro Oeste (CO-Midwest): PP2, PT2, PT9, PY9.

Log: call/date. Fee: 6 IRCs. Valid: after Jan. 1, 1982. Manager: PY1DFF, PO Box 1045, 24000 Niteroi, RJ, Brazil.

Worked CWRJ Associate Members Award: WAMAW

CW only. Work 10 CWRJ Associate Members and/or CWRJ Operator Team Members. Endorsements: 2. First: 5 additional CWRJ Associate Members. Second: same.

Log: call/date. Fee: 6 IRCs. Valid: after Jan. 1, 1982. Manager: PY1EWN, PO Box 621, 24000 Niteroi, RJ, Brazil. Note: CWRJ Associate Membership is available to foreign amateurs with a profound interest in Brazilian CW Groups' activities, awards, etc. SASE to W5XW for details in English; PY1EWN in Portuguese; DJ3WM in German.

Brazil's Frontiers Award: BFAW

CW only. Work 5 countries which have frontiers (borders) with Brazil: (FY, PZ, 8R, YV, HK, OA, CP, ZP, LU, CX).

Log: call/date. Fee: 6 IRCs. Valid: after Jan. 1, 1982. Endorsements: none (on initial application, any award will be endorsed QRP upon request and proof). Manager: PY1DFF, PO Box 1045, 24000 Niteroi, RJ, Brazil.

CWRJ "YL" Flowers Award: YLAW

CW only. With the first letter of the suffix of the callsigns of stations worked in the 10-meter (28-MHz) band, spell the names of 5 (five) flowers (English or Portuguese names); stations worked must include 5 (five) YL operators. YL stations may be used to substitute letters in the names of flowers (as in poker: wild cards); YL contacts may be on any band. Contacts may be any country. Endorsements: none (on initial application, any award will be endorsed QRP upon request and proof).

Log: call (listed in order to form names of flowers)/YL info/date. Fee: 6 IRCs. Valid: after Jan. 1, 1982. Manager: PY1DWM, PO Box 24039, 20522 Rio de Janeiro, RJ, Brazil.

Worked CWRJ Awards: WRJA

CW only. Applicants must have the basic CWRJ Award plus 5 others from the CWRJ Award Program. Endorsements: none (on initial application, any award will be endorsed QRP upon request and proof).

Log: numbers/names of awards. Fee: 6 IRCs. Manager: PY1DFF, PO Box 1045, Niteroi, RJ, Brazil.

GAITHERSBURG MD

The NBS-BRASS will operate K3AA November 3 through November 6, 1983, in observance of the dedication of the first active amateur-radio club station at the National Bureau of Standards. Multi-op activities on CW, phone, and RTTY will be near the low end of the 80- to 10-meter Novice- and General-class bands. Certificates can be obtained by sending an SASE to BRASS, c/o National Bureau of Standards, Mailroom, Washington DC 20234.

CHESAPEAKE APPRECIATION DAYS

The Anne Arundel Radio Club will operate W3VPR from Sandy Point State Park, near Annapolis, Maryland, as part of the annual Chesapeake Appreciation Days celebration, October 29 and 30, 1983. Operation will be from 1000 until 1600 EDT in the lower part of the General-class CW and phone bands, 40 and 20 meters, and CW in the 15-meter Novice band. Certificate via PO Box 604, Glen Burnie MD 21061.

SPECIAL-EVENT STATION WA2UEC

Rocky Point, New York: The Radio Central Amateur Radio Club will operate WA2UEC from the former RCA High-Frequency Radio Station, called "Radio Central," on Saturday, November 5, and Sunday, November 6, to commemorate the 62nd year of the station (now silent), part of the New York State Park. Operations for the 24-hour period will be on 2-160 meters, up 10 kHz from the edge of the General band, and on two meters on these frequencies: 146.52, and 144.550/145.150 repeat. Novice-band operation will be on 7.110 kHz.

A special QSL card showing a photo of the former station will be available. Send your QSL with a large SASE to Radio Central Amateur Radio Club, PO Box 680, Miller Place NY 11764, or QSL to the *Callbook* address.

MICHIGAN AMATEUR RADIO LADY OF THE YEAR

The recipient of the 1982 Michigan Amateur Radio Lady of the Year Award was Aileen Gagnon WA8DHB of Gladstone, Michigan.

Aileen has been a very active member of the amateur-radio community since she was first licensed in April of 1962. Her particular area of interest is public-service communications and she is highly involved in various aspects of the national traffic system. Aileen is an assistant section manager (for Michigan's upper peninsula), official relay station, net manager of the upper peninsula net, member of the TASYL, UPYL, MACS and MITN Michigan Nets, a net control for the MITN, and is active on the MATW (Michigan amateur traffic workshop). She also is very active in emergency communications and is net control for the upper peninsula ARES net as well as prime organizer for net activities during the SET.

Aileen has received two certificates of

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merit from the ARRL and is a past president of her local radio club, the Delta County Amateur Radio Society, and a member of the local repeater association.

During her very rare spare moments, Aileen keeps a constantly updated card file of all the upper peninsula hams. This is used to print an annual UP ham directory.

Aileen is a busy housewife (hubby is Melvin), and she has a son, a daughter, two stepdaughters, a stepson, and six grandchildren. Also, Aileen and Mel have one of the truly outstanding vegetable gardens in Delta County.

The Michigan Amateur Radio Lady of the Year Award is presented each year at the ARRL state convention in Muskegon, Michigan, by the section manager.

WORKED ALL "QST" AWARD

If you like to collect awards, here is a new one for you. The Worked ALL "QST" Award, sponsored by the CRRL.

As most of you might already know, the "QST" suffix has been assigned to the CRRL in all Canadian call areas. VE_QST calls are used by official bulletin stations across the country. These stations are active during League contests and public-service events. They also provide regular bulletin services to local nets and on a nationwide basis to Canadian hams.

This Worked ALL "QST" Award is available in five categories: CW, phone, RTTY, mixed, and QRP, with four endorsements: VE0, VO2, VE8, and VY1.

To qualify, one must work all eight stations from VO1, VE1 through VE7. Once you have all eight "QST" QSL cards, you can send them to CRRL, Box 7009, Station E, London, Ontario, Canada N5Y 4J9, or directly to the award manager, John Gowron VE4ADS.

The licensees who control the use of "QST" calls and maintain logbooks for QSL purposes are: William Kremer VE7CSD (VE7QST), Bill Gillespie VE6ABC (VE6QST), William Munday VE5WM (VE5QST), Peter Guenther VE4PG (VE4QST), Dick Reiber VE3IBV (VE3QST), Don Welling VE1WF (VE1QST), and Clarence Mitchell VO1AW (VO1QST).

The four endorsement calls will be active from time to time. Watch these pages for announcements.

LETTERS

COMPU-KIDS

Just a note of appreciation regarding *73*. I find it informative, timely, accurate, and comprehensive. I read your editorials with an open mind and feel you do have a progressive attitude. I don't always agree, however. For example: The young fellows I have Elmered had no difficulty with the code but really can't cope with the written. Part of the problem, of course, is the lack of study-habit training in our school systems. However, I agree that amateur growth is the primary necessity.

The VIC-20 code program in the August, 1983, issue is what prompted me to write. This is an excellent little program and it works. This approach should help lots of computer kids get started. I had my nephew type it in and after a few corrections (his mistakes) it ran nicely. I am going to rework it to run on my TI99/4A and will send it in if somebody doesn't beat me.

I, too, am an ex-submariner, Wayne. I served as a Torpedoman on the *Puffer*, *Moray*, *Boarfish*, and *S-12* (training). A great experience!

Well, I'd better get back to learning how to use my new word-processing program so that I can retire this turkey typewriter.

J. W. Guthrie KF6FC
Cermel CA

JW, the more I get involved with my college project, the more I understand how much change is needed in our schools. We need to stop thinking of them as public baby-sitting systems and start teaching 'em things again. I can't believe how much lower grade education has changed since I went to school fifty years ago.—Wayne.

CW CLUTTER

I have been following your editorials about the elimination of code requirements for a ham license. For over 25 years, I was involved in non-communication electronics. My work involved design, prototype construction, and supervision of technicians.

For over 50 years (since I was about 15), I have wanted to become a ham, but I have refused to clutter my mind with code just to pass some test. I have never had any interest in CW communication and once the test was passed I would never use the code again. As the result of my conviction, I have never had a license.

Keep trying, but I don't think we will live long enough to see the day when "Reason rules the day."

I like *73* very much and find the construction articles very good. Keep up the good work.

James C. Anderson
Albuquerque NM

BUY AMERICAN?

It is truly amazing the powers encompassed in the printed word. Your excellent reporting of the contents of Joe Vegh's (W5VSV) letter regarding his attitude about buying American was thought-provoking and meaningful. What a powerful statement was made when he stated he would "straighten screws, glue on decals, touch up paint, and complain like hell before buying foreign products." The only thing I ever did was "complain like hell" because it did not occur to me to do the other things mentioned. The domestic products I have purchased recently seem to need more than screws straightened or decals re-glued. Hell fire, I have some items total rebuilding cannot cure. When I raise hell with the manufacturer, all I get in return are nasty letters or excuses such as: "The union members do not do their job" or "American workers cannot do a dollar's worth of work for a dollar anymore; they have to have $5.00 and two men to do one man's job." I wonder if Joe gets better results raising hell than I get.

I, too, suffered at the hands of our Nipponese friends in World War II. During their attack on Pearl Harbor, December 7, 1941, my ship (*U.S.S. Utah*) went down so fast many of my friends failed to swim to safety, so I, too, can see where Joe can conjure up ill will toward the Japanese. My father nearly had a stroke in 1974 when I drove up in a brand new Toyota. No amount of explaining could ever convince him my reasoning was sound. "But the car is built better than modern American cars," "But, Dad, my time can be better spent than straightening screws or re-gluing decals and touching up paint," "But, Dad, this car actually runs for days on end without benefit ot a push or pull from outside sources."

All of this fell on deaf ears because my father did what Joe advocates: Buy no foreign products . . . unless you need them or want them. My father did not use Joe's disclaimer, however. He did not buy foreign! Not to his knowledge, anyway. When I pointed out his clock radio was made in Taiwan, his color television was 96% Japanese made, his car radio (in his 100% American-made car) was a Japanese product, and several other items in his household were also foreign, his second near-stroke of the day was not long in coming.

After reading your editorial on the subject, my wife and I decided to re-evaluate our position and become 100% American in our daily purchases. After all, I used to give talks about "Americanism" at local high schools and service clubs. What a traitor! Talking about being loyal on one hand and then going out availing myself of foreign products. So we came up with ideas we think everyone should follow.

No more Italian sausage, French wine, German beer, Swedish meatballs, Russian vodka, caviar (unless the sturgeon checks out to be born and raised in American waters), Spanish rice, Hungarian goulash, French, Italian, and Vienna bread, Chinese noodles, borscht, Irish stew, Soul Food (didn't we import those people from Africa?), Danish rolls, Sukiyaki, Chinese egg rolls, Spanish omelets, spaghetti, Irish potatoes, and many, many other things. For a complete list, don't send me a letter. Just forget it. My wife and I are contemplating losing a lot of weight.

Then we got into wearing apparel. We came to the conclusion that naked is as naked does. There isn't much available that is not made in its entirety or assembled in foreign manufacturing plants. This is going to be tougher than we thought.

Our final conclusion was to buy clothes and food from the only true American extant, the American Indian. There is, however, a rumor that even these people sneaked into the United States via some land bridge between Russia and Alaska. Can anyone confirm or deny this? If this cannot be solved, we simply do not know what we are going to do for survival. By the way, can anyone inform me whether or not the Indians make automobiles and television sets? Radios? Lawn mowers? Computers? I know they make rugs and jewelry, but I don't think I would look good wearing a formal rug, jewelry, and nothing else.

Joe could have refrained from writing and you, Wayne, could have let well enough alone and *not* commented on it. As it now stands, we (my wife and I) can't find too much to eat, enough clothing, automobiles that don't break down the day after warranties expire, products that don't need screws straightened and decals glued back on, and worst of all—how about that ham I just heard calling CQ? He had a terrible accent and a foreign call! Do I dare invite him into our country by answering his call?

Wayne, you and Joe are troublemakers. Why didn't both of you just keep still so I could go on buying products on merit and not because it was made here or there? All this time I thought I was a discerning purchaser picking and choosing that which worked best for me, and now you two come along and shatter my whole style of living. I'm thinking of giving up on *73* as I heard a rumor your stapling process for the magazine is of dubious parentage. Shucks!

Jim Oberto WA9YYV/7
Phoenix AZ

P.S. Was the /7 needed? I am confused now.—J.O.

BOOTLEGGER!

For the past six months, we have been receiving QSL cards for contacts made with EL7M. All attempts on our part to pinpoint the location of this illegal operator have failed.

Please be advised that the callsign EL7M is not a legally issued callsign by the Ministry of Post and Telecommunications, Republic of Liberia. The user of this callsign is therefore a bootlegger.

It would be appreciated if all legally licensed ham operators would assist us in trying to identify this individual and pass the word around of this illegal operation.

Please note that all QSL cards received by the EL Bureau for contacts made with EL7M will be discarded.

H. Walcott Benjamin EL2BA, President
Liberia Radio Amateur Association
Monrovia, Liberia

Sonofagun, you mean that two-meter contact with EL2M was a pirate? Damn!—Wayne.

TO THE HILT

The first thing I read when I get my *73* is your editorial and I always enjoy it to the hilt. If I ever have the chance to meet you face to face, I would like to shake your hand—I've always been an outspoken person myself.

As a new ham—a Novice at the age of 56—I got started late and sure wished I had known about amateur radio 30 years ago. I am now working with my wife and 14-year-old grandson on code.

Keep the good work up—we need more people like you to speak out.

Gene Smith KA6ZAH
Oroville CA

A pox on the hams of Oroville for managing to keep amateur radio a secret from you all those years. I sure hope you won't carry on in the Oroville tradition. Get out to the high school and get a ham club started, using your grandson as bait.—Wayne.

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HAM HELP

I am looking for the service and instruction manuals for the COE HAM III/CD 44 rotor, manufactured by Cornell-Dubilier. I will pay copying and postage costs.

Karl Masquita Leite PS7KM
Caixa Postal 395
59000 Natal, RN
Brazil

Can anyone help me find the service manual or any other information on the Galaxy III transceiver? It was made by World Radio Labs some years back. I also need a base or mobile power supply for the Galaxy III.

James E. Crawford K05YD
PO Box 643
Lovington NM 99260

I am trying to interface my VIC-20 with my ham rig and would like any software or hardware information.

SFC Skip Barley KA4ROY/13
167 Signal Company
APO NY 09221

I have a hand-held made by Westinghouse Air Brake Co., model RPN-150. I would like service information and assistance in converting it to 2 meters.

Mike Antio KA8RIJ
9940 Hubert
Allan Park MI 46101

I need the service manual or schematics for a Sonar 40 transceiver. I will pay copying and postage costs.

Alvaro Alberto P. Miranda
R. Joaquim Borges, 706
13300 ITU-SP, Brazil

I want to convert my 9-V broadcast-band radio to receive between 5.4 and 16 MHz. Does anyone have any suggestions?

Kevin Neal
Rt. Box 221A
Flippin AR 72634

For a CB conversion project, I need the schematic for a Hy-Gain 2710X.

Kenneth Aston
650 La Sada Rd., Sp. 3-A
La Puente CA 91744

I need the service manual and schematic for the Bearcat 250 scanner. I will make a copy of the original and return.

C. Frazier K9FWF/4
PO Box 972
Windermere FL 32786

I am trying to use Motorola HT batteries for other projects, but I can only draw 20 mA before tripout. Is this proper?

G. C. La Grange W8AKG
3166 E. Circle Dr.
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73 INTERNATIONAL

from page 82

the 60-year mark this year. They are M. W. Coutts of Auckland and W. M. (Soupy) Groves W5NW, whose original US call in 1923 was U5NW, according to the OTC Directory.

Arthur (Jumbo) Godfrey ZL1HV, retiring president of NZART, was made a Life Member of the Association at the Annual Conference at Dunedin. Jumbo was also recently appointed a Director of IARU Region III Association in the place of Tom Clarkson ZL2AZ, who retired from the position.

Honors: Tom Clarkson ZL2AZ was honored by Her Majesty Queen Elizabeth in her New Zealand Birthday Honors List, being awarded the medal of Ordinary Member of the Order of the British Empire (M.B.E.) for his services to amateur radio. Tom has had a long association with ham radio since he was first licensed in 1925; he has been NZART President, an NZART Councillor, a foundation Director of IARU Region III Association, and a Life Member of NZART. The recognition by the Queen in her Birthday Honors is well deserved.

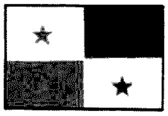
Changes to amateur-radio frequency allocations in ZL from August 1, 1983, have been issued by the regulatory body, the New Zealand Post Office. The main changes are the extension of Grade II licenses and Novice licenses and an extension of the 160-meter band.

Grade II licensees may now operate the 10-meter band between 28 MHz and 29.70 MHz, as well as the other bands previously allocated. The Novice operators have also been allocated a segment of the 10-meter band between 28.10 and 28.60 MHz. The extension of the 160-meter band, which now covers 1800 to 1959 kHz, will be of benefit to Grade I and Grade II operators.

Another change introduced by the NZ Post Office has been the deletion of the Modes of Emission from the Frequency Allocation List. They have placed the responsibility on NZART to set the band plans for each band, based on IARU recommendations, and on all of us to ensure that the mode of emission employed is compatible with other band users and that the bandwidth of the emission is not excessive and does not interfere with others. The NZART Frequency Management Working Group has produced a draft proposal for the New Zealand band plan which is in line with the modes of emission that are in use now (the time of writing this is July), and basically there are no changes, just a shift of responsibility in the allocation and implementation of the modes of emission.

The new 18-MHz and 24-MHz bands are still in the pipeline, but there has been a small change in the 10-MHz band. It is now open from 10.10 to 10.15 MHz for Grade I operators only.

There are many alterations in the VHF and UHF bands; nine new bands are being added above 47 GHz as well as many new segments for the Amateur Satellite Service, which corrects the near-tragic outcome of the 1971 WARC Space Conference when meager provision was made for the Amateur Satellite Service. Provision has also been made for the use of certain bands for international traffic at a time of natural disaster. This is a new provision for many countries as a result of WARC-79 Resolution 640, but it is an amateur-radio function that NZART has always supported.



PANAMA

Miss Dayra Z. Chang HP1AZC
Apartado 6-1175
El Dorado
Panama, Panama

From L. O. Mathieu HP1ALX: Any radio amateur who visits the city of Panama would be very happy with the courtesy and the friendly treatment that radio amateurs offer in this country.

It can be a great surprise for a visitor to see that such a small city with just a little more than half a million inhabitants has been able to produce many repeaters in order to offer better service and communications to radio amateurs. We have in Panama various organizations of radio amateurs which we should mention. Liga Panamena de Radioaficionados has the leadership in Panama because the majority of radio amateurs throughout the Republic are members. We would also like to mention Radio Club de Panama, another outstanding organization, and also Asociacion de Radioaficionados and Club Experimentadores de Colon. There is another organization that we would like to bring to your attention; it is the Club Geminis de Panama. All of its members are also part of the firefighters division of Panama, and as radio amateurs they have been one of the most outstanding clubs in Panama. Finally, I should mention the Canal Zone Amateur Radio Association, an organization that was founded when the United States was administering the Canal Zone territory. Most of the members of this club are US citizens, and it is one of the most active clubs, especially on HF.

With this information, I feel that I have presented a general view of amateur radio in the Republic of Panama, which offers three classes of licenses. Class A is for those radio amateurs who have technical capacity in the electronics field and have passed the correspondent test in addition to the Morse-code and the general-theory exams. Class B is for those who pass only the theory and Morse-code exams. Finally,

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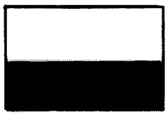
we have Class C for those who pass only the general-theory exam. This license cannot be renewed and expires after one year. Non-Panamanian citizens also can obtain these licenses if there is mutual agreement between the two countries.

Panama is a country where the radio amateurs are well appreciated because they have always been hard-working people in emergencies and catastrophes of any nature.



POLAND

Jarzy Szymczak
78-200 Bialogard
Buczka 2/3, Poland

EQUIPMENT

The rapid development in radio communications makes radios become out of date quickly, and it is difficult to win contests without the latest gear. In countries where there are hundreds of thousands of hams, many manufacturers compete with one another to sell more and more advanced equipment.

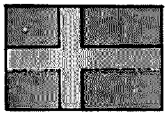
But in Poland, where there are only 12,000 or so hams, the situation is quite different. If they have the money, Polish hams buy American- or Japanese-made products. But if that is not the case, they construct their transmitters themselves. Individual construction is nearer to the spirit of amateur radio than buying ready-made gear; in the past, designing and building stations contributed significantly to the advancement of the state of the art. At any rate, no Polish plant makes radios for hams, and very few amateurs can buy gear from abroad.

So how do they shift for themselves? Radio amateurs belonging to the Polish Scouts Association have some opportunities to obtain gadgets from military stores. Most often, they are given obsolete gear needing repair. Other hams find schematics of transceivers in magazines such as *Radio Electrician*, and some hams publish their ideas.

Recently, the bulletin of the PRAA (Polish Radio Amateurs Association) contained details of a 5-band shortwave receiver, a 10-MHz heterodyne receiver, and a frequency synthesizer. In bulletin no. 4, there is a description of a new version of vfo and a mixer. Usually, the lack of parts makes building foreign designs impossible. In technical magazines, one occasionally comes across information on Polish parts. For example, in May it was announced that new 9-MHz SSB filters are being produced. These substitutes for the renowned XF-9B are being made by Omig, which will also be making PP-9-A1, PP-9-A2, and PP-9-A3 filters.

As you can see, things look rather gloomy, but the Technical Commission of the PRAA has worked out a plan for improvement in the near future. It was decided to put up more measuring laboratories which will enable hams to convert military surplus and test transceivers manufactured in Poland. For example, Zwus will soon be manufacturing an AM heterodyne receiver, a reflectometer, an electronic switch, and the 12 AVO aerial. The Technical Commission will get professional equipment which is no longer in use and will distribute it to radio amateurs through the PRAA District Departments. To discover the needs of radio amateurs, two polls were conducted and published in the bulletin of the PRAA. One of the polls referred to the general needs and finances of Polish hams. Every ham in the survey answered questions relative to his wants and needs in components, conductors, cables, sub-assemblies, and test equipment. Additional polls will ask about needs for services, documentation, and technical literature.

The Technical Commission appealed to all radio amateurs for cooperation and asked all industrial electronics plants to begin producing the basic equipment. We hope that as a result of Poland's economic reforms, some plants might say yes.



SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn, Sweden

SATELLITE-REPEATER COLLISION

The European (Region 1) frequency allocation on 2 meters is 144.0–146.0 MHz, only half of the 2-meter band in America (Region 2). A rapidly-growing ham population using 2-meter repeaters has emphasized the need for more repeater channels.

In Sweden, as well as in the other Region 1 countries, there are only 10 repeater channels, designated R0 through R9. Here we usually say only the repeater output frequency, contrary to common US practice to say both the input and output frequencies, e.g., 21/61 for 146.21 in and 146.61 out. Our channel separation is 25 kHz and repeater input is always −600. Channel R0 is 145.600 and R9 is 145.825. All Japanese 2-meter gear is made in three versions, one for the home market where no repeaters are allowed (yet), one E-version for Europe, with limited frequency coverage but with a 1750-Hz tone oscillator as repeater-opener, and one A-version for America.

With the Phase IIIB satellite up and active, severe interference is expected within the repeater coverage for channels R8 and R9, 145.800 and 145.825 MHz respectively.

Solutions

The widely-discussed solution to this problem is to abandon channels R8 and R9. This would mean a remaining maximum of only eight repeaters in a wide area in order not to cause unnecessary interference. Those living in densely-populated areas in the US and elsewhere who can easily access twenty or more repeaters can imagine the problem. There is heavy opposition against moving repeaters 1 MHz lower, i.e., into the 144-MHz band segment, which furthermore is against the Region 1 band plan.

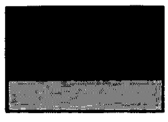
What else? Well, the probable solution will be repeaters on so-called X-channels, i.e., channels split by 12.5-kHz separation. The industry already has European versions of 2-meter equipment capable of this new channel separation. However, interference from repeater channels on both sides is to be expected with existing equipment having a frequency swing designed for 25-kHz separation. In the beginning, repeater traffic on 145.800 and 145.825 MHz will be shared with satellite traffic, but these two frequencies will probably be abandoned eventually.

QRZ VS. CQ

Or, what's wrong with an old-fashioned CQ call? We sure live in a rapidly changing world. However, sometimes you hesitate and think for a while. Habits change; language changes as well as usage. Dialing across the bands, especially during an SSB contest, gives you a chance to observe the operating techniques used. In such a contest, you more and more often hear "QRZ Contest," and a regular "CQ Contest" is getting rare. According to the Q-code abbreviations, QRZ? means "Who is calling me?" Many of those using QRZ instead of CQ should never get a QSO if the answering station would respect what QRZ? stands for! Is maybe the feeling of being a "big gun" driving us to change old practice? Who will admit that they have to call others? No, probably it is higher status giving the impression that others are always calling them. Would you call this radio-amateur psychology?

DX BULLETIN

SK3SSA is one of many stations transmitting bulletins for radio amateurs in Sweden. This bulletin station is operated by Lars SM3AVQ and transmits in RTTY. There are other SSA bulletin stations on both HF and VHF, on CW, SSB, and FM. Through voluntary efforts by a few dedicated hams in Scandinavia, we can enjoy the superb weekly "DX Bulletin" issued by the Southern New England DX Association. In Denmark, OZ1DJY picks up the RTTY bulletin on 20 meters at midnight local time. During the week, he retransmits it to SM3CFV, who sees to it that the "DX Bulletin" can be added to the domestic "SSA Bulletin" on RTTY each Sunday morning on 80 meters. An excellent service where RTTY is the perfect mode of transmission.



WEST GERMANY

Ralf Beyer DJ3NW
Opferkamp 14
3300 Braunschweig
West Germany

TELEGRAPHY

A lot has been written and said in support of or against CW. But the net outcome is that there is no significant sign of shrinking CW activity, and the CW enthusiasts are getting more organized in order to promote CW. Their arguments are numerous, e.g., better utilization of the frequency spectrum, minimal equipment needs, last chance if everything else fails, and so on. The argument I like best is "CW is fun," and so do many who contribute to the promotion of CW.

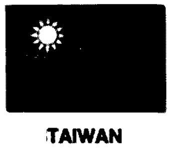
Various groups and clubs have been formed in order to support CW. All of them have a common denominator in their bylaws: Telegraphy (CW) is considered the process of mental coding and decoding of information in Morse code—no machines like keyboards and CW readers are allowed. Assistance is offered to all who are interested in learning the code, and adherence to the recommendations of IARU and the regulations of the respective national radio society is mandatory.

Typical activities of the German "Activity Group Telegraphy—DL" (AGCW-DL), for example, are rag-chewing, QRP experiments, CW training courses on the air, CW bulletins, contests, awards, and regular meetings. This group has about 1000 members. The individual national AGCWs in Europe are members of the European CW Association (EUCW), a multi-national organization. Everybody interested in the promotion of CW is invited to join the AGCWs, and no particular proficiency level is required. Foreign hams may apply for an associated membership in AGCW-DL, which is free of charge. The point of contact is Ilse Mueller DL5MAI, Stoffelsberg 3, D-8860 Noerdlingen, Federal Republic of Germany.

The High Speed Club (HSC) founded in 1951 is another CW group. It follows the same fundamental guidelines mentioned earlier but requires some personal achievement in CW by its members. In order to join HSC, one should be able to complete a CW QSO of 30 minutes duration at 25 wpm with solid copy and excellent keying. Five recommendations by HSC members confirming this achievement and 8 IRCs are all you need to apply for membership. Again, membership is free of charge. Therefore, do not confuse HSC with groups using similar logos and charging annual fees.

The HSC is also a member of EUCW and has more than 1100 members in 48 countries. Its club station, DL9HSC, is active on all bands and issues the special DOK number, HSC, for the DLD award. The point of contact is Ernst Manske DL1PM, Ansgarstrasse 14, D-2105 Seevetal 11, Federal Republic of Germany.

"Outrageous" may be your comment regarding a speed of 25 wpm. But there are thousands of hams who communicate regularly at this and even higher speeds comfortably. And there is much more in store. Once you have mastered 40 wpm, you may join the Very High Speed Club (VHSC) administered by PA0DIN, D. J. Hoogma, Schoutstraat 15, 6525 XR Nijmegen, The Netherlands. And in case you are looking for further challenges, ask ON5ME about the super and extremely high speed clubs, SHSC and EHSC! In any case, being a high speed fan or not, it is fun to celebrate the art of CW, to promote it by good operating practices, to give a hand to those who want to participate, and eventually to join one of the groups signaling "CW spoken here."



TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan
Republic of China

FLASH

The Chinese Telecommunications Authority has finally approved the request of Italian hams to operate their rigs and calls followed by BV portable. So far, there is no further information received from the ARI about their boys' departures and arrivals. They are required to contact CRA (China Radio Association) for necessary arrangements in this regard.

It has also been learned that permission will be given to a PA ham to be the second operator in the BV2A if he holds a valid and equivalent license issued by his government to operate on 14 and 21 MHz.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Ever play this game? Take one letter—let's say "V". Well, that is either the first few bars of Beethoven's fifth or a common test signal on CW. Two letters? How about those two, back there—CW; or, being involved with radioteletype, we could use its test signal, RY. Three letters? That's easy—FSK. And four letters can be either AFSK or, you asked for it, RTTY! But how about five letters? This month we will take a look at five of the hottest letters to hit RTTY, and they spell AMTOR.

Let's start out by dropping back a bit and examining some of the fundamentals of radioteletype communications. As we have noted before, the commonly used RTTY code is the five-level Murray, sometimes called Baudot, code. Each letter is represented by a unique five-bit code, with most of the codes doubling to represent a figure or punctuation, by use of a shift into a second character set. One of the basic problems with this scheme is that in the world of radio, interference is a given. It is easy to see what would happen to a character code if any of the five bits were randomly changed from mark to space, or vice versa—the resulting character would be incorrect. Now, it might be possible to find or correct the character in plain text copy, using sophisticated computers or a good proofreader; but in code groups, data, or weather reports this would be impossible.

Various schemes have been devised to allow for error correction of bit-mangled characters. One technique, used with the American Standard Code for Information Interchange (ASCII), is to add a "parity" bit at the end of the character code. This extra bit is set at either a space (0) or mark (1), determined by the number of marks or spaces within the character code. The end result is to produce either an odd or even number of set (mark) bits. The result is termed odd, or even, parity, respectively.

Used over closed systems, this parity bit gives a remarkable improvement in accuracy. The receiving station is set up to reject any character in which the parity is not correct, and initiate a request for the sending station to repeat the letter or group. Just how this request is accomplished varies with the system, and since we will be getting into a parallel system with AMTOR later, I will not go into computer details here.

The problem with the parity bit is that if multiple bits are messed up, as might well happen with a noise burst, the computed parity may still be correct. Another, more sensitive, technique for error correction is needed for radioteletype, particularly on high-frequency, noise-prone circuits. Devised for commercial telex circuits, a system for Teleprinter Over Radio (TOR) has been established as an international standard. When adapted for amateur use, this system, which goes by many proprietary names, is called AMTOR. In order to error-proof the system as much as possible, a seven-unit code is used. Rather than depend on one parity bit, however, only combinations of four marks and three spaces are used. Thus, inverting one or more bits is highly unlikely to produce another recognizable (four-mark, three-space) code group. Additionally, code groups should be chosen so that a one-bit change or inversion would not produce a legitimate group. This is analogous to the Gray code, which is a modified binary code which eliminates ambiguity by removing one-bit transitions between digits. Of the total 128 codes available to a seven-bit system (2 to the 7th), there are 35 unique codes which fit the above criteria. Allowing for the fact that a standard Murray teleprinter uses all of the codes available to the five-bit code (2 to the 5th, or 32, characters), it would appear that such a seven-bit code would do nicely.

The resultant code is shown in Fig. 1, comparing the familiar Murray code to the CCIR code used in various TOR circuits. Observant individuals will notice that there are three Control Signal codes given after the 35 noted above, and that these do resemble some other of the codes used for letters. Well, these codes are used in a rather special fashion, which I shall be going into, and are unlikely to be confused with the letter codes when used in that way.

If all we had right now were the seven-bit codes for each letter, with some means of built-in error correction, that would be nice, but there is more. Imagine two operators talking to each other, using any mode you please, sending traffic. Now these are exceptionally well-trained operators, and at the end of each line of the message the sending station breaks for a confirmation. A quick QSL is issued to confirm receipt of each line, or a SAY AGAIN or IMI (CW for "?") is used to request a repeat of a garbled line. The sending station obeys the receiving station's request 100% of the time, and no errors are ever made in a message again. Of course, if the sending station did not hear the receiving station's answer, he would respond with "WHAT?"; the receiving station, presuming he did not get the last block, would send "SAY AGAIN", to which the sending station would respond either "WHAT??" or "SAY AGAIN WHAT?" and the whole thing would go around again. You get the picture.

Letters	Figures	Murray	AMTOR
A	–	11000	1110001
B	?	10011	0100111
C	:	01110	1011100
D	$	10010	1100101
E	3	10000	0110101
F	!	10110	1101100
G	&	01011	1010110
H	stop	00101	1001011
I	8	01100	1011001
J	'	11010	1110100
K	(	11110	0111100
L	)	01001	1010011
M	.	00111	1001110
N	,	00110	1001101
O	9	00011	1000111
P	0	01101	1011010
Q	1	11101	0111010
R	4	01010	1010101
S	bell	10100	1101001
T	5	00001	0010111
U	7	11100	0111001
V	;	01111	0011110
W	2	11001	1110010
X	/	10111	0101110
Y	6	10101	1101010
Z	+	10001	1100011
Carriage Return		00010	0001111
Line Feed		01000	0011011
Letters Shift		11111	0101101
Figures Shift		11011	0110110
Space		00100	0011101
Blank		00000	0101011
Repeat Request		–	0110011
Permanent A (alpha)		–	1111000
Permanent Z (beta)		–	1100110
Control Signal 1		–	1010011
Control Signal 2		–	0101011
Control Signal 3		–	1001101

Fig. 1.

With people on each end, the whole thing could be resolved with one quick sentence or so. But if we are going to automate this thing, a better form is needed. That is where those Control Signals come in. After some experimentation, it was formulated that the receiving station should respond to each received block with Control Signal 1 (CS1) and CS2 alternately. Thus, receipt of a duplicate Control Signal by the sending station indicates non-receipt. If the sending station does not receive the receiving station's response, it sends a request for signal repetition (RQ) instead of more data. The third Control Signal, CS3, is used to transfer assignation of the sending- and receiving-station status to the other station. In this way, either station can send or receive, alternately, with the other station concurrently confirming receipt.

So what we have at this point is a system which allows the receiving station to tell if the information received is valid, and to automatically request a repeat from the sending station if it is not. But we have done this at the expense, if you will, of two more bits of data to be sent per character. Now, if we are talking about "standard" 60-wpm RTTY, where each data pulse is 21 ms long, this would lengthen each character, now composed of seven data pulses, a start pulse, and a stop pulse, by about 25%, slowing the rate of transmission to a dismal (in this computer age) 45 wpm. Snore city!

Well, the way to deal with this is by eliminating those start and stop pulses, and speeding the whole thing up anyway so that the error correction becomes less a hindrance, and essentially transparent. Now, let me back up for a bit to explain. Conventional, if I may call it that, RTTY is know as a "start-stop," or asynchronous, system. That means that each character is an entity unto itself, starting and stopping within carefully defined limits. The system may idle for an indeterminate length of time, with a new character arriving at any time, heralded by a start pulse and ending with a stop pulse, which itself merges into the idle state. Contrast that with a synchronous system, where each character is assigned a precise time slot for its existence. By synchronizing clocks at the sending and receiving end, it is possible to eliminate the start and stop pulses by presuming that a character will be sent during a certain window of time, only. Clearly, loss of synchronization between sending and receiving stations will reduce a signal sent synchronously to garble, but there are ways of minimizing these problems.

So what do we now have? A synchronous, error-correcting way of sending RTTY which can be made to look like Murray, but which can far exceed the older system's reliability. In January we will look into AMTOR some more, and I would appreciate any of you using the technique penning me a note letting me know what you think of it. Next month, our December shopping list, a regular feature of RTTY Loop.

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GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	7	3A	3A	3A	7	14	21	21A	21
ARGENTINA	14	7	7	7	7	7	14A	21A	21A	21A	21A	21
AUSTRALIA	21	14	7B	7B	7B	7B	7B	14B	14	14A	21	21A
CANAL ZONE	14	7	7	7	7	7	14	21	21A	21A	21A	21
ENGLAND	7	7	3A	3A	7	7B	14	21A	21A	21	14	7
HAWAII	21	14	7	7B	7	7	7	7B	14	21A	21A	21
INDIA	7	7B	7B	7B	7B	7B	14	14A	14	14B	14B	7B
JAPAN	14	7B	7B	7B	7B	7	7	7B	7B	7B	14B	21
MEXICO	14A	14	7	7	7	7	7	14	21A	21A	21A	21
PHILIPPINES	14	7B	7B	7B	7B	7B	7B	7B	14B	14B	14B	14
PUERTO RICO	14	7	7	7	7	7	14	21	21A	21A	21	14A
SOUTH AFRICA	14	7	7	7	7B	14	21	21A	21A	21A	21A	14A
U. S. S. R.	7	7	3A	3A	7	7B	14	21A	14	7A	7B	7
WEST COAST	14A	14	7	7	7	7	7	14	21A	21A	21A	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	7A	7	7	3A	3A	3A	7	14	21	21A	21A
ARGENTINA	14A	7A	7	7	7	7	14A	21A	21A	21A	21A	21A
AUSTRALIA	21A	14A	7A	7B	7B	7B	7B	7B	14	14A	21	21A
CANAL ZONE	14	14	7	7	7	7	7A	21	21A	21A	21A	21A
ENGLAND	7	7	3A	3A	7	7B	14B	21	21A	21	14	7
HAWAII	21A	14	7A	7	7	7	7	7	14	21A	21A	21A
INDIA	7	14B	7B	7B	7B	7B	7B	14	14	14B	14B	7B
JAPAN	21	14B	7B	7B	7B	7	7	7	7B	7B	14B	21
MEXICO	14	7A	7	7	7	7	7	14	21	21	21A	21
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7	14B	14B	14	14A
PUERTO RICO	14	14	7	7	7	7	14	21	21	21A	21A	21
SOUTH AFRICA	14	7	7	7	7B	7B	14	21	21A	21A	21A	14A
U. S. S. R.	7	7	3A	3A	7	7B	7B	14A	14	7B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	7	3A	3A	3A	3A	3A	7A	14A	21	21A
ARGENTINA	21A	14	7	7	7	7	7B	21	21A	21A	21A	21A
AUSTRALIA	21A	21A	14	14	14B	7B	7B	7B	14	14A	21	21A
CANAL ZONE	21	14	7	7	7	7	7	21	21A	21A	21A	21A
ENGLAND	7B	7	3A	3A	7	7B	7B	14B	21A	21	14	7B
HAWAII	21A	21	14	7A	7	7	7	7	14	21A	21A	21A
INDIA	14	14	7B	7B	7B	7B	7B	7B	14	14B	14B	14B
JAPAN	21A	21	14B	7B	7B	7	7	7	7	7B	14	21A
MEXICO	14A	14	7	7	7	7	7	14	21A	21A	21A	21
PHILIPPINES	21A	21	14	7B	7B	7B	7B	7	14	14	14	21
PUERTO RICO	14	14	7	7	7	7	7	14	21A	21A	21A	21A
SOUTH AFRICA	14	7	7	7	7B	7B	7B	14	21	21A	21A	14A
U. S. S. R.	7B	7	3A	3A	7	7B	7B	14	14	7B	7B	7B
EAST COAST	14A	14	7	7	7	7	7	14	21A	21A	21A	21

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

NOVEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
		1 F/F	2 F/G	3 G/G	4 G/G	5 G/G
6 P/F*	7 F/F	8 G/G	9 G/G	10 G/G	11 F/G	12 F/G
13 F/G	14 F/G	15 F/G	16 G/G	17 G/G	18 F/G	19 G/G
20 G/G	21 G/G	22 G/G	23 G/G	24 F/G	25 F/G	26 F/G
27 F/F	28 F/F	29 F/F	30 P/F*			

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W2NSD/1
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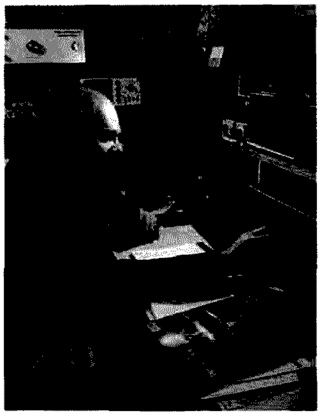

ASPEN HAM CONVENTION JANUARY 9-13

Gambling that Aspen will once more manage to coax some snow onto the slopes this winter, you're invited to join the usual intrepid group of hams who will descend on the town during the second week of January. This is the ninth annual ham winter conclave.

Last winter, in addition to the skiing and camaraderie, we had demonstrations and talks on the latest in packet-radio developments. The winter before, there was a symposium on proposed ham-equipment technology developments. It's always something.

At any rate, if you're a ham, a skier, gregarious, and are interested in joining the ham group swarming over the slopes of the four major ski areas in Aspen—and can manage Mexican, Chinese, Eskimo, and other weird foods—you're invited to join us on our round of the restaurants.

I have to get to the Winter Consumer Electronics Show in Las Vegas during the first week in January. This will bring me to Aspen along about Sunday the 8th, during what is called the low season (lower prices). If you bring your HT, you will be able to keep in touch with all of us on the slopes while we're skiing. We might also be able to talk while driving from Denver into Aspen and back—a long drive.

We normally pull between a half dozen and a dozen, plus a fair number of local hams—enough to properly make fun of me when I manage to trip on one of the steeper slopes and crash.

In recent years we've been staying at the Limelight, just a block from downtown. But then almost everything in Aspen is no more than a block from downtown.

Wayne Green haters: Here's your opportunity to rekindle the flames. Wayne Green lovers: Cure that silly fixation once and for all and find out what Wayne Green is really like—if you dare.

FOREIGN GIFT SUBS

The other day I contacted a chap in Czechoslovakia and had a nice chat. It didn't hurt that he recognized my call and commented on how much he has enjoyed *73*. I wondered how, in the face of the currency problems, he had managed to get the magazine. He explained that a kind American ham had sent him copies.

If you have any DX friends, you might think in terms of either passing along your copies of *73* or perhaps buying them a subscription. *73* is of particular interest to DX hams because it has more construction projects than any other ham magazine, it has an International DX news column, and it isn't filled with a bunch of useless operating news or contest results which are of interest to only a tiny minority.

Tell you what, the regular foreign surface subscription rate for *73* is $40 a year. I hate having it that high, but foreign postage rates have gone absolutely crazy and we generally find that it's possible to stay in business longer if we don't lose too much money. But I want to lend a hand to help out our DX friends, so I'll make a deal with you. If you give a DX amateur a subscription to *73* as a Christmas gift and you get the subscription in to me before Christmas, I'll go almost half of the cost. Your price this Christmas for foreign gift sub-

Continued on page 126

QSL OF THE MONTH

Everybody, including hams, seems to be talking to computers these days, and it was only a matter of time before QSLs caught up with the trend. So this month's winner, from Dave Ball WA4PDQ, is a QSL card that would be at home on the wall of the shack or in the supermarket check-out line. Dave neatly included a translation of the bar code for those of us with analog eyes, and if you look closely, you will notice that hidden within the bar code is yet a third translation of his callsign.

To enter your QSL, put it in an envelope with your choice of books from *73*'s Radio Bookshop and mail it to 73, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be considered.

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Code Practice: Have You Seen the Light?

This simple solar cpo is the best weekend project under the sun—or bulb.

You will find this solar code oscillator handy to use whether you are just beginning to practice the Morse code or just keeping in touch. There are no batteries to wear out or to corrode—never fret about shutting the oscillator off. Yes, even years later you can pull the unit off the shelf and it will work every time (Photo A).

In most instances, solar cells are rather expensive to use in small electronic devices. Here, five solar cell pieces are taken from a 10-piece broken energy pack. You can usually purchase this pack for less than $2.00 and practically any size cells can be used for this project. Just connect the five pieces in series and you have a voltage source of over 2 volts.

The unit is assembled in a Radio Shack experimenter box measuring approximately 6 × 3 × 2 inches. Practically all of the components for the solar oscillator, except the solar cells, may be picked up at the local radio store. The LED flasher-oscillator IC can be obtained from any Radio Shack store (276-1705). You can build this solar code oscillator for less than a $10.00 bill, without the telegraph key. In fact, you can assemble it for half that price if a container box and speaker are found in your electronics junk box.

Since the LM3909 IC oscillator operates on very low voltage (1.5 V) and pulls less than 3 mA of current, solar cell pieces provide adequate power (Fig. 1). The practice oscillator may be operated in the sun or under a reading lamp. Any size 8-Ohm speaker may be used in the project. Just select the correct size and container to house the small PM speaker.

The small components are mounted upon a 2½" × 3" perforated board. Simply cut the small piece from a larger piece of stock. If a smaller size perforated board is handy, use it. There are only five small components to be mounted upon

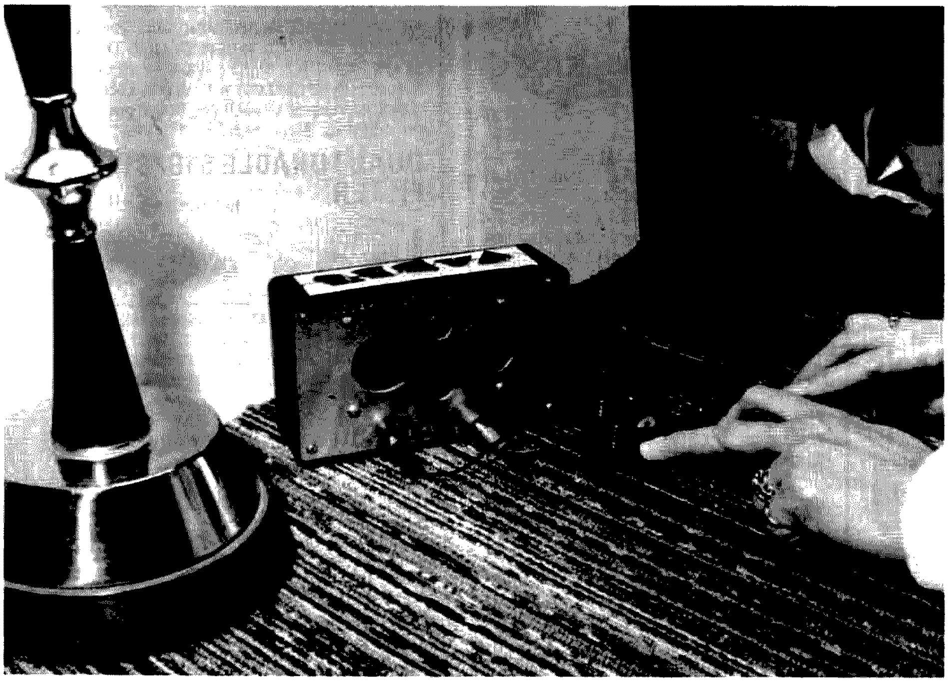

Photo A. This little solar code oscillator may be operated in the sun or under a regular reading lamp. Sufficient volume is obtained from a small 8-Ohm PM speaker.

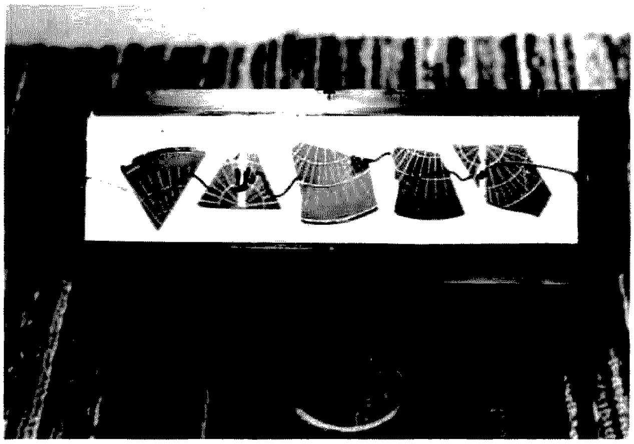

Photo B. The solar cells may be mounted on the plastic case or on a piece of cardboard. For added protection, cut a piece of thin plastic to cover the cells and cement the ends with rubber silicone cement.

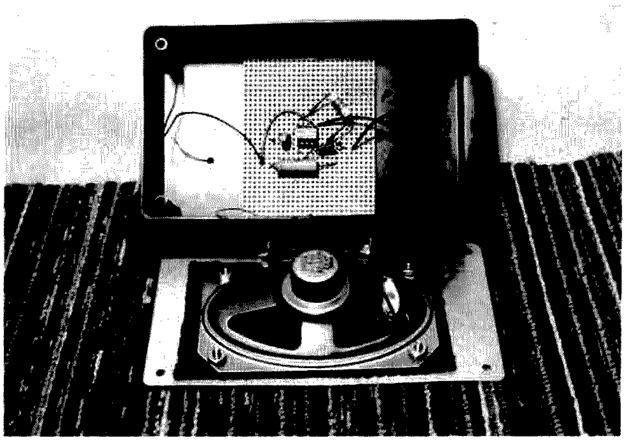

Photo C. The wiring of the small components is mounted upon a small perforated board. After the oscillator is tested, cement the board to the inside of the plastic box.

the perforated board. After all components are wired and tested, the board is glued to the inside of the plastic box with rubber silicone cement.

Mount the speaker on the aluminum cover. Some plastic boxes may have a plastic front cover. Lay the speaker on the cover and mark the speaker mounting holes. Drill several small holes or two large ones for the speaker opening. A piece of metal or plastic screen may serve as grille cloth behind the metal cover. Drill two small holes for the key jacks. Make sure they are insulated from the metal cover.

Connecting the Cells

Select five large pieces from the solar-cell assortment. The solar cells may be mounted directly upon the plastic case or on a piece of cardboard (Fig. 2). Then cement the cardboard cell arrangement to the plastic case. For added protection, you may cover the cells with a thin piece of plastic. Before mounting the solar cells, they should be connected in series.

Start with cell number 1 and connect a six-inch piece of fine wire to the top bar side of the solar cell. Any type of fine hookup or wrapping wire will do. Tin both ends of the hookup wire. Try to solder the cell-connecting wires to the center of each cell. Solder a one-inch lead to the bottom side of cell number 1 (silver). Hold the lead in place with the blade of a pocket knife. Make clean, flowing solder connections.

Now solder the small pieces of wire to the top bar of cell number 2. Flip the cells over and connect another one-inch piece to the bottom side of cell number 2. Connect all five cells in this manner until all cells are wired in series. Solder a six-inch connecting wire to the bottom side of the last cell (5). Under direct sunlight, you should generate from 1.5 to 2.5 volts from the solar cells.

Place a dab of clear rubber silicone cement on the bottom side of each cell. Turn the cells over by holding on to the wire ends. Press the cells in place. Be careful not to press too hard and break a cell. Line the cells up in a row. The cells may be placed close together by curling the small hookup wire. Let the cement set for a couple of hours (Photo B).

Wiring the Circuits

First, mount the IC socket in the middle of the perforated board. Bend over socket terminals 1 and 5. Temporarily, this will hold the socket to the mounting board until all wiring has been completed. The small resistor and capacitor are mounted as they are wired into the circuit. Stick the terminal wires through the perforated holes near the IC terminals. Solder the speaker and solar-cell wires after inserting through the small holes.

Start wiring up the oscillator with the six-inch speaker wires connected to terminal 5 of the IC socket and R1. Solder the long negative wire from the solar cells to the negative terminal of C2. The positive wire of the cells is soldered to the positive

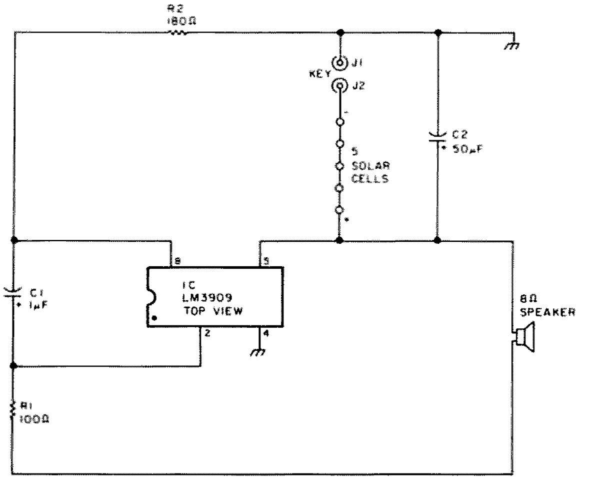

Fig. 1. The oscillator circuit is built around an 8-pin LM3909 IC chip. This small IC pulls less than 3 mA at 2 volts, making an ideal solar project.

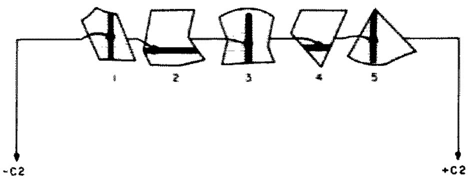

Fig. 2. Select five large solar-cell pieces from the 10-piece assortment. Connect all cells in a series arrangement.

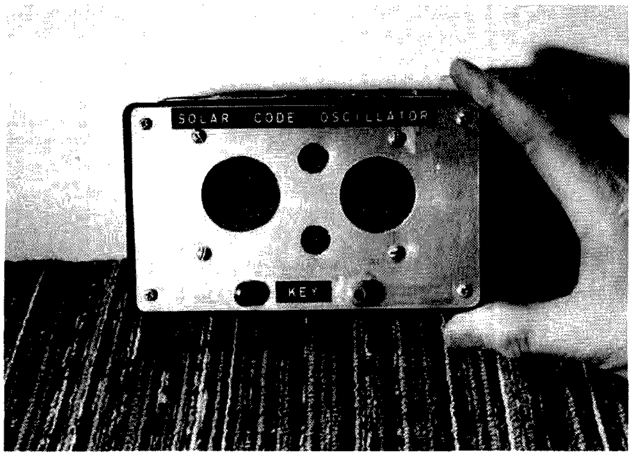

Photo D. Close-up view of the small oscillator. In this model, a metal front panel was used. The speaker holes may be drilled out with a small bit or with a circle cutter.

Parts List

J1, J2—banana jacks (Radio Shack 274-725 or equivalent)
C1—1 uF, 16 V electrolytic capacitor
C2—50 uF, 16 V
R1—100-Ohm resistor, 1/2 W
R2—220-Ohm resistor, 1/2 W
IC—LM3909 (Radio Shack 276-1705 or equivalent)
S1—8-pin IC socket (Radio Shack 276-1995 or equivalent)
Solar cells—10-piece broken energy pack
Crescent solar-cell chips, #P42,749—25 for $10.95 (Edmund Scientific Co., 101 East Gloucester Pile, Banington NJ 08007)
Solar Cell Experimenter's Assortment, S112—$7.95 (Solar Amp, Inc., PO Box 2788T, Denver CO 80227)
Speaker—any size (2- to 4-inch) PM speaker
Miscellaneous—Cabinet, telegraph key, hookup wire, and hardware

terminal of C2. Connect two four-inch hookup wire leads to the key jacks. Ground the lead from the black female jack. Solder the red jack lead to the negative terminal of C2. Don't forget to ground terminal 4 of the IC socket (Photo C).

Double-check all wiring connections with the circuit diagram. If a VOM is handy, check the voltage and solar-cell polarity leads. The positive terminal of the solar cells must be soldered to the positive terminal of C2 and terminal 5 of the IC socket. Usually, the top bar terminal lead of cell 1 is the negative terminal. Of course, the code oscillator will not perform with the solar-cell polarity reversed. You cannot ruin the IC since the low voltage and current is developed with the solar cells; the IC is not damaged with the wrong polarity.

Mark the terminals of the IC socket with a black felt pen or grease pencil. Plug in the LM3909 IC chip with the small dot at terminal 1. Insert the telegraph key and start to tap away. You may find the tone of the oscillator changing somewhat when placed near or out of the light. If the sunlight is too bright, just cover up one of the cells. ■

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Unlimited Guarantee for Power Supplies

Plan for the worst and you'll get the best, says KCØEW. He may be right.

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Sometime between opening that first "guaranteed-easy-to-assemble-in-one-hour" kit and building your own home radar defense system, you're going to have to build a power supply. There's no getting around it—most transistors hate house current, and 800 volts from D-cells is a little impractical. Fortunately, power-supply design doesn't have to be complicated. Granted, there are many, many ways of getting from 117 V ac to something usable, and some of 'em take a Nobel nominee to understand. But if you're not looking for the *most* efficient, 10¢/Watt, state-of-the-art, 10-kW supply in a shoebox, power-supply design can be fairly simple. It won't be elegant, but it'll work. And work pretty well, too.

Any ac-to-dc supply performs two basic functions: rectification and regulation. Simply put, this means changing the ac supplied by the line to dc and maintaining the output voltage (or current) at the desired level. Some designs, of course, are going to do these jobs better than others; they may add other features, such as multiple outputs, current limiting, etc. We'll cover some of these in this article, but what I really want to cover are some basic ideas and rules for a simple power-supply design. By the time you've finished reading, you'll have designed a usable supply for your bench. Well, OK . . . you can finish the rest of the magazine first.

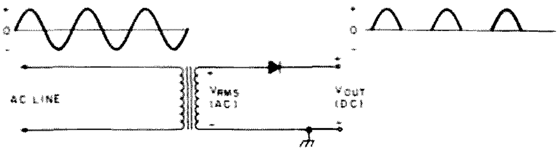


Fig. 1. Half-wave rectifier circuit.

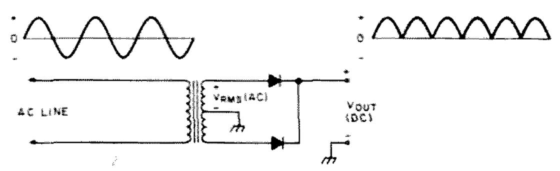


Fig. 2. Full-wave rectifier circuit.

First, a few generic rules for successful designs. Machinists have an old established rule: Spend five hours measuring and five minutes cutting. The same applies to any design. Mistakes on the drawing are easily corrected with an eraser. Mistakes found during construction are often corrected by pitching the whole thing and starting over. Myers's First Rule for Successful Projects: Get it right on paper first. Also, let's not forget that we really want to design for the worst case always. For example, what is the most current we'll ever need from our supply at a given voltage? How many outputs are we going to need now and in the future? Once you've determined your worst-case numbers, throw in a little belief in Murphy by making them worse. If I'm going to be powering some TTL, say 5 V at 1 A maximum, I might design for, say, 5 volts at 1.5 A. The extra half Amp might cost me a little bit extra, but I'll never regret putting it in. With that out of the way, let's get on with the design. For the sake of discussion, let's go ahead and build the 5-V, 1.5-A supply I just mentioned.

We know we want a solid five volts at half an Amp, and all we've got to work with is the 117 volts ac coming out of that hole in the wall. First, we'll have to get the voltage down to something reasonable and somehow get it into dc. Fortunately, there's a simple way to change ac voltages around at will—the transformer. Following a step-down transformer ("step-down" because we're going from a high voltage to a lower one), we'll need a rectifier to change the ac to dc and filtering and regulation stages to smooth out the dc output and hold it at a constant level.

We'll begin with a look at rectifiers. A rectifier is anything that changes the back-and-forth, both-directions-at-once alternating current coming out of the transformer to a flow in one direction only. Of course, the lowly diode is ideal for this—all it ever does is conduct in one direction only (well, maybe it does a little more than that, but we'll look into diodes in more detail later). Putting a diode in series with an ac source (in this case, the secondary of the transformer) will give us a sort of dc. During half the ac cycle, the diode blocks the current and no power flows. This scheme is shown in Fig. 1 and is called the

half-wave rectifier circuit, since only half the wave is used. It's cheap and simple, but the half wave not passed by the diode is lost—we can get no power from it. If we were to smooth out the half waves coming out of this circuit, the dc voltage (the average of the half waves) would only be about 0.45 times the rms output voltage of the transformer. This is due to the fact that the output of the half-wave circuit is zero half the time. What we need, it seems, is a rectifier that will let us use the other half of the ac cycle, too.

Fig. 2 shows a full-wave rectifier. The two diodes allow current to flow during the full cycle, with each diode conducting half the time. Now that we're using the full cycle, the average voltage out is 0.9 times the transformer secondary's rms output. (You may have heard rms, or "root-mean-square," voltage described as the "equivalent dc voltage" or, in other words, the dc voltage required to equal the ac in power. So, we're using about everything the transformer could give us.) But notice that the full-wave circuit as shown requires a transformer with a center-tapped secondary. This cuts the ac voltage available in half, since we're only using half the secondary at any instant. This, of course, is going to limit the dc output we can get, and we've got the extra bother of having to find a center-tapped transformer. Hmmmm. What we really need, it seems, is some way to get at that other half of the ac while not needing that third wire. Enter the bridge, shown in all its glory in Fig. 3.

A little thought while looking at this circuit, keeping in mind the fact that diodes conduct in one direction only, will convince you that it works. What we have now are two diodes conducting during each half of the wave, one pushing and the other pulling. And we'll get all the power we can ever hope for.

Diodes being fairly cheap, we'll usually opt for the full-wave bridge as the rectifier of choice. The only time you might want to consider the two-diode full-wave circuit would be for certain high-voltage transformers which simply aren't made for use with any other circuit. These usually have fairly light insulation around the center-tap, which might break down when used with the bridge. Note that this applies only for high-voltage work—for the voltages we've been talking about, it's a pretty safe bet that any transformer will work if it meets our other requirements.

Remember, the average dc output from either full-wave circuit is 0.9 times the rms voltage from the transformer secondary. The maximum dc voltage available would be obtained by putting a capacitor across the output, which would then charge to the peak voltage of the ac, or 1.4 times the rms voltage. This represents the highest voltage that can be obtained from any simple transformer/rectifier circuit. What we can reasonably expect out, then, will fall somewhere between these two values. The next two stages in the power supply will tell us what the output will be and what the transformer output has to be to get there. But first, a bit more on the diodes in the rectifier stage.

Most of the time we'll be using silicon diodes for our rectifiers, and while these are pretty simple parts, there are a couple of things to watch. The first, the diode's current rating, is pretty straightforward. Just make sure the diode is going to be able to handle all of the current you're going to put through it, plus our usual safety margin. For the 1.5-Amp supply we've been talking about, 3-Amp diodes might be a good choice.

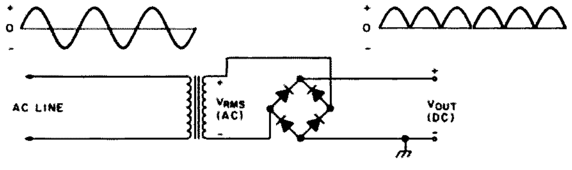


Fig. 3. Bridge rectifier circuit.

The other item we've got to worry about is one that is often overlooked: the peak-inverse-voltage, or piv, rating of the diode. While it's normally assumed that diodes will conduct one way only, you can't push them too far. If the reverse voltage on the diode exceeds the piv rating, the diode may break down and conduct in the wrong direction. Besides being bad as far as the operation of your rectifier is concerned, the large currents going the wrong way can quickly fry the diode.

The inverse voltage you'll have to worry about depends, of course, on the secondary voltage of the transformer and also on the type of rectifier circuit chosen. While the bridge will only put 1.4 times the secondary's rms output across the diodes, the half-wave and the two-diode full wave will put 2.8 times the rms voltage on them. Therefore, if you're running a 10-volt secondary with a half-wave circuit, the diode is going to have to withstand 28 volts placed backwards across it every half cycle. (This assumes that the load is nothing but a capacitor, which is going to charge to the peak voltage as mentioned earlier. But remember, we're always going to design for the worst case.)

With the voltage stepped down to something reasonable by the transformer and converted to dc by the rectifier, all we have to worry about now is smoothing out the bumps left over from the ac and trying to hold the output stable. This can be quite a challenge to the power-supply designer, but there are a few simple techniques we can use to get a usable supply design easily.

Smoothing out the pulsing dc from the rectifier is the job of the filter, which comes right after the rectifier. The simplest arrangement is to use a capacitor or capacitor and inductor combination to remove the ac component remaining in the current. The capacitor, usually a large aluminum electrolytic type, is placed across the output of the rectifier stage. The capacitor looks like a short to the ac component, while blocking the dc.

Another way to look at it is to consider the capacitor as a place to store energy; during the times that the voltage from the rectifier is dropping off, the output is supported by the charge stored in the capacitor.

Either way, the bigger the capacitor and the lighter the load, the higher the output voltage will remain. This situation can be improved somewhat by adding an inductor before the capacitor, in series with one side of the supply as shown in Fig. 4. This is called a choke-input filter stage. Here the inductor acts to block ac while passing dc. We can also look at the inductor as an energy-storage device and say that

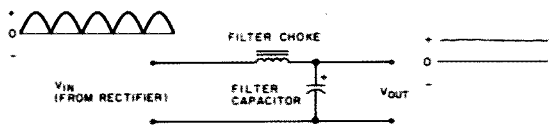
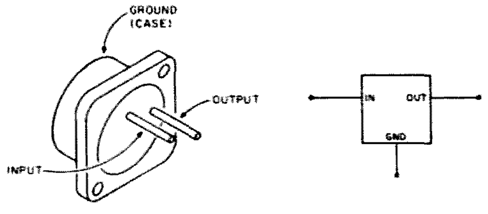


Fig. 4. Choke-input filter.



a) TO-3 PACKAGE   b) SCHEMATIC REP.

Fig. 5. The LM309 voltage regulator.

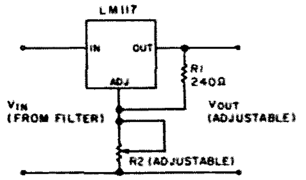


Fig. 7. Variable-voltage supply, with R2 as a potentiometer.

the current is maintained by the inductor (from energy stored in the magnetic field of the coil) during those times when the output of the rectifier is dropping off. Either way, the inductor aids the capacitor in maintaining the output at a constant level.

Capacitor-input and choke-input filtering stages are often all that is needed to provide for an acceptable dc output. But the calculations for proper design of these stages can get somewhat involved, as is finding the proper choke, etc. Fortunately, there are some simple regulating circuits which can make this job much simpler, at least for the supplies we'll want to build. So, we'll just use a large filter capacitor to get rid of most of the ac ripple and let the regulator handle the rest, along with the job of fixing the output voltage.

For light to moderate current requirements, at voltages up to about thirty volts, there is nothing easier than putting a voltage regulator IC in your design. These are integrated circuits which look a lot like power transistors from the outside, but are fairly complicated little pieces of hardware on the inside.

A regulator IC can hold your output voltage stable to within a couple of percent or better, from zero to full load. One of the more popular, the LM309, is shown in Fig. 5. Notice that it has only three leads—the input, the output, and ground. With 7 volts or higher across the input and ground, the voltage from output to ground will be held at 5.05 volts, plus or minus about a quarter of a volt (according to my trusty 1978 *National Semiconductor Linear Handbook*). And, in the TO-3 package (the big, flat can power transistors come in), it's good for a solid 1-Ampere output current. Not bad for a part that'll set you back maybe a couple of bucks at your local parts palace.

While this is almost ideal for our design (it's a little light on current, but there are higher-output versions available—up to 5 Amps and higher in some cases), you should know about the little item shown in Fig. 6. This is the LM117 adjustable regulator. Where the 309 gave us 5 volts out, no questions asked, the 117 allows you to set the output voltage at any point up to a maximum of 37 volts. This is done by connecting two resistors to the ADJ lead, one going to ground and the other to the output. The output voltage is given by:

$V_{out} = 1.25 \times (1 + R2/R1)$.

R1 is usually a few hundred Ohms (the National Semiconductor book suggests 240 Ohms) and R2 is chosen for the desired voltage. Rearranging the above formula, assuming 240 Ohms for R1, gives:

$R2(Ohms) = (V_{out}/1.25 - 1) \times 240$.

R2 could even be a potentiomenter, as shown in Fig. 7, to make a variable-voltage supply.

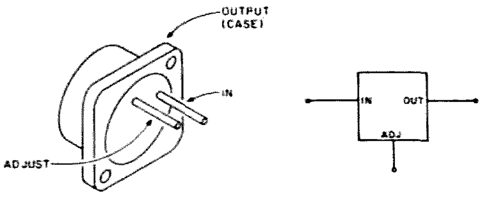
Another method of regulating the output voltage of your supply involves the use of a special type of diode called a zener. The zener diode is ideal for use as a voltage reference due to the fact that the voltage across the diode when operated backwards is very constant over a wide range of current. (Actually, all diodes show the phenomenon of reverse breakdown occurring at a certain voltage, but the zener has been so constructed as to fix this voltage precisely at a desired point and to hold to that value better for various reverse currents.) Now, how do we get from the reference level supplied by the zener to a stable output?

Zener diodes do provide a stable voltage drop, but they aren't built to handle large currents. So, the zener won't be handling the output directly. Instead, we'll put the zener at the base of a transistor which is passing the output current, as in Fig. 8. Now, since the transistor is an NPN type, the base and emitter form a P-N diode, just like the silicon diodes used in the rectifier. An interesting property of these diodes is that the voltage drop across the diode, when operated normally (or forward biased), is also fairly stable and fixed at around 0.65 volts. Since we lose 0.65 volts, then, going through the base-emitter diode, the output (the emitter) will be held at a voltage 0.65 volts less than the zener voltage. Now, what are all those other components in Fig. 8 doing there, and how do you design one of these things?

Well, for both the transistor and zener to work, they'll have to have a little current. The zener will require a certain minimum current to do its voltage-fixing trick, and the transistor will need some current into the base proportional to the current passing through from collector to emitter. The dc beta of the transistor is the number of times the current into the base must be multiplied to get the collector current. It can be as high as several hundred for small-signal transistors to as low as five or ten for the big, high-current power types.

As an example, if we're running 2 Amps through a transistor with a beta of 20, the base will need 0.1 Amps. Resistor R1 supplies both the zener current and the base current in Fig. 8. The way to calculate the value for R1 is to subtract the zener voltage from the input voltage to the regulator and divide the result by the total of the zener and base currents. The number you get is the maximum value for R1 in Ohms. As a practical rule, keep the value for R1 well under this number, say 75% of the calculated value. Too large a value for R1 and the transistor and zener won't get enough current to operate properly. Too low and you'll be wasting current in the regulator.

To make the regulator



a) TO-3 PACKAGE   b) SCHEMATIC REP.

Fig 6. The LM117 adjustable regulator.

stage as efficient as possible, we'd like to keep the base current required by the transistor as low as possible since it's wasted as far as the output is concerned. To do this, the beta of the transistor should be as high as possible. However, high-current transistors usually aren't blessed with high betas. One way around this problem is to use a special type of transistor, a Darlington. The Darlington is actually two transistors connected as shown in Fig. 9 (also, the name Darlington more properly refers to the connection of the two transistors and not to the part itself). When combined in this manner, the two transistors look like one, with a combined beta approximately equal to the betas of the two original transistors multiplied together. This can give a part with both high current capacity and high beta, making it ideal for this application. However, the B-E drop is now about 1.3 volts.

The other components shown in Fig. 8 have a place with both the IC and zener/transistor regulators. The small capacitors at the regulator's input and output help keep the output stable when subjected to short, fast disturbances (transients). The diodes across and around the regulator stage serve to protect the active devices against damage.

For example, if the supply is connected to a load which contains, say, a large capacitor, the voltage at the power supply's output may remain high for a short time after the supply has been shut off. In this case, current would try to flow back into the supply, into the regulator's output. The diode *from* output to input passes this current around the regulator so that it cannot flow into the transistor or IC and damage it. These diodes should be fairly heavy-duty units (at least equal to the rectifier diodes in current rating, and preferably a little bigger).

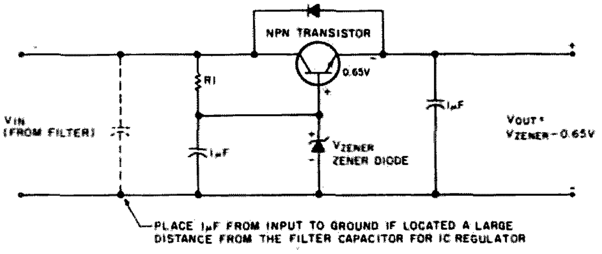


Fig. 8. Zener/transistor regulator.

Of course, sometimes it isn't voltage we want to regulate, but current. The techniques described above, with minor modification, will also work here. Since we've developed a couple of ways to tie down a voltage, regulating current is simply a matter of adding a resistor, as shown in Fig. 10. The regulator stage is now regulating the drop across this resistor, which is in series with the output. But what it's really doing is regulating the output current, thanks to Ohm's Law. The output current is, of course, now fixed at $I_{out} = V_{reg}/R$, where V is the voltage determined by the regulator and R is our series resistor in Ohms. A variable-current supply is made as easily as a variable-voltage one, by using the LM117 with a potentiometer for R2.

No matter how you configure your regulator stage, there are a few things to keep in mind. First, for any of the regulator designs we've looked at, the input to the regulator must be at a higher voltage than the desired output. How much higher depends on the type of regulator chosen, but a good rule of thumb is that you'll need at least two volts more in than you want to get out. Check the manufacturer's data sheet for the exact number in the case of an IC regulator.

Since there is a voltage drop from the input of the regulator stage to the output, this stage is dissipating power. The amount of power dissipated in Watts may be found by multiplying the drop across the regulator by the current passing through it. The maximum dissipation for the device you're using (from the data sheet) must not be exceeded. Most IC regulators will shut down before they pass enough current to cook themselves, but either way your supply won't work. Also, the data sheet for the IC regulators will list a maximum input voltage for the part. Check all the specs before designing in any part.

Well, with all this behind us, let's build a supply. We'll choose a full-wave bridge for our rectifier, which tells us that the output will be somewhere between 0.9 and 1.4 times the rms out of the transformer. Since we wanted a 5-volt supply with a 1.5-Amp maximum output current, let's find a transformer that can give us at least 5/0.9, or about 5.5, volts out at, say, 2 Amps.

But wait—we're going to lose at least two volts in the regulator stage, so what we really need is at least 7.5 Vrms from the transformer. And notice that I said two Amps—not only am I being a little conservative here, but I know that some current is going to be lost in the regulator.

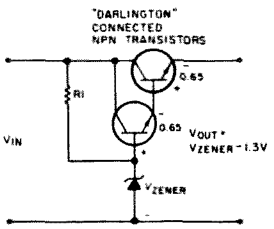


Fig. 9. Darlington configuration.

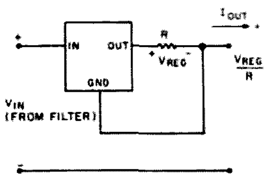


Fig. 10. Regulated-current supply.

Well, a flip through the latest Radio Shack catalog shows that they've got an 18-V, 2-A center-tapped model available (p/n 273-1515). We could either use half of the secondary (9 Vrms) for this supply, leaving the other half free for, maybe, a second output, or we might use the two-diode full-wave rectifier instead and make use of the center tap.

Looks like we'll switch over to only two diodes for our rectifier, since I really don't need a second output. (Again, one of the advantages of designing before I start building—I can change my mind!) Adding a capacitor after the rectifier will filter the resulting dc sufficiently for the regulator to handle, if we stick to a rule of thumb of about 3,000 uF per Ampere. Since we want 1.5 A out, we'll put at least a 4,500-uF cap here. Since the maximum voltage this cap will see is 1.4 times the rms out of the transformer, this capacitor should be rated for at least 1.4×9, or 12.6, volts. Derating an aluminum electrolytic by at least 25% is always a good idea, so the minimum specs for the filter cap call for a 4,500-uF, 17-V-dc unit. Again, the Radio Shack catalog lists a good choice—their p/n 272-1022 is a 4700-uF, 35-V-dc part which should work just fine.

Moving now to the regulator, we can instantly rule out the LM309 as not having enough current-handling, being rated for only about one Amp. While there are heftier 5-volt regulators available, let's try an adjustable regulator, just for the experience. The LM117 we mentioned earlier is rated at

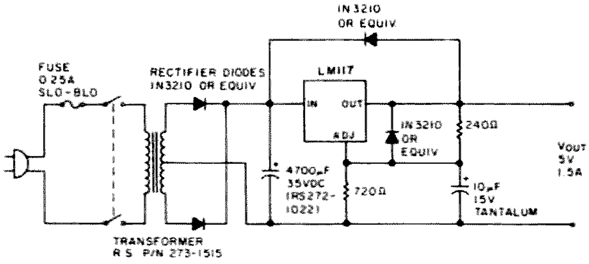


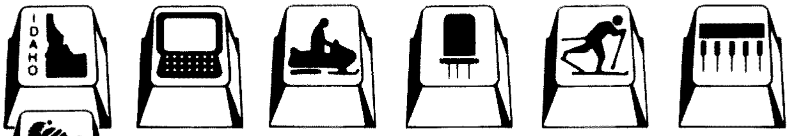
Fig. 11. Final design of the 5-V supply.

1.5 A, or we might play it really conservative and go with a higher-current adjustable such as the LM350. Either way, we can get R2 from our formula, assuming 240 Ohms for R1: $R2 = (5/1.25 - 1) \times 240 = 720$ Ohms. This isn't a standard value, but we can get 720 Ohms by putting a 330-Ohm and a 390-Ohm in series, or hunting through a pile of 680s and 750s with an ohmmeter. Obviously, the closer R1 and R2 are to their design values, the closer the output voltage will be to the desired level.

With R1 and R2 chosen, all that remains is to include the protection diodes and the capacitor at the output (usually about 1 uF) to complete the design of our 5-V supply. The final design is shown in Fig. 11. Notice that a couple of other amenities, such as a switch, a pilot light, and a fuse, have been included in the final schematic. A fuse or circuit breaker is often overlooked in home-brew designs, but you'll never regret putting one in. At the least, you might keep the supply from frying, and you might keep your house wiring from doing the same thing. The proper rating for the fuse is easily determined by remembering that the transformer action with regards to current is the opposite of its effect on voltage. In other words, if the transformer reduces the voltage by a factor of ten, then it'll only draw one-tenth the current into the primary that the secondary is putting out. Since we're going to be drawing at most two Amps from the secondary at nine volts rms, the peak through the primary should be: $I_{primary} = 2A/(117\ V/9\ V) =$ 154 mA. A quarter-Amp fuse should make sure that we catch all problems without blowing under normal operation. Use a "slo-blo" type so that the fuse won't blow from the initial inrush of current when you first switch on the supply and the juice zooms into that big filter cap.

Construction should be simple and straightforward, and the layout is as far from critical as you can get. A couple of points, though: Make sure there are no exposed points at line voltage, and be neat with your layout and actual construction. Also, it's a good idea to mount the regulator on some type of heat sink. You could either buy a commercially-made TO-3 heat sink or mount the regulator on the case of the supply (assuming you're using a metal box). In either case, be sure the regulator package is insulated from the case electrically (you can also buy little pre-cut silicone rubber pads, or cut your own), and use a good helping of silicone heat-sink goop.

Have fun designing and building your supplies. If you'd like additional info on power-supply design, either handbook (the ARRL's or Bill Orr's) has an excellent section devoted to the subject. Keep those soldering irons hot! ■



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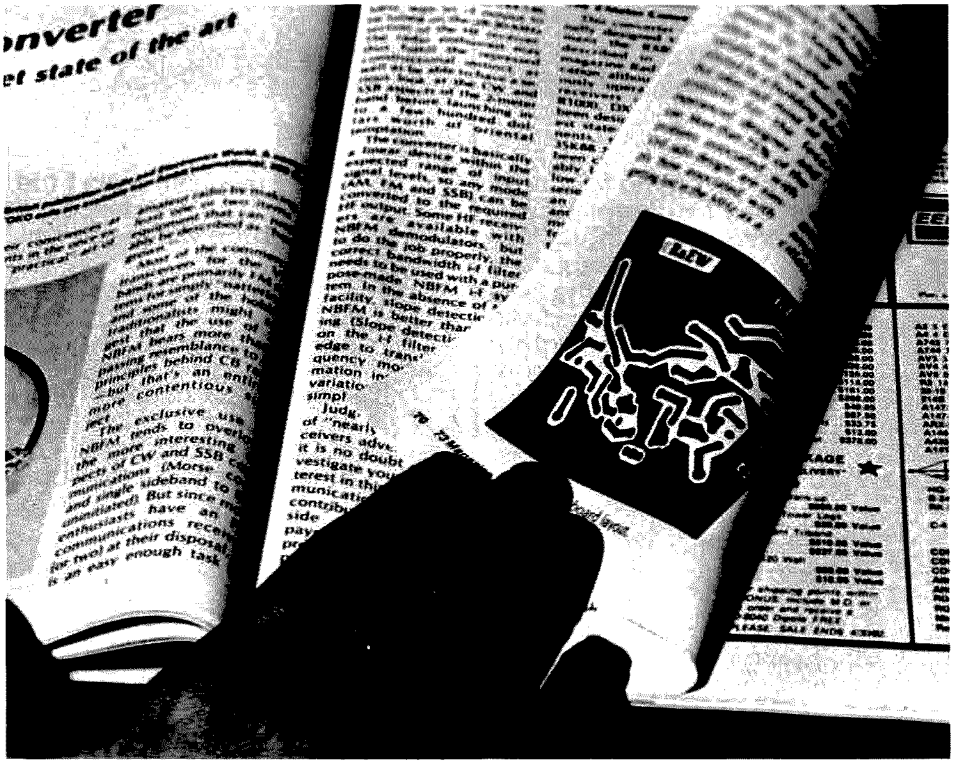
Make circuit boards without expensive equipment. All you need is a light and a fast switch hand.

How many times have you found an excellent construction article in an amateur magazine such as *73* but didn't build the thing because you had no simple, convenient, low-cost method of getting the PCB layout off the page and onto a negative? Magazines and textbooks, unfortunately, have printing on both sides of the page, making it necessary to have the pattern photographed with a copy camera for best results—an expensive undertaking. Other methods such as photocopying leave much to be desired also, due to linear distortion and problems of access to the equipment.

Well, get the junk box fired up, folks, because we're about to walk through a simple, low-cost, and quick method of making PCB negatives that will put you back into the homebrew business. It'll take a lot longer to tell you about it than it will to do it. You don't have to know a thing about photography or have a degree in chemistry to participate, so join in.



Typical article containing PCB layout. My technique offers a simple alternative for those who do not have access to copy cameras or good photocopying equipment.

This technique allows anyone to make exact-size PCB negatives (microwave fans rejoice) directly from the printed page, no matter what is printed on the reverse side (so long as it isn't entirely jet black). The model for this article was taken from a typical page in *73*, as shown in the photograph. We're going to print the whole mess (it may come out with both sides of the page showing) onto Kodalith high-contrast film, then remove what we don't want. The process requires making both positive and negative copies, but have no fear. Only two easily-mixed chemicals are used and the entire operation can be carried out at the kitchen or bathroom sink. The bathroom is better because it's easier to control dust in that area. I'll explain this further on.

First, a word about *positive* and *negative*. The pattern on the magazine page is a *positive* image—the subject, if you will. The *negative*

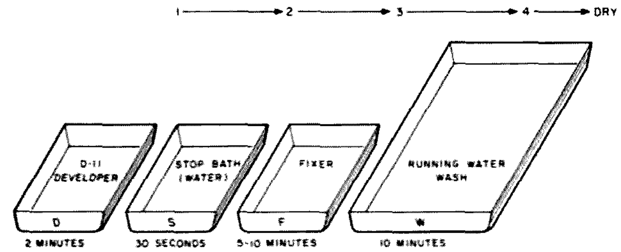


Fig. 1. Layout of trays, showing sequence of operations. Note that trays are marked for their respective chemicals. Interchanging trays and chemicals eventually results in disaster somewhere down the line due to contamination.

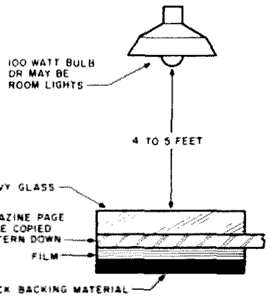


Fig. 2. This is the setup for making the first exposure directly from the magazine page.

is the first copy of that subject and is identical to the negative you get in your camera when making an ordinary photograph. By printing that negative, you get an image that looks like the subject; it also is a positive.

The photo-etching process can be done using the positive or the negative technique; we will make both positive and negative images so that all bases will be covered. (See the illustrations.)

Setting Up

First, trot down to the local photography store with the shopping list in Table 1. There are no exotic items on the list, and a well-stocked store should have everything on hand. Graphic arts people and photographers use this stuff by the ton every day.

Next, stop off at the hardware store with the list in Table 2. (All of these items can be purchased at the photo store but would cost you a bundle by comparison.) If you opt to "borrow" some of the common items from the kitchen, keep them. *Don't ever use them for food again. Photographic chemicals are highly toxic.*

Mix the chemicals. Follow the manufacturer's directions. There is no magic involved; just get in the ballpark. A few tips might be in order, however. Mix by stirring, as recommended. Sure, you can dump the whole mess into the gallon jug and shake it like mad, but this action mixes an excessive amount of air with the chemicals and the oxygen in the air causes rapid deterioration of the chemicals.

Try to mix the chemicals the day before you will use them, and store the mixture in the area where you will be developing your film. This will allow any air in the solution to escape—and you won't have to worry about temperature problems. Most schools recommend sixty-eight degrees Fahrenheit as the ideal temperature. This temperature was picked because that was the average room temperature of a house in England when the process was discovered generations ago. Photographic processes work over a wide range of temperatures, with adjustments, but we won't go into that here. Just maintain an average, comfortable household temperature.

Prepare the work area. Dust and dirt are the villains in any photographic process. Clean the work area until it shines. Remember the bathroom recommendation? Great. Turn the shower on hot for a short period of time to fill the room with steam. Turn the shower off, close the door, and let things cool off for about an hour. The steam will have settled all of the dust out of the air by the time you're ready to work.

Minimal equipment is required. The gallon jugs needed are not shown.

The work area must be light tight. The film must be opened and processed only under the illumination of your safelight, so you must seal up the windows and doors so that no great amount of outside light seeps in. I'll leave that operation up to you because how it's done depends on your particular circumstances. To check if it's been done properly, stand in the darkened room for five minutes. You'll then be able to see any obvious light leaks. Seal them up.

Lighting

You will be using two kinds of light; we will call them white light and safelight. The white light can be a 100-Watt light bulb or just the ordinary room lights if they are fairly bright. The white light should be directly over the area where you will be exposing your film. (This area is called the "dry side" of the room.) The safelight that you purchased at the photo store should have a red filter to give off a red-color light. It should have a bulb no larger than 15 Watts, and 7½ Watts is better. Hang it four to five feet away from the film-processing areas. You'll be sur-

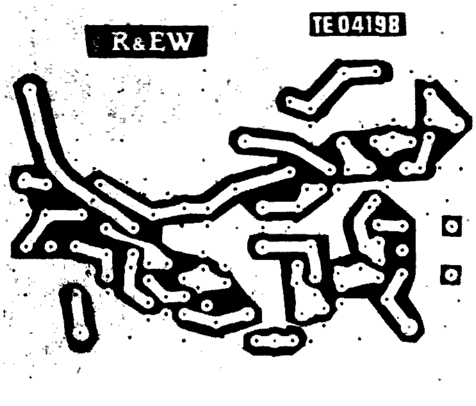


Fig. 3. A negative obtained by the process described.

A windowpane makes a quick "light box" for retouching both negative and positive. Mark on dull (emulsion) side of film only. North light works best.

prised to find that after a few minutes in this dim darkroom light you'll be able to read a newspaper. *Please take all of the usual precautions when working around plumbing fixtures and electricity.* If you are not sure about the safety of your conditions, have an expert check them out. Don't take chances.

Pour about an inch of the appropriate liquids into the three small trays (see Fig. 1) and arrange them as shown. The larger wash tray may be used on the same "wet side" of the room or set up in another area as you will be washing the film in normal room-lighting conditions. If you happen to spill the chemicals, wipe them

1. Kodalith ortho film, type 3, Kodak #2556. (This is a very thin Graphic Arts film, sold in 4″ × 5″, 5″ × 7″, and 8″ × 10″ sheets, 50 sheets per box. *Do not open except in darkroom.*)

2. Kodak D-11 developer. (Sold in powder form. When mixed with water, makes one gallon. Kodalith developer is usually used with this film but produces overly-hard blacks in unwanted areas for our purposes.)

3. Fixer. (Also known as hypo. Sold under many brand names. May be powder or liquid. Buy powder. In liquid form you're paying for a lot of water.)

4. Photoflo. (Kodak's trade name for a wetting agent that helps dry film without spots. Buy smallest container. It'll last forever.)

5. Stop bath. (A solution of 28% acetic acid and water is normally used but too much acid can produce bubbles on the emulsion. I use plain tap water only, at the same temperature as the other chemicals, for all my films.)

6. Stainless-steel tongs. (One required for handling wet film. More expensive than wood or bamboo but doesn't absorb chemicals and lasts a lifetime.)

7. Safelight with 1a red filter. (I use a 10-Watt red bulb that I know doesn't fog the film. To test: In a dark room, lay a sheet of film on the work table, place a coin on the film and turn on the safelight for five minutes. Develop the film. You should not get an image of the coin on the film if the light is safe.)

8. Red opaque pen. (I use red because it's easy to see on the film. Do not use regular marking pen. Black india ink also works well but can be quite messy.)

Table 1. Photographic materials needed.

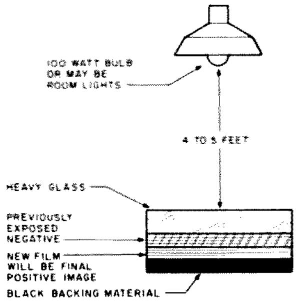


Fig. 4. This is the setup for the second exposure. The resulting positive image can be used to make your PCB.

up because they can cause ugly stains. (Suffering the wrath of others is not part of this process.) Now all of the running is done; the setup is complete, so let's get on with the fun part.

Making the Negative

Close the door, turn on the red safelight, and turn off the white room lights. Your room should be dimly lighted by only your safelight at this point. Open the film box, snip off the end of the foil envelope containing the sheets of film, and remove one sheet of film. Fold the end of the foil envelope over, place it back in the box and *close the box.* Lay the film on the black backing material—or in the contact frame if you have elected to go that route. The film is so thin that for our purposes it doesn't make any difference which side is up, but it is good darkroom practice *always* to have the emulsion side facing the subject being copied.

Next, place the pattern to be copied on the film, copy down, in contact with the film. Lay the heavy glass on top of the pack to hold everything flat and in place. Fig. 2 shows the setup for this operation. *Recheck the film box to be sure it is closed.* Switch on the white light for two seconds. Turn off the white light. The negative has now been exposed.

Developing the Negative

Remove the exposed negative from the pack and with a quick sliding motion put it into the tray of developer so that it is covered with developer solution. Rock the tray gently by lifting and lowering one corner to keep fresh developer constantly moving over the surface of the film. You will see the image pop up on the film in about thirty seconds. Continue agitating in this manner for a total of two minutes.

When the time is up, carefully grasp the film by one corner with your tongs, lift it out of the developer, and let it drip for five seconds. Slide it into the tray of stop bath and agitate it for about thirty seconds. Again, lift it out by one corner, drain it for five seconds, and slide it into the fixer. Don't let the tongs touch the fixer or the next time you put them in

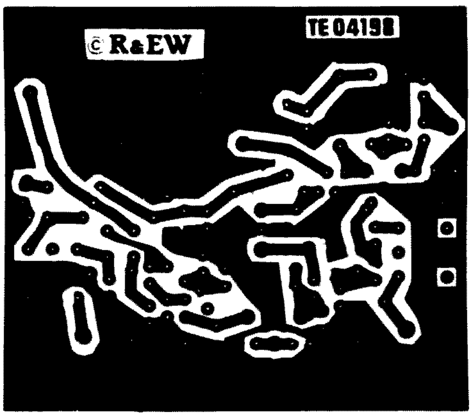


Fig. 5. A positive obtained by the process described.

the developer the fixer will contaminate it and decrease its working life.

Agitate the film in the fixer for five to ten minutes. The film will have a milky-white cast to it when you put it in the fixer. A good rule of thumb is to fix the film for twice as long as it takes for the milky cast of the film to clear. After the film has cleared you can turn on the white room lights. (Did you check to be sure your film box was closed?)

Remove the negative, which should show a good strong image at this point, and place it in the wash tray containing running water of approximately the same temperature as the processing solutions. Wash away the residual fixer for about ten minutes. Turn off the water and add several drops of Photoflo™ to the wash water. Move the film around in the Photoflo solution for about thirty seconds.

Remove the negative from the tray and hang it up by one corner to dry. Do not wipe the film. Drying should take about one hour, but if you're in a hurry you can use a hair dryer to accelerate the action. Let the film drip dry for about fifteen minutes before using this technique, and don't get too much heat on the film or nasty things will happen. Gently does it. Just be sure that it is perfectly dry for the next step.

Fig. 3 shows an example of a negative obtained by the process described.

Opaquing the Negative

Place the film negative on a clean window pane (or light box if you have one) and hold it in place with tape on two diagonal corners. A window on the north side without direct sunlight works best. Now you can examine your negative image in all its glory. The image will be reversed from that in the book—the clear areas representing the copper and the black areas representing the areas where the copper will be etched away on the final board.

The is the first stage. You may notice some of the printing from the reverse side of the printed page showing through the clear areas, but don't be concerned. The next operation will remove it.

With your red opaquing pen, color in all those unwanted spotty clear areas showing through the black, being careful *not* to fill in any clear areas that will eventually be copper. (The red ink allows light to show through, but don't worry about it. The film cannot see red light—it will look black to the film.)

Making the Positive

Back to the darkroom: red safelight on, white light off. Take a new piece of film from the box and sandwich it with your negative, as shown in Fig. 4. *Check the film box to be sure it's closed.* Flick on the white light for a two-second exposure. Run the new film through the developer, stop bath, and fixer the same way you did the first time. Wash and dry. You now have the positive that should look pretty close to that pattern you copied from the page. Tape it to your window or use your light box and spot-fill the unwanted clear areas.

A couple of notes that might help you through the learning curve: Don't be afraid to vary the times given for exposure or processing. Kodalith is a very versatile material that can perform all kinds of tricks for you. For instance, by varying the exposure times you will find that the width of lines and diameters of circles change. Not only is this phenomenon a characteristic of the film and a good indicator of proper exposure, but it can be used to make such things as QSL cards using the line-positive technique. The *Photographic Lab Handbook*, by John S. Carroll, is an excellent reference for this type of work. Eastman Kodak also has a library of publications on the use of their products, most of which should be available from your photo dealer.

The red opaquing pens recommended here are sometimes hard to come by. Black india ink is a good substitute but can be hard to see on the black image. Standard marking pens do not work too well, in my experience. The ink seems to vary widely in its light-filtering characteristics.

Thanks to my wife, Rita, for helping me with this article.■

1. 3 one-gallon jugs. (Used for mixing and storing chemicals. Must be glass or plastic, not metal. Opaque containers are recommended but are expensive. Empty plastic milk bottles work fine if you store the chemicals in a dark place.)

2. 3 glass, plastic, or stainless-steel trays. (Should be about two inches deep and larger than the largest size film you expect to use. Mark them D, S, and F. Use them for the same chemicals each time.)

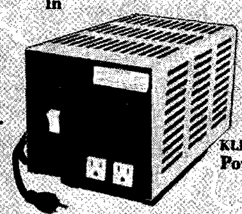
3. 1 piece of clear glass, ¼-inch thick. (Should be larger than the largest size film you expect to use. Contact printing frame may be used instead.)

4. Black backing material. (Should be larger than the largest size film you expect to use. I use a sheet of black plastic foam. Material such as cloth will produce lint that will give you fits. Not required if you use contact printing frame.)

5. 1 large plastic tray or tub. (Used for washing film.)

Table 2. Hardware needed.

Computer Protection



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"We've Been Boarded!"

When the Lorelei *strayed into Nicaraguan waters, hams came to the rescue. Here, the net results.*

Following is a chronological account of an event of which all amateur radio operators can be proud. This is because, beyond any doubt, it was an instance where the Amateur Radio Service was the only means by which comfort, aid, and reassurance were given to certain people who were involved in emergency circumstances.

To the best of my knowledge, all of the operators involved (whose cooperation and coordination were of critical import) were these: Art HH2A, Fred K2OGS, Bill HR1BL, Bob N6CSV, Brian, a non-amateur, Dan N6IAU, NMI (Coast Guard, Miami), N1CLS/5, YV2CPG, and myself, W9UUC.

I usually tune in my radio to the Maritime Mobile Net on 14.313 as soon as I get home (Elmhurst, Illinois), around 3:30 or 4:00 in the afternoon. This is just what I did on Tuesday, May 17, 1983. After listening for only a short time, I heard a station say he was maritime mobile with emergency traffic.

HR1BL (Tegucigalpa, Honduras), who was net control at the time, asked if anyone had a good copy on the ship. Both K2OGS (Yonkers, NY) and HH2A (Haiti) said they did. Net control asked them to move him off the net frequency. They went to 14.324, and I followed them and told them I also had a good copy on the ship.

The emergency call was from Bob N6CSV, and his signal was coming from within 12 miles of the Pacific coastline of Costa Rica. He advised that the emergency was still in progress.

He stated that he had been sailing with three other American sailing vessels on a pleasure cruise about five days out of Mexico. They all had been heading for Punta Arena, Costa Rica, when a storm came up at night and blew the four of them off course. Soon after the weather cleared and the next day had dawned, he found himself alone at sea—in touch with the others through only one of them, Brian. It was Brian who had the emergency and had contacted N6CSV by VHF maritime radio, channel 16.

At that moment, Brian came on frequency and said he was not a licensed operator, but that he understood (correctly, of course) that in an emergency situation it was legal for him to transmit. HH2A couldn't hear Brian too well, but I could, so he asked me to ascertain the nature of the emergency.

Brian informed me that he was aboard the sailing vessel *Lorelei.* He told me how his and the other two ships had become separated by about 20 miles from N6CSV. At daybreak, the three saw close to them land which they believed might be Nicaragua. Realizing that they were in that nation's waters, they immediately headed westward and stayed on that course for some time.

It was then that the reason for the emergency transmission became clear. I learned that on deck above Brian, unaware of his radio communications, was an armed crewman from a Nicaraguan gunboat. All three ships had been boarded (after Brian had thought they were in international waters), and, at that very moment, they were guarded and under orders to sail for the Nicaraguan port of San Juan del Sur.

At this time, HH2A, who could hear enough to get the picture, suggested that this called for US State Department attention. K2OGS agreed and said he would place a call to the departmental emergency number at once.

Still having the best contact with both Brian and N6CSV, I informed them both of our actions. Brian then asked me to call his brother in the States and apprise him of the situation, but ask that he not, at this time, let his wife's folks know what was taking place. At this point, YV2CPG (Philadelphia)—I believe that was his call—came in to say that he was portable in the area and would stand by in case he was needed.

Brian and I were keeping our transmissions as short and infrequent as possible to minimize the chances of having any Nicaraguans overhear, but now Brian informed me that the crisis was deepening. He had just been informed on VHF by the skipper that the order had been given that all men would have to leave the ships when they reached land and that all the women would have to remain on board.

About this time, K2OGS came back on and said Coast Guard, Washington, was going to handle everything and would be up on frequency soon.

For a long time nothing was heard and tension began to mount. N1CLS portable 5 came on and said he was at Keesler Field, Biloxi, and had a direct line to New Orleans if needed.

Finally, after more delay, K2OGS came back to say that NMI (Coast Guard, Miami) was now going to handle everything and would be up on frequency soon.

After what seemed a half hour or longer but actually was only about another ten minutes, NMI did come up on frequency. But could we

turn all transmissions over and just listen? No. NMI had such a terrible ac hum on his signal that he was very difficult to copy and was impossible for Brian. I had to continue to relay all transmissions.

NMI needed specific information, and I obtained it from Brian: the names of all ships and their documentation numbers, the home port for each, a contact phone number in the States for each ship, and the names of all persons on each ship.

NMI also wanted to know if all parties were American citizens, if all three ships had been boarded simultaneously, and where they were heading. I reported for Brian that the answer was yes, they were all American citizens, and that they were being taken to the port of San Juan del Sur. Then NMI wanted to know if they were under any kind of harassment or were being taken in forcibly.

Looking back to that Tuesday, May 17, I believe now that it was at this point that tension had been at its highest, for Brian's answer gave us our first reason to begin to feel better. No, no actual harassment, Brian said, even though there were the armed guards on all ships. In spite of this, said Brian, all three ships were keeping in continuous contact with each other via their VHF marine radios, and nobody was being threatened.

At this point, we heard from HR1BL again. He informed us that he was in touch with the American Embassy there in Tegucigalpa. While he was on the phone with them, he wanted to pass on the same information which I had relayed from Brian to NMI. I therefore gave it to him. A short while later, we learned that the embassy in Tegucigalpa was in communication with the embassy in Managua, the Nicaraguan capital.

Tension heightened once more when it was reported by one of the listeners on both the VHF channel and 14.324 that one American on one of the boarded ships had given a real tongue lashing in Spanish to one of the Nicaraguan naval officials regarding their capture and being forced to sail into a Nicaraguan port. Almost at once, however, a follow-up report cleared the air and it seemed that everybody was being very cooperative.

It is an indication that understandings were then finally being reached by all concerned, that the last transmission I logged—at 2315Z—was to the effect that at least six ships in the Bay of Coco (off Costa Rica—where N6CSV had sent out his call for help) had been listening to all that was said and reported that there was plenty of beer on ice ready for all ships returning from the high seas!

Now we come to the aftermath of the story. At approximately 0110Z on May 19 (2010 Chicago time, on the 18th), I contacted Dan N6IAU on board one of the ships which had been seized. He seemed to know me by name and asked me to make some phone patches for him.

We had a very good ragchew about the whole episode, and from it and the phone patch I made for him to his mother, I learned more about what had then happened.

It turned out that as a licensed amateur operator he had been listening to everything which transpired between me and Brian. I never asked him the reason he didn't ever transmit, but who knows, perhaps he felt the armed guards on his ship might come down at any time.

He felt that one reason they were released so quickly from San Juan del Sur was that the Nicaraguans didn't want the counterrevolutionaries in their country to get hold of the situation and perhaps blow it up all out of proportion. He also stressed how very well they all were treated.

N6IAU even mentioned the fact that they had shown the gunboat guards the weapons they had on board their ships for purposes of self-protection. The guards hadn't been at all interested and made no move to confiscate them.

Not only were they not harassed, but while at San Juan del Sur, the Minister of Defense invited his father to go to Managua for a tour! The Minister took his father around the city and bought him a steak dinner and some drinks. N6IAU said they all had been a little anxious while his father was gone, but when he returned were pleased by the report that the steak was one of the best ever served anywhere in the world!

Finally, you readers should know that N6IAU's mother said that while the State Department had kept in close contact with her and had continually assured her that they would let her know as soon as they had fresh information, thanks to amateur radio, she was able to call the State Department and be the one to report the up-to-date news!

In conclusion, I would just like to state that much of the credit for the successful outcome of this episode should go to Fred K2OGS for contacting Washington and apprising them of the situation and to Bill HR1BL for quickly reporting the details needed to our embassy in Honduras. All I did was relay information to NMI and to HR1BL when he had our embassy on the line. HH2A also did a fine job as net control.

I would like to thank Jack K4DMK (aka the Swamp Rat)—who does a fantastic job as coordinator of the 14.313 MM net—for information received to help me in the preparation of this article. ■

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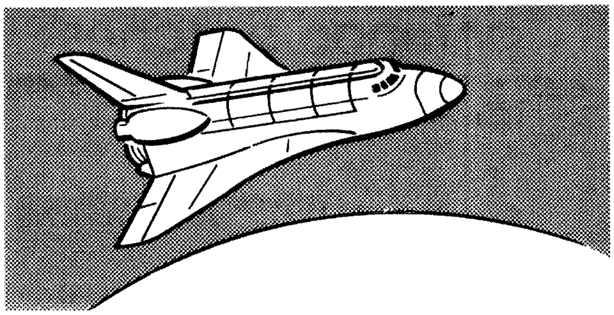

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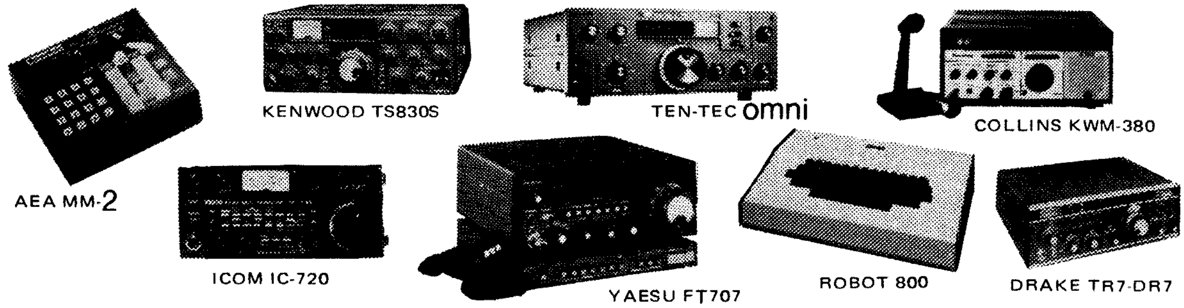

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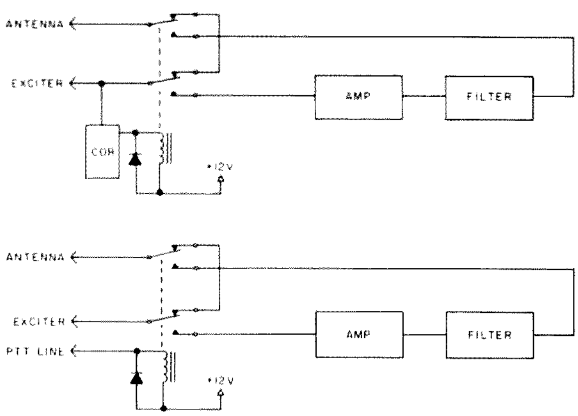


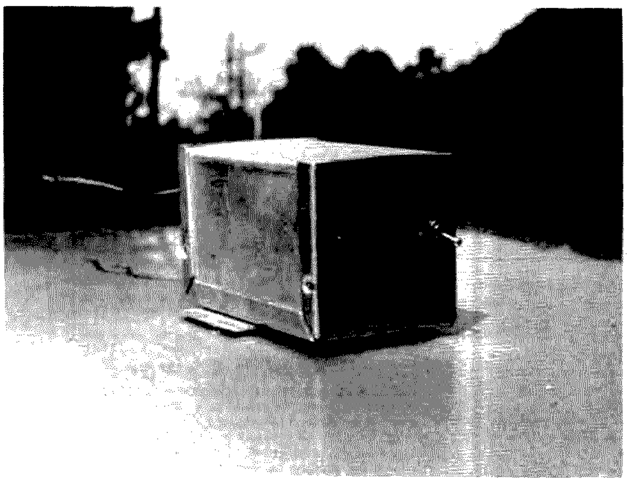
Fig. 1. Block diagram using COR (top) and transceiver PTT line.

With varying degrees of success, I have converted several CB transceivers for use on 10 meters; the most recent was a Realistic TRC448. After conversion, the transmitter would produce only 1 Watt AM and 4 Watts SSB. I felt that a little more power would provide a more satisfactory mobile signal. What I needed was a small linear amplifier, preferably solid state.

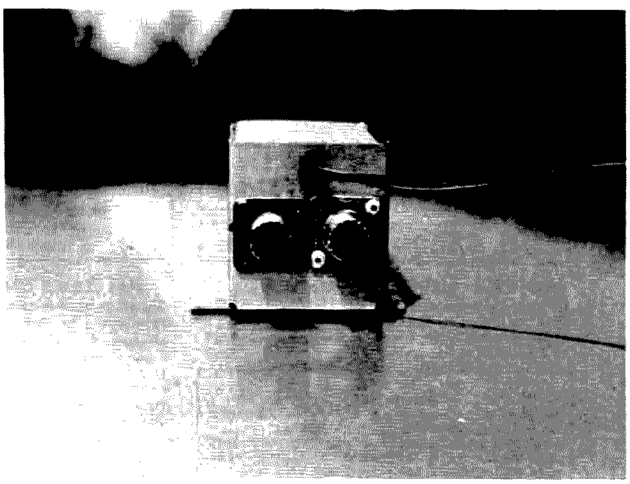
One of the primary reasons for converting a CB radio in the first place was cost, so any power amplifier used would have to be inexpensive to build. Ideally, it could be built using parts from the junk box.

After spending considerable time digging through old magazines and books, many circuits were found, but all of them failed to meet my requirements. They either used vacuum tubes (too much current drain), produced more power than I wanted (I wanted only 40 or 50 Watts), or used more than one power transistor, adding to the cost of construction. I was just about ready to forget about more power and use what I had.

A few days later I found what would possibly meet the requirements I had set for an amplifier: It was inexpensive, solid state, and had low current drain. A friend had a small amplifier that had originally been manufactured (illegally) for the CB market. Like most amplifiers of this type, the manu-



The front of the amplifier shows the power switch on the right and the LED power indicator on the left.



The rear view shows the placement of the SO-239 rf connectors and the power leads.

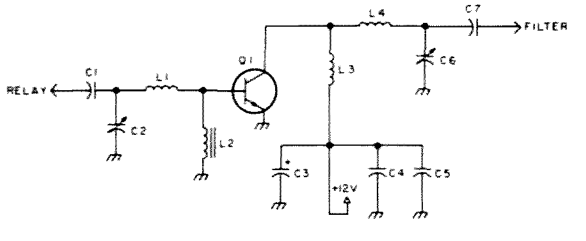


Fig. 2. Power amplifier.

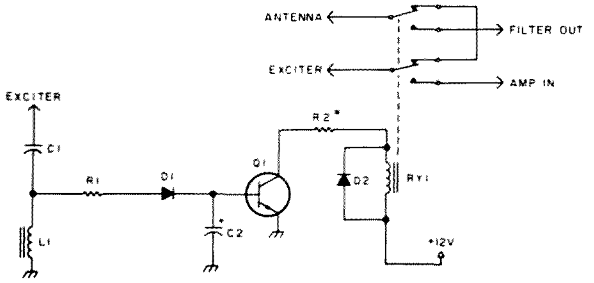
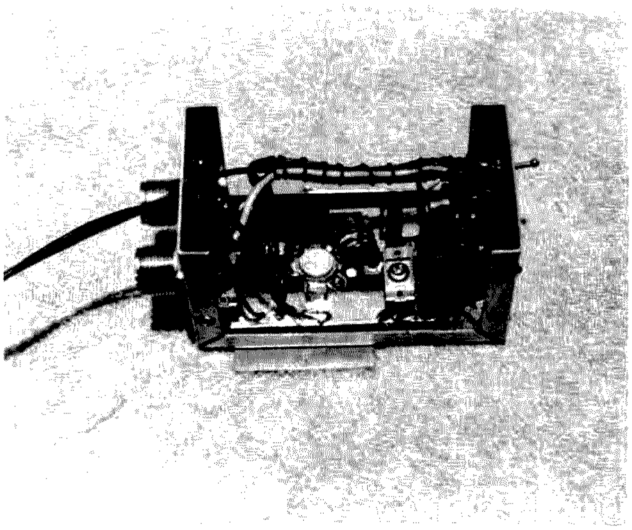


Fig. 3. Optional COR circuit.



The first amplifier constructed did not have a heat sink as large as later units. The only heat sink used other than the enclosure was a small strip of aluminum used as a mounting bracket. This proved to work well when the amplifier was mounted on a metal automobile dash. The COR circuit board and relay are seen in the right end of the enclosure. The COR board was soldered to the amplifier board to facilitate mounting and conserve space. The enclosure shown in this photograph measures $2\frac{1}{4}" \times 2\frac{1}{2}" \times 4"$. In later versions, a larger enclosure was used.

facturer did not put his name or address on the unit so that no information was available on the circuitry. The only way to find out about the circuit was by drilling out the pop rivets holding the cover and looking inside. After much discussion, my friend agreed to let me take his amplifier apart.

Once the cover was removed, I saw that in its present state this was not what I was looking for. The circuit board was poorly laid out, the power transistor was not mounted on the board but was located on the side of the enclosure and had rather long lengths of wire running to the circuit board, and there was no output filtering.

The only redeeming factors for this amplifier were its simplicity and the availability of the parts used in it. It was definitely a junk-box project. The only part that I would have to buy would be the power transistor. With a new circuit board layout, perhaps some minor changes in component values, and output filtering, I should be able to produce a usable amplifier.

The input and output coils were each reduced by half a turn, L1 from $4\frac{1}{2}$ to 4 turns and L4 from $3\frac{1}{2}$ to 3 turns. The shank of a $\frac{5}{16}"$ drill bit was used as a form for each of these coils. They are wound of 16-gauge, solid-copper wire, either bare or enameled, and the spacing between turns is approximately equal to the diameter of the wire.

The collector choke, L3, was close-wound of 22-gauge hookup wire (enameled could be used). A $\frac{1}{4}"$ drill bit was used as a form for this coil. Input capacitor C1 was changed from 220 pF to 330 pF.

A new circuit board that would be easy to make and that would allow all of the

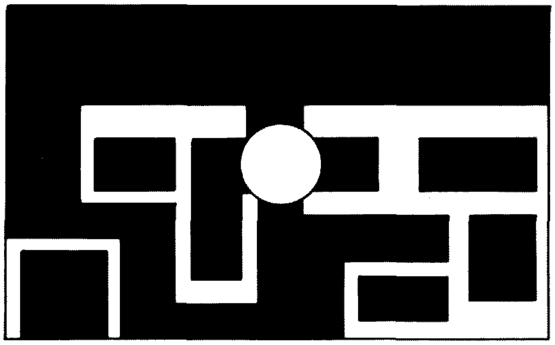


Fig. 4. Power amp PC board.

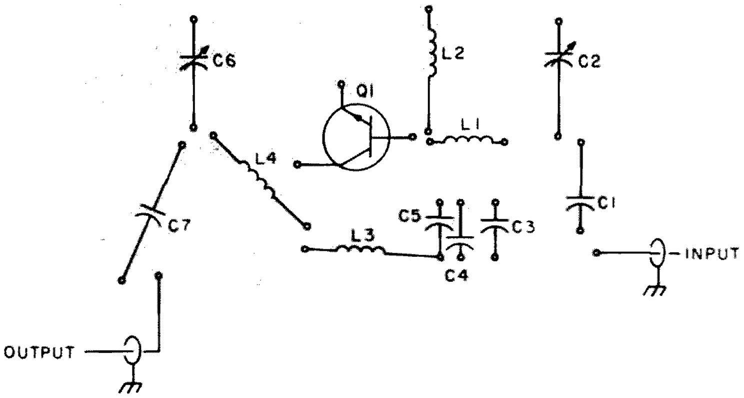
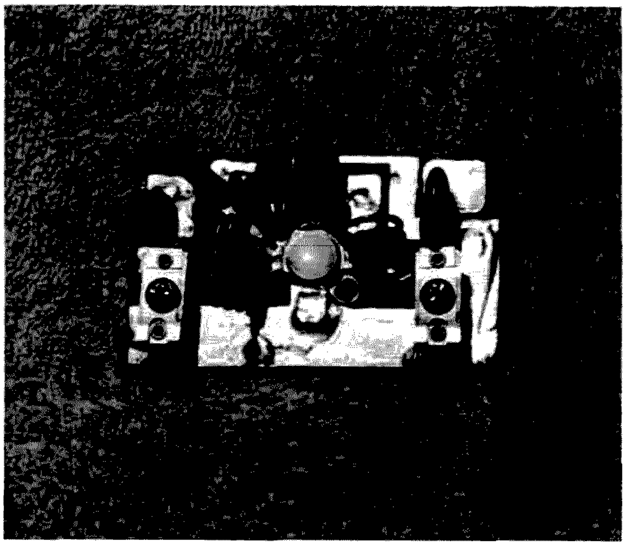


Fig. 5. Power amp parts placement.



Circuit board of the first amplifier constructed. It used a flange-mounted power transistor rather than the stud-mounted MRF455A specified in the parts list. Later units used MRF455As because they only require a single round hole in the board, making them easier to mount. The input pad is at the upper left, the output at the upper right.

Parts List

Power Amplifier

C1	330 pF	NE*	$ .26	
C2, C6	55-300-pF compression trimmer	FS*		
C3	.01-μF disc	FS	1.35	
C4	.001-μF disc	FS	.09	
C5	1-μF 50-volt radial leads	FS	.16	
C7	1200-pF, 1-kV dipped mica	NE	.75	
L1	4 turns 3/8" long (see text)			
L2	1.8 μH	FS	.24	
L3	9 turns (see text)			
L4	3 turns 5/16" long (see text)			
Q1	MRF455A or equivalent	NE	14.08	

COR

C1	220 pF	NE	.26	
C2	1-μF, 50-volt radial leads	FS	.16	
D1	1N914, 1N4148, etc.	FS	.08	
D2	1N4004 or equivalent	FS	.12	
L1	1.8 μH	FS	.24	
R1	470 Ohm, 1/4 Watt	FS	.25	(for 5)
R2	see text			
Ry1	DPDT 12-volt coil relay	FS	1.80	
Q1	2N2222 or equivalent	FS	.90	

Miscellaneous

2 connectors (SO-239)	RS*	.99	
Enclosure, aluminum box, 5 1/4" x 3" x 2 1/8"	RS	2.49	
1 SPST switch	RS	1.99	
1 red LED indicator	RS	.79	(for 2)
1 series resistor for LED (use 470-Ohm resistor from COR)			

* NE—Newark Electronics, 500 N. Pulaski Rd., Chicago IL 60624; FS—Fuji-Seva, Box 3375, Torrance CA 90510; RS—Radio Shack.

components to be mounted on it was designed. I used 1/16" double-sided fiberglass circuit board with etching on one side and the foil left intact on the bottom. Components were soldered directly to the foil pads on top of the board. There is only one hole drilled, in the center of the board—the one for the power transistor. The power transistor mounts through the hole; its stud goes through the box used as an enclosure, and a 1/16" thick piece of aluminum was used as a heat sink. (The aluminum should be the same length and width as the enclosure.) Small spacers should be used between the circuit board and the enclosure to support the board. No strain should be placed on the transistor leads, and care should be exercised when tightening the nut on its mounting stud.

Tune-up of the amplifier is simple: Connect the exciter (3 or 4 Watts AM or CW) to the input of the amplifier and a 100-Watt power meter and a 50-Ohm dummy load to the output. Adjust trimmer capacitors C2 and C6 alternately for maximum power output. When maximum output is obtained, adjust C6 for approximately 50 Watts output. Compression or expansion of coils L1 and L3 may be necessary to obtain maximum output. A 12-volt power supply capable of supplying 5 to 6 Amps of current or a 12-volt battery should be used as a power source during this procedure.

The MRF455A is rated for 60 Watts when used with a finned heat sink, but neither the transistor nor the heat sink (the aluminum plate) gets warm during normal use. Care should be exercised during tune-up to keep the output near 50 Watts, or the transistor may possibly be overheated.

There are two ways of controlling the amplifier: by using a COR (carrier-operated relay) or by using the PTT line in your transceiver. If your transceiver uses relay switching, as mine does, it is a simple matter to run a control line from the PTT line to the amplifier-control relay. If you have electronic switching, the COR probably will be the easier way of controlling the amplifier; a schematic and circuit board layout are included with this article. The value of the electrolytic capacitor on the base of the switching transistor will have to be changed for use on SSB; 10 μF should be about right.

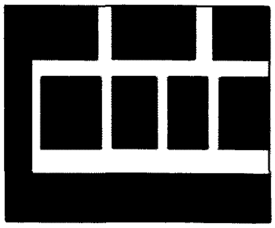


Fig. 6. COR PC board.

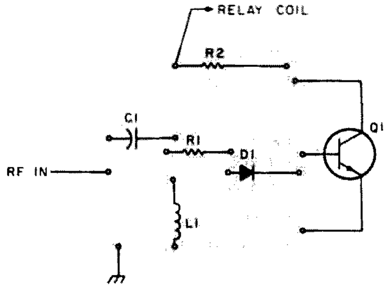


Fig. 7. COR parts placement.

Depending upon the relay used, the 200-Ohm resistor in series with the relay coil may be omitted or its value adjusted for positive switching (the relay in my amplifier would not drop out without the resistor).

A filter is needed on the output of the amplifier before putting it on the air. It may be an external filter or it may be built into the same enclosure that houses the amplifier. I used a tunable low-pass filter that I had bought at a hamfest. I tuned the filter for minimum interference on TV channel 2. (The filter has seven tunable sections.) I don't know how much this attenuates the second harmonic, but after tuning there was no interference to the TV receiver.

The amplifier is broadbanded and should work equally well on other bands. For this reason I have not included parts values for an output filter. Several suitable filters are discussed in chapter 15 of my *Radio Amateurs Handbook*.[1] Particularly interesting are the Chebyshev low-pass and the "Citation-Eliminator" filters on pages 15-7 and 15-8. I have not, as of yet, tried either of them.

The parts used in the construction of this amplifier are readily available. Mine, with the exception of the MRF455A, was built entirely out of parts that I had in my junk box. If all new parts are used, it can still be built for under $50.00. Parts sources and prices are given in the parts list. (If you shop around you can probably find lower prices.) I can supply etched and drilled PC boards for $7.50 and an SASE per pair.

I will try to answer any questions if they are accompanied by an SASE. ■

[1]American Radio Relay League, Newington, Connecticut, 1979 Edition.

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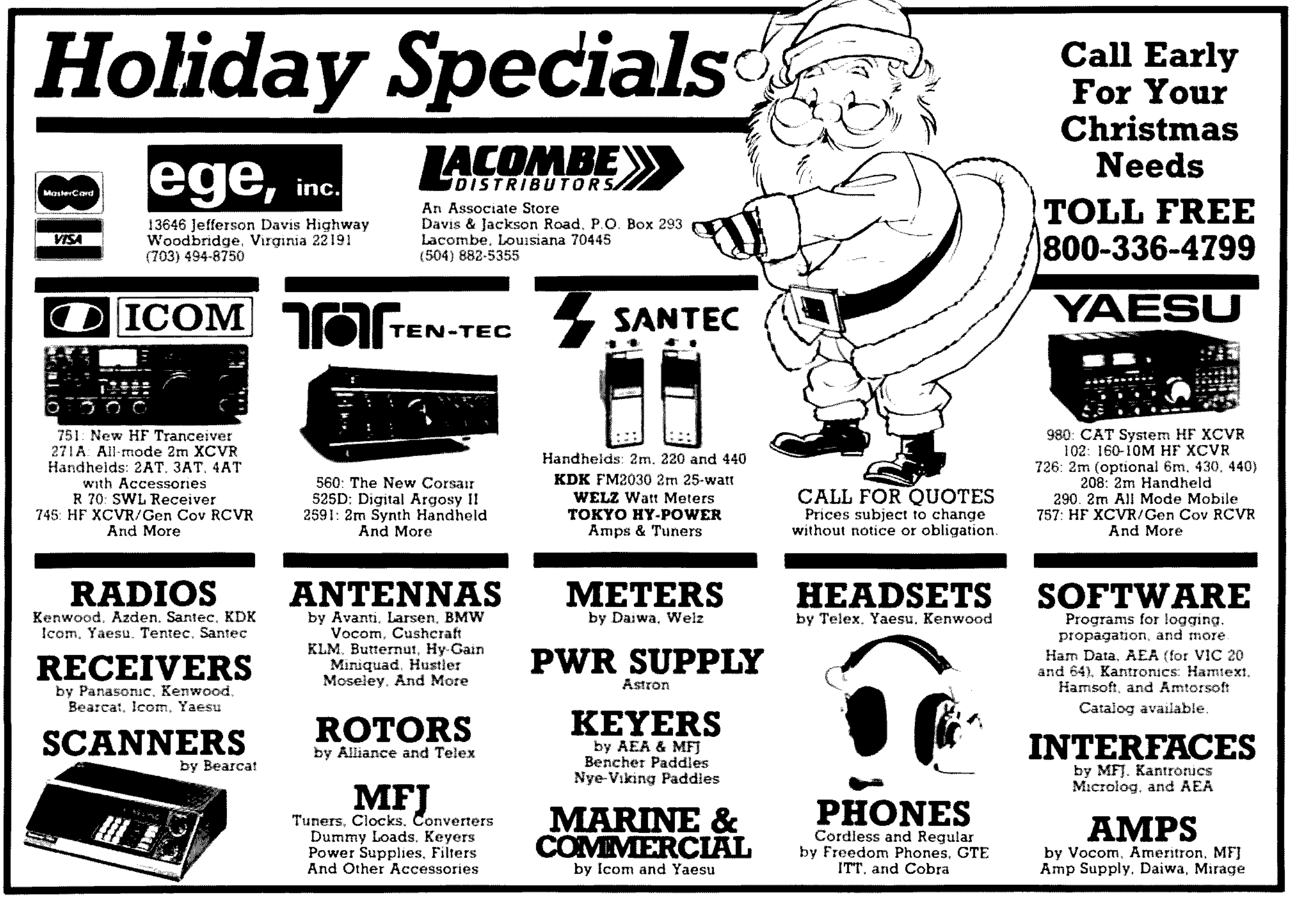

Timothy Daniel N8RK
7 Peabody Drive
Oxford OH 45056

TVRO Troubleshooting

Get your Earth station off the ground with these signal-enhancing hints.

My head swells to twice its usual size every time I complete a home-brew project. After all, there is nothing quite like the feeling that accompanies turning a handful of parts into a living, breathing circuit. But then again, there is nothing worse than a project that *doesn't* work. My first experience with a satellite TV system taught me that. No need to worry about a swollen head; just give me a corner to hide in while I do the troubleshooting.

It's one thing if we are talking about a three-chip keyer that you have a grand total of $5.00 and two hours invested in. But watch out if the investment is in the thousands of dollars and hundreds of hours, not to mention promises made to family and friends. Perhaps the only thing worse than a TVRO system that shows no sign of working is a TVRO that puts out poor quality pictures. *"Is that the best it can do?"* the neighbors ask.

The problem isn't the satellites; it's just that getting a TVRO up and running isn't the same as taking a $2000 ham radio transceiver out of the box and making your first QSO ten minutes later. Troubleshooting is almost always called for. Even if you buy most of the components for TVRO, it takes some fine tuning. However, a dB here, a dB there, and pretty soon you'll have a picture that does justify a swollen head.

Gain Without Strain

You have to start somewhere, and unless you *know* what is wrong, I suggest you begin with the antenna. Backtrack a few steps and take a close look at the way your antenna is built. The gain of a parabolic dish is highly dependent on the accuracy of the surface. Most commercially-built antennas claim efficiencies between 50 and 60 percent, based on a surface accuracy where all errors are less than ± 1/16 of an inch.

You can't just give your antenna an eyeball diagnosis. A thorough checkup is in order, using either a carefully-made template or the mirror method described by Steve Gibson in the April, 1982, issue of *73*. The final check on your antenna's surface accuracy should be done while it is in operating position and subject to everyday stresses.

If the patient seems to be in danger, take preventive measures before proceeding. A one- or two-piece molded dish that is out of spec could spell disaster while antennas made from petals can sometimes be strong-armed into shape. But beware of a need for excessive pounding or bending. The whole surface should be accurate, not just one side! Luckily, commercial antennas have become much more reliable in recent months, but do check them carefully before you buy.

Photo A. Follow the crowd and point your antenna in the same general direction as everyone else. Be sure to include declination in your azimuth calculation.

If you home-brewed the antenna, then there is no one else to blame but yourself. Wood-frame dishes covered with window screen have become popular and they work well. Just make sure that each of the ribs is sanded down to match the master and that the screening is carefully applied. Bulges, ripples, and excessive overlapping will cost you gain. If you have built a spherical antenna (sometimes called an 8-ball or McCullough dish), spend an extra afternoon adjusting the tensioning bolts. Then erect the framework and recheck the curvature before installing the screen. This beats trying to smooth out the surface after it has been stapled into place.

Perfect Pointing

Once you are convinced that there is no way to squeeze another ounce of gain from the antenna surface, ask the question, is it pointed in the right direction? Don't laugh and turn the page. Photo A shows the value of going along with the crowd. But the chances are that you don't have twenty other satellite antennas in your backyard to use as references. Assume noth-

ing and go dig out the January, 1982, issue of *73*. On pages 60-62 is Steve Gibson's cookbook on satellite finding.

Follow the equations carefully. Better yet, have your ten-year-old work through the numbers. When you are done, assuming you live in the northern hemisphere, the bearing you arrive at should be somewhere on the southern horizon. Chances are it will be something like 238 degrees (New Hampshire) or 202 degrees (New Mexico). The elevation could be less than ten degrees if you live in the Arctic or as much as ninety if your QTH is on the equator.

The next step sounds simple but isn't. Is the dish pointing in the direction that the numbers say it should? You will need some sort of compass and inclinometer to find out and you must know the declination for your location. There are a hundred and one places to find the declination, or how far true north is from magnetic north. You can ask at the local airport, check a topographic map, or find a knowledgeable Boy Scout. The important thing is to include declination correctly in your antenna aiming.

Checking the elevation of the antenna isn't too tough. A protractor, along with a string and small weight, can be used. Or you can go whole hog and buy an inclinometer at the local hardware store (see Photo B). The method is up to you, but check and double check the azimuth and elevation of your antenna. Don't stay up nights worrying if you can't get the antenna perfectly aimed. After all, the compass and inclinometer have limited accuracy, so you'll need to do a little jiggling anyway to get the best picture.

We have been operating under the assumption that the only thing between your antenna and the satellites is a lot of air and maybe the occasional sea gull or pigeon. If the situation is otherwise, you may have built a nice piece of outdoor sculpture rather than a satellite dish! Buildings, trees, fences, and even a phone pole will absorb microwaves, so before you pour the concrete, make sure that the antenna has a clear shot at not just one bird but all across the satellite belt. The farther north you live, the more you will have to worry about obstructions, thanks to the decrease in antenna elevation angle that occurs as latitude increases.

Photo B. An inclinometer is helpful for determining the elevation of your antenna.

If a potential antenna site looks shaky, consider another location. Consider even a roof-mounted antenna as shown in Photo C. You can check a location by running a test with a portable antenna. This can confirm a clear path and tip you off about any problems that might result from earthbound microwave signals. But remember, even a field check can backfire. Consider the plight of one TVRO owner who shortly after installing a system found that his neighbor was building a garage that would stand directly in the signal's path! Like all other aspects of setting up a satellite terminal, site location must be done with care.

Feedhorn Fun

Assuming that the antenna is built right, located in a good spot, and aimed correctly, it is time to consider the next link in the TVRO chain, the feedhorn. Start by making sure that your feedhorn matches the antenna. Feedhorns are not created equal, and besides ending up with a downright poor one, you also could lose out if the horn over-illuminates the antenna (picking up unwanted ground noise) or under-illuminates the dish (which is the same as throwing part of the signal away). Perhaps the most popular horn for parabolic antennas is the scalar feed, sometimes called the Birkill, coaxial, or Chapparell feed. If you bought a budget-priced TVRO package, you may have the more traditional horn feed. In that case, it might be worthwhile to upgrade.

Besides matching the feed to the antenna, it is important to position the horn correctly, as shown in Photo D. If you don't, precious microwaves will be wasted. Find out what your antenna's focal length is and then measure out an equal distance along a line perpendicular to the center of the dish. The front edge of the feed should fall close to this point. Your feedhorn mount also deserves close attention. Not only must it be adjustable, but it also should be reasonably solid with no sagging. If you are using a home-built affair, avoid metallic or large supports that could degrade performance.

When the feedhorn is in its final position, it should point squarely at the center of the dish. If you have to point it to one side to get the maximum signal, it indicates that the dish surface is not right. As the feedhorn is adjusted, you should find one spot that gives the best signal. Any movement greater than ½ inch or so should cause the signal level to drop off. If you don't get a pronounced peak or if there are several peaks, then the dish needs attention.

Before giving the system a smoke test, it would be wise to check out the LNA. Is it attached securely to the horn with no gaps at the waveguide junction? Verify that the feedhorn/LNA combination is aligned for either horizontal or vertical polarity. If you are using a TV rotor, it might be best to leave it disconnected so that the horn can be twisted by

hand during the initial alignment. Or, if you want to go first class, consider replacing the rotor with a feed that has built-in polarity switching via a miniature motor or electronic rotation.

Make sure that the correct voltage is being supplied to the LNA. You may not be able to do this with LNAs that use the rf feedline to carry the power supply voltage, but no matter what kind of receiver or LNA you are using, don't scrimp on the cable that connects the two. Remember, you are not hooking up a CB radio. RG-58 won't hack it nor will hardline if you do a lousy job soldering the connector. By taking the time to do the job right, you'll reduce the possibility later of moisture ruining your signal.

D-Day

By now you are probably itching to make a smoke test. To make life easier, take the receiver (if it is an indoor type) and a TV set out to the antenna. This helps to avoid wild-goose chases that result from bad cable runs, and it makes it simple to observe the results of any adjustments you make. Before you throw the switch, double check all the connections. Don't be like one fellow who, in his excitement, forgot that he needed an rf modulator between the receiver and the TV set!

The next few steps are critical. To get the best possible picture, you'll need to adjust the antenna, feedhorn, and possibly the receiver. Although the adjustments don't usually interact, it is important that you deal with only one at a time, proceeding to the next step only after you complete the previous one.

Start with the antenna. If it has an az-el (azimuth-elevation) mount, leave the elevation setting alone and carefully vary the azimuth position. A swing of ten to fifteen degrees in either direction should yield a signal.

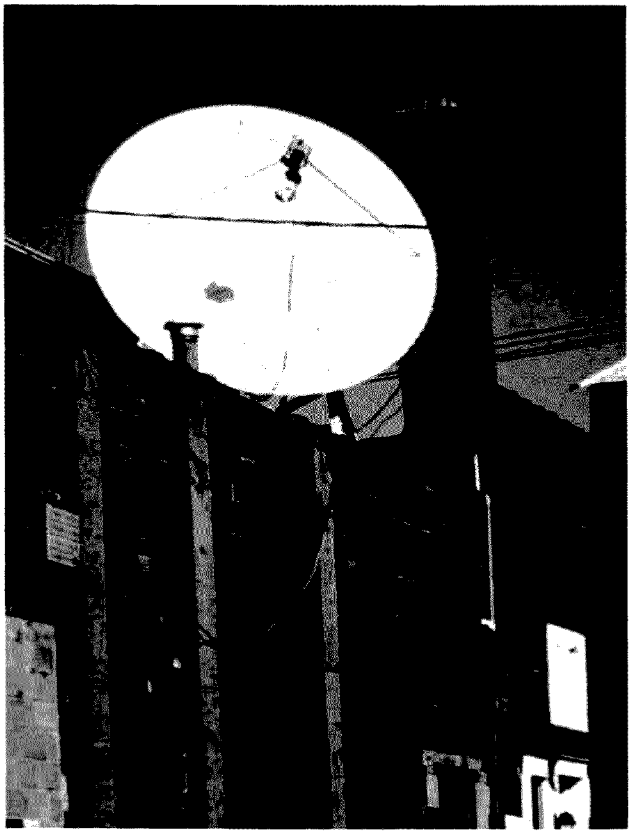

Photo C. If you can't find a suitable spot on the ground for your antenna, consider using a roof. It almost guarantees a clear shot at the satellites.

If it doesn't, recheck the elevation and original azimuth settings. If your antenna has a polar mount, it must be aligned against the north-south axis. Then you should be able to swing it through an arc without changing the elevation setting.

The first signal you receive may or may not be video. Don't be surprised if you get a jumbled screen and audio that sounds a bit like radioteletype or badly-mistuned sideband. All that you have to do is try another transponder on the same satellite or possibly readjust the antenna so that it points at one of the television birds. If you find yourself lost, return to the initial signal and verify that everything is still working.

Before you start scanning the sky in search of new satellites, it would be a good idea to get the feedhorn shipshape. All that should be necessary is a minor adjustment of its distance from the center of the dish and the polarity. Any substantial movement from side to side spells trouble. If you are using a spherical antenna, then proper placement of the feedhorn is crucial since it also determines the direction the antenna is pointing.

Peaking the signal requires that you have a steady source. Stick to one satellite and one transponder—preferably one that is transmitting color bars. The strength of such a signal will vary over time but will certainly be more reliably constant than signals from different transponders or, heaven forbid, different satellites.

Hopefully, your receiver has a signal-strength meter built in. Lacking that, there may be a terminal on the back for attaching an external meter. Or, as a last resort, you can use the screen as a reference. If you choose this route, it is imperative that the TV be located where the person making the adjustments can see it. Don't waste a lot of time making adjustments that you "think" are improving the picture. After all, there is a limit to anyone's ability to discern a change.

If you have gotten this far and made everything work, then you don't need any more advice from a magazine article. On the other hand, if you think you might be ready to forsake satellite TV for another hobby like stamp collecting, don't—at least not yet. For the time being, assume that the electronic part of the system is working. Concentrate your efforts on the antenna and feed. If your initial 20-degree sweep didn't work, make a slight change in the elevation setting and try another sweep. After a couple of tries at this, go back to the original azimuth and elevation settings and reposition the feedhorn. Repeat this sequence until you have systematically exhausted all reasonable positions.

Problems?

Still no luck? Then assume that something is wrong with the electronics. The best way to find the culprit is through the "buddy system." You need someone with a working TVRO who will let you try your receiver and LNA. Or, you could borrow their LNA and receiver to try with your antenna. This method of substitution is not terribly elegant, but it does work and sometimes is your only alternative when you lack test equipment.

Assuming that you have a commercially-built LNA, there is little that can be done besides verifying that it is hooked up correctly and the power supply is functioning. Manufacturers threaten to void the warran-

ty if you open up an LNA, and with good reason. There are no user-replaceable or -adjustable parts; all that you are likely to do is foul something up! Although receivers are not quite as touchy as LNAs, there is little that can be done to one if you don't have some sort of signal generator and a decent oscilloscope. Randomly tweaking the i-f cans with the hope that some miracle will occur is a sure invitation to disaster. The manufacturer may provide a few tips on what can or can't be adjusted by the user; as a last resort, you may want to give them a try.

Let's shift gears and look at some of the problems that you may have even though you are receiving pictures. The first problem is what satellite TV aficionados call "sparklies," otherwise known as snow. Sparklies are the result of noise that overpowers part of the signal.

The solution lies in boosting the level of the signal or reducing the amount of noise. The primary mechanisms are the antenna and the LNA. Is the antenna big enough? Is it providing the expected amount of gain? Does the LNA have a low enough noise figure? If you are convinced that your antenna is up to snuff, your only alternative may be a better LNA. Switch from a 120-degree unit to a 100-degree one. Obviously, this is an expensive fix and should be attempted only after you have tried everything else.

Adding another amplifier after the LNA probably won't help. By that stage, the noise is already present and a new amplifier will increase both it and the signal. A line amplifier could come in handy if you have a very long coax run between the LNA and receiver. This addition won't make up for a poor LNA or antenna, but it does ensure that the receiver has enough signal to work with. Line amplifiers also are used when one LNA drives several receivers.

Photo D. Feedhorn placement is critical. Start by finding your antenna's focal point and then make slight variations in the feedhorn position until the signal is maximized.

It may be hard to believe, but you can get too much gain. The result will be pictures that tear and smear. The solution is pretty simple: Just add some loss before the receiver. Loss can be had cheaply; a piece of coax should do the trick.

A TVRO can be likened to a chain and yes, this chain is only as strong as its weakest link! A good rule of thumb is that the first two links, your antenna and LNA, will have the biggest role in determining overall performance. Stephen Gibson's "Satellite Central" articles in the November and December, 1982, issues of *73* are well worth rereading if you are unsure of how strong each link must be. Remember that a combination that works well in one location may be less than optimal somewhere else. Satellite signals vary and receivers have special quirks. For example, a receiver with a PLL detector may be great for marginal signals but not so great for strong signals.

Another problem that you could encounter is drift. Frequent tweaking of the tuning dial might indicate an unstable oscillator stage. This problem is more apparent in single-conversion receivers but can plague double-conversion units, too. Pictures great but the audio is lousy or just not there? Remember that the audio is on an FM subcarrier and is processed separately from the video. The audio on most North American entertainment transponders uses a 6.2- or 6.8-MHz subcarrier. Is your receiver's audio control set correctly? Some services, like Music Television (MTV), may require special audio processing.

The final problem I'll address is probably the toughest to cure. You know that your TVRO is working because you are receiving some kind of signal. Unfortunately, this signal doesn't make any sense and you might receive it regardless of where your antenna is pointed. The culprit is terrestrial interference, land-based microwave signals that are in or near the 4.0-GHz TVRO band. As an unlicensed home-terminal owner, you pretty much have to grin and bear it.

Short of moving, there are two solutions, First, prevent signals from reaching your system. Use your LNA and receiver to sniff out the direction the offending signals are coming from and then locate your antenna so that something, let's say a house, stands between it and the signal source. If there is no way to completely shield the system, then you might try filtering out the interference. The success of this approach depends on the relative level of the interloper. You can avoid most terrestrial interference problems by doing a thorough site check and, when needed, using an antenna that doesn't pick up unwanted side or ground signals.

Building your own TVRO is not easy. Sure, you can take the easy way out and plunk down a bundle of cash and have a pro install a system for you. But thousands of hams have taken on the challenge themselves and succeeded. A smaller number of adventurous souls have built everything from scratch. A few relied on luck, but most learned the basics and paid attention to details. Learn from their experiences. Heed the fundamentals. Don't cut corners. Soon you'll have a working TVRO and a well-deserved swollen head. ■

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Streamline the IC-25A

Add a dual-speed vfo and remote control. You can do it in a few easy steps.

Living within a mile of a local repeater, I had been experiencing a severe desense and cross-modulation problem with my "brand-X" rig when listening to other repeaters. The local repeater was annihilating the front end of brand-X. The ads for the new Icom IC-25A were very appealing, and I decided to try another radio as a solution to my problem.

One look at this mighty midget and my plastic money was on the counter, and the Icom was mine! If you haven't seen this little rig, you are in for a treat. It has all varieties of bells and whistles, and the design and craftsmanship are superior. It is so small (2"H × 5½"W × 7"D) that it suggests many convenient hiding places for a mobile installation. Furthermore, the desense problem experienced with my other rig was nonexistent in the Icom, even when parked beneath the antenna of the local repeater.

As with most rigs, we hams always want to change or add something, and the IC-25A was no exception. The two vfo's provided did not seem to give me any added flexibility; in fact, they created a difficulty. Using the 15-kHz vfo, I often would dial to some desired frequency and then find that I was either 5 kHz too high or 5 kHz too low. Then I would have to switch to the slow 5-kHz vfo and dial it to the desired frequency. This was frustrating and time consuming, so I decided to eliminate the dual-vfo feature and create a single, two-speed vfo.

Another convenience I wanted was a remote scanning control. The IC-HM8 touchtone™ microphone supplied with the IC-25A did not have this feature, so I decided to add it to the mike.

Memory retention was another item considered, but the thought was abandoned when I could not find space to mount a battery inside this very compact transceiver. Furthermore, I learned that Icom has available a memory-holding device identified as BU-1 which fits between the two halves of the external power connector.

You will find that the following changes make an excellent little rig even bet-

Photo A. New scanning switch installed.

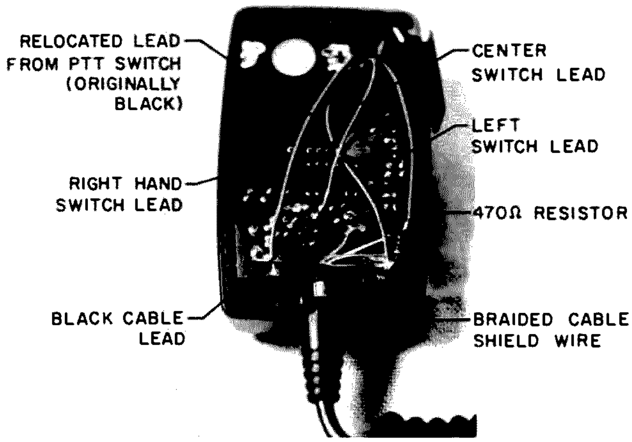

Photo B. The scanning switch wiring.

ter! In performing the modifications, the technician should refer to the comprehensive schematics and pictorials furnished with the IC-25A.

For convenience and selection, these modifications are identified separately as Mod A, B, and C. It is suggested that you read all three mod instructions before proceeding, to help you decide which ones you may want to accomplish. These changes are not difficult, but they do require some expertise in working on solid-state circuitry and printed circuit boards. Therefore, this work should *not* be attempted by "first timers."

Mod A

This modification converts the dual vfo to a single vfo with two-speed control. Also, the existing fast-speed dial rate is changed from 15 kHz to 25 kHz. The original vfo push-switch now becomes a slow/fast dial rate selector. It also functions to change the rate during the full-range-scan mode.

1) Remove the top and bottom covers of the IC-25A. When removing the lower cover, unplug the speaker from the mating plug on the PC board.

2) Remove the four front-panel knob controls (Vfo/Memories, Main Tuning, Volume, Squelch). All knobs will pull off their shafts. The large tuning knob may be tight and may require gentle, simultaneous prying underneath two opposite sides. Use two table knives with pieces of cardboard underneath them to protect the face of the panel. Pry up evenly.

3) Remove the two top screws and two bottom screws and carefully slide off the front, black bezel (panel).

4) Remove the two screws on the left side and two screws on the right side that hold the front control assembly to the main chassis.

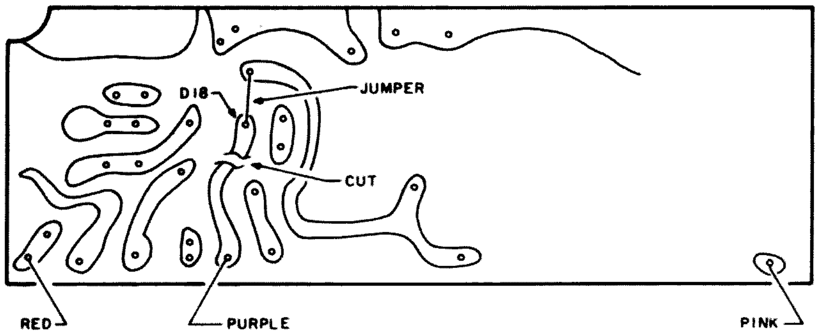

Fig. 1. Switch board, foil side.

5) Carefully move the front control assembly forward to separate it from the main chassis.

6) Take off the retaining nuts and remove the volume and squelch controls from the front control assembly. Place them carefully aside. It may be necessary to free their wiring from the harness assembly by cutting a wire-wrap.

7) With the unit and front control assembly upside down, locate the switch board assembly. It is a small PC board situated directly behind the three push-switches (Scan, Simplex, Norm).

8) Refer to Fig. 1 and locate the *red* wire at the extreme *left* corner of the switch board. Unsolder this lead and lengthen it by splicing a 1½" piece of wire to it. Solder the end of this extension to the *pink* wire located at the extreme *right* corner of the switch board. This wire relocation creates the single vfo with the original tuning rates of 5 and 15 kHz.

9) Refer to Fig. 1 and locate the *purple* wire on the edge of the switch board. From this connection point, follow the board foil up to its end where there is a single soldered connection. This connection is the cathode end of diode D18. Using an X-acto® knife (or other sharp blade), very carefully cut across the foil below this point. This action disconnects D18 from the purple wire. Check with an ohmmeter between the purple wire and the D18 solder point to make sure that you have completely severed the connection.

10) Using a small bare wire, solder a short jumper from the isolated connection point of D18 to the board foil directly *above* it, as shown in Fig. 1. Be careful not to bridge any solder to adjacent areas. This action converts diode D18 to a new function as D32 and creates the faster dialing rate of 25 kHz.

11) Carefully replace the volume and squelch controls in their original positions with their locating tabs in the proper holes. Secure them with the original nuts.

12) Reattach the front control assembly to the main chassis with the original four screws.

13) Reassemble the panel bezel on the front control assembly with the original four screws, and press all four knobs back in their proper place.

14) Take the bottom cover and plug the speaker lead back in place with its mating connector on the PC board. Observe the plug polarity. Place top and bottom covers in place and secure with original screws.

After this work is completed, you will have a single vfo with the A-B vfo push-switch now functioning to change from a slow to a fast tuning rate (5 or 25 kHz). The yellow light above the switch will now stay lit at all times.

Mod B

If it is desired to create the single vfo but maintain the original tuning rates of 5 and 15 kHz, then perform Mod A but do only steps 1, 4, 5, 7, 8, 12, and 14. After this work is performed, you will have a single vfo with the A-B vfo push-switch now functioning to change from a slow to a fast tuning rate (5 or 15 kHz).

Mod C

This mod is to install an UP-DOWN scanning-control switch on the IC-HM8 microphone.

1) Obtain a subminiature SPDT toggle switch, *center OFF*, momentary contact (Calrad P/N 40-584 or equivalent).

2) Remove the single screw and take the back cover off the microphone.

3) Gripping the PC board at its edges, carefully lift it upward. This will unplug it and separate it from the mating plug on the tone pad. While still connected, lay the PC board aside exposing the inside of the mike case.

4) There is an oval hole existing in the case directly below the microphone element location. Carefully drill a ¼" hole through the center of this oval. It is best to drill a pilot hole with a small drill (i.e., 1/16") and enlarge the hole slowly by increasing sizes to ¼". Make the pilot hole from the inside out, but enlarge the hole from the outside in. This will prevent pushing and loosening of the front panel.

5) Remove all hardware from the switch shaft and install it in this hole. It will be necessary to fabricate one

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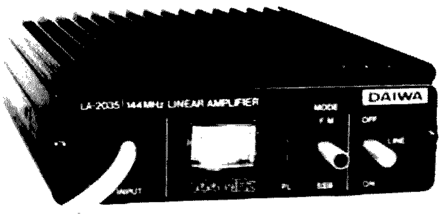

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Maximum output power: 30 watts plus.
Power consumption: 13.8VDC at 5A Max
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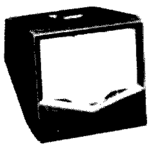

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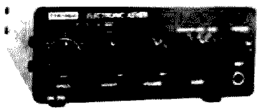

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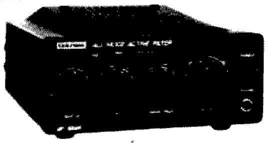

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or two spacing washers to provide a flat contact for the nut. Use a ¼" washer and cut or grind off one edge up to the edge of the ¼" hole. Secure the switch with a nut (refer to Photo A).

6) Cut three 5" lengths of #22 wire and solder one to each of the three switch terminals. Place these wires so that they protrude from the top of the mike, and then plug the PC board back in position.

7) Unsolder the black lead from the PTT switch where it connects to another black lead from the cord at the bottom of the PC board. Connect this black lead to the same ground point on the PC board as the braided shield wire from the cable.

8) Take the center wire from the new switch and connect it to the same point where the black PTT wire was just removed. This connects it to the black cable wire.

9) Take the left-hand switch lead and connect it through a 470-Ohm resistor to the ground foil on the PC board.

10) Take the right-hand switch lead and connect it *directly* to ground on the PC board. (See Photo B for connections.)

11) Replace the back cover and secure with the screw.

12) Open the connector on the other end of the cable, unsolder the black lead from lug 6, and resolder it to lug 3.

13) Reassemble the plug.

This completes the modification and you now have UP-DOWN scan control from your microphone. This feature does not affect the normal operation of the S/S scan switch on the front panel of the IC-25A. If desired, the length of the plastic bat handle on the new switch may be cut to a shorter length. ■

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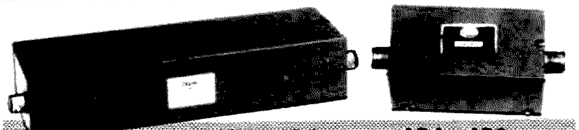

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Model	Power (Watts)	Cut Off Frequency	Frequency of Maximum Attenuation	Minimum Attenuation	Frequency Range	Price
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A Perfect Match for the HW-8

Heath's little rig is the QRPer's dream come true. So is 30 meters. Join them with this super-fast mod.

On October 28, 1982, the Federal Communications Commission opened up most of 30 meters to US amateurs. Those of us with newer rigs were able to get on the air by adding a new dipole to the antenna farm or by finding a new tap on the antenna tuner coil. However, most of us with older rigs were faced with the possibility of having to wait until we could get a newer rig. Many older rigs, like the Heath SB/HW series, would be a little difficult to modify.

QRP operators, though, are fortunate to have the much-modified HW-8 to play with. The purpose of this article is to describe a simple modification to allow you to convert your HW-8 to 30 meters with a crystal and three capacitors.

The HW-8 is a direct-conversion receiver which generates the local oscillator signal by mixing a crystal oscillator and a variable-frequency oscillator. This allows the vfo to run at one frequency and facilitates multiband operation. This same system allows easy conversion to other bands.

In order to convert the HW-8 to 30 meters, all you need to do is change one of the crystals and realign the rig. I suggest that you change the 20-meter crystal. It appears to be easier to move the rf circuits at 20 meters down to 30 meters than it would be to move the 40-meter circuits up. In addition, the transmitter PA-output network is a low-pass filter, and moving the 40-meter low-pass up might require major surgery. This modification requires no surgery at all—only a few additions.

Once you gather the parts together, the entire conversion should not take you very long. Following are step-by-step instructions covering the conversion and realignment:

1. Referring to the Heathkit™ HW-8 circuit diagram, remove both covers, unsolder the 20-meter crystal, Y3, and replace it with the 30-meter crystal at 18.895 MHz.

2. Locate L19 and C121. Solder a 30-pF capacitor across L19 in parallel with C121. It is easiest to tack this new capacitor on the bottom of the circuit board. This facilitates reversal of the modification.

3. Locate C7 and C22 in the rf amplifier circuit. Add 60 pF of capacitance in parallel with each capacitor. I used two 30-pF capacitors across C7 and C22 each. Anything in the 60-pF range should work as well.

4. Replace the bottom cover. This completes the modification; only alignment is left.

5. Attach an rf probe and VTVM to the base of Q7. If you don't have an rf probe, use the circuit Heath suggests in Fig. 1. Adjust L19 for maximum response on the VTVM and then turn the coil slug ¼ turn counterclockwise. L19 is the *bottom* slug in the L19/L21 coil can.

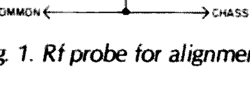

Fig. 1. Rf probe for alignment.

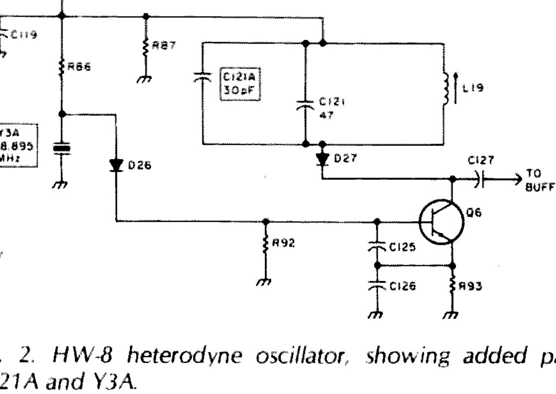

Fig. 2. HW-8 heterodyne oscillator, showing added parts C121A and Y3A.

6. Move the rf probe to the emitter of Q5. Adjust L15 for maximum response. You will have to move the coil slug almost to the bottom.

7. While listening to an on-the-air signal (WWV is convenient), adjust C7 and C22 for maximum received-signal strength.

8. Attach a 50-Ohm dummy load to the output, key the transmitter, and adjust C103 (in the final amplifier) for maximum output with the loading control at the 12-o'clock position.

9. If you want, you can calibrate the vfo using WWV at 10 MHz. Put the top cover back on.

10. Have your first QRP QSO on 30 meters.

The results are excellent. My HW-8 has a 30-meter power output of 1.2 Watts into a 50-Ohm load. Within two minutes after finishing the realignment, I worked NN4F in Memphis. He gave me a 579. I find that I can work stations on 30 meters easier than I can on 20 while using QRP. There is some high-power teletype on the band, but you can sneak around that.

The receiver performs fine although I have not been able to evaluate it for sensitivity and dynamic range. The converted HW-8 seems to work just as well on 30 meters as it does on any other band!

So there you have it; a thirty-minute modification to put you QRP on thirty meters. Come on down to 10.1 MHz and have some fun! ■

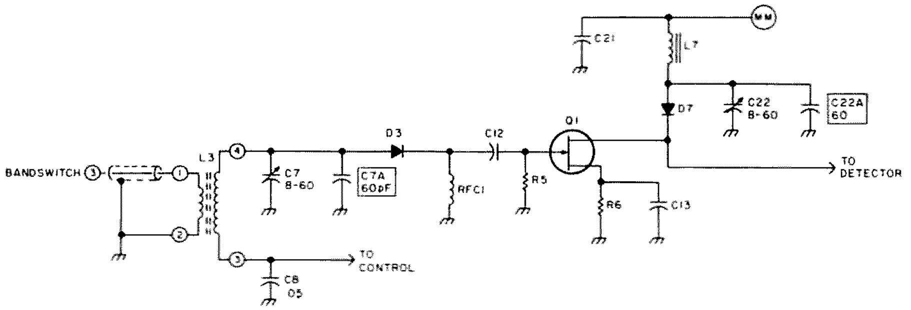

Fig. 3. HW-8 rf amp showing added capacitors C7A and C22A.

Parts List

Y3A	18.895-MHz crystal, type OF-L, cat. no. 031300, International Crystal Mfg. Co., Inc., 10 North Lee, Oklahoma City OK 73102. Price: $6.88.
C7A, C22A	60-pF capacitor, Radio Shack, Jameco, and other suppliers. Value of 50 pF to 70 pF acceptable.
C121A	30-pF capacitor, Radio Shack, Jameco, and other suppliers.

Capacitor values may be approximate and determined experimentally. I used 30-pF capacitors from a Radio Shack assortment, paralleling two to get 60 pF.

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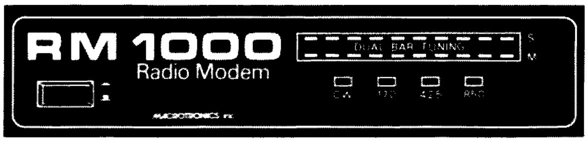

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Don Wallace: Superham

Meet W6AM, the Grand Old Man of amateur radio.

Author's note: Some of the material in this article was written by Peter K. Von Hagen WA6HXM. The author extends his gratitude to Mr. Von Hagen and also to *The Palos Peninsula News* for permission to reprint excerpts from his well-written article.

How many hams do you know who have been the personal radio operator for a US President, won the Hoover Cup for having the best amateur station in the nation, been the world's champion DXer for many years, and have mobile rigs in their automobiles operating with one kilowatt of power on the low bands and 250 Watts on two meters?

There is only one person among the hundreds of thousands of amateur radio operators in the world who meets the qualifications listed above, and many of you have probably already guessed his name and call: Don C. Wallace W6AM—the 85 years young Grand Old Man of Amateur Radio.

Early Years

Wallace was born in 1898 in Belview, Minnesota (current population: 439), where his father was a banker. The transfer of his father to another branch of the same bank in nearby and considerably larger Redwood Falls represented a step up the ladder, so the family moved there. In 1905, they moved to Los Angeles, where the population at that time was only one hundred thousand!

In 1908, Don began to peruse his father's physics books. He found out how doorbells, motors, etc., worked and, putting his new knowledge to immediate use, actually constructed a motor, a doorbell buzzer, a telegraph sounder, and a key.

Two years later, Don and his friend John Cook used number 18 rubber-covered wire to construct a five-block-long telegraph line between their homes. The line was fastened to telephone company poles for the four blocks before the tracks of the Pacific Electric Railway were encountered. Fortunately, the railroad had two poles very close together at that particular location, one on each side of the track. This facilitated running the wire under the rails to Cook's home a block further on.

This line furnished a lot of code practice and also served as an excellent antenna for Don's first crystal set until the wire running under the tracks was discovered by a railroad worker who, not knowing what his eventual destination would be, started coiling it up and finally delivered a very large coil of wire to the Wallace residence.

Don Wallace was a youngster with a huge curiosity. In those days, number 6 dry cells were used in a "make and break" circuit to produce square wave ac which could, of course, be stepped up to many thousands of volts to provide ignition voltage for the automobiles of that early age.

Don's uncle in Anaheim, California, with whom Don was visiting, had considerable trouble in starting his automobile due to weak batteries, so a trip was made to a nearby garage, and Don went along. Don asked the mechanic what he did with the old batteries, and the man pointed to a large pile of discarded cells in a back corner of the garage and told Don to help himself. He loaded about one hundred dry cells into his uncle's vehicle and hauled them to Anaheim. At a dime store, he bought a roll of copper wire for ten cents. He connected all the dry cells in series and was able to produce a good spark, thus introducing himself to the world of spark communication.

Upon his return to his Long Beach home, Don strung a length of copper wire to a neighbor's home and they began communicating in code. Another neighbor showed Don a 20,000-volt transformer with a spark gap that he was using. This neighbor had a cat that would sit right on the spark during transmissions, barely moving when the 20,000 volts was applied. Watching that operation convinced Don that cats have substantially more than nine lives.

Don's next step was to visit the man who installed stove pipes in Long Beach. That gentleman allowed Don the use of his machinery to cut stove pipes into appropriate lengths to serve as transformer cores. Don then spent the next two months winding his own 20,000-volt transformer. A crank arrangement was built into an apple box which made the winding of the wire around the transformer cores easier. Paraffined paper was placed between the layers of wire.

After completion of the transformer project, Don built a simple homemade receiver. (There was, of course, no source of commercially-made receivers at the time.)

The Bureau of Navigation of the US Department of Commerce had not, in the infant state of radio at that time, arranged examinations for persons to qualify as radio operators, so Don wrote, "I can send and receive five words per minute in code. [Signed] Don C. Wallace." He had the statement notarized for a fee of 25 cents and mailed it to the proper authorities and soon received the call 6OC. John Cook received 6OD, and they went on the air immediately.

John Mead, a buddy of Don's in neighboring Hollywood, was licensed as 6OE in 1912. His rotary spark-gap transmitter had a very high-pitched note, while Don's 6OC station had a medium-pitched note. Everyone tried to have a distinctive note to his signal with the result that it was often possible to recognize a station merely by its "note" even before it officially identified itself.

Don and Mead had switches which would turn the motor driving the rotary spark gap on and off without turning off their transmitters. While this motor was building up speed when it was first turned on or when it was losing speed after being purposely turned off with the transmitter in operation, it would change the pitch of the transmitted signal very significantly; Don can imitate perfectly those variations in signal note even to this day.

At that time, Don constructed an automatic identifier for his station, utilizing a wooden wheel, using brass-headed upholstery tacks and strips of brass on the outer circumference of the wheel to form the dots and dashes, respectively, which were necessary to transmit the call 6OC.

Don is shown here in Minnesota in 1924 holding the Hoover Cup which was awarded him by the US Department of Commerce for having the best amateur radio station in the United States during the previous year.

Maritime Operation

PJ, the Marconi Wireless Company station only six miles away in San Pedro, was annoyed with Don for causing interference to commercial traffic. (That station's call letters were soon changed to KPJ to indicate its commercial status.) But KPJ was Don's idol. He rode his bike to the station one day and introduced himself to the station manager, who told him that he would get Don a position as a ship wireless operator providing Don could obtain a commercial operator's license.

All the radio operators' exams were administered in San Francisco, so Don went down to the harbor and talked with the officers of several ships then in port. At six feet, four inches, Don (at age 15) convinced one officer that he could clean the overheads (ceilings) of the ship's rooms without using a ladder, an important point to the ship's owners since using a ladder in a rolling sea was considered a hazardous procedure to be avoided if possible.

Don was "signed on" as an able-bodied seaman aboard the S. S. *Yale*, a passenger ship bound for San Francisco. There he passed the Second Class operator's examination. Just as today, one could not obtain a First Class Radiotelegraph license without shipboard experience.

Returning to Long Beach, he again visited KPJ where he heard one of the ship operators complaining that he would much rather go to the baseball game than work his shift. Alertly, Don told the Chief Engineer that he could handle the job. The Chief agreed and Don was paid the sum of one dollar.

Incidentally, Poly High School had its own spark station, with a block-long antenna suspended between two 80-foot towers. Guess who was largely responsible for the school having such an installation. Hint: Don Wallace has always been an advocate of *long* and *high* antennas.

Shortly after his experience as a substitute KPJ operator, Don was assigned to one of the Banning Brothers ships operating between Long Beach and Catalina Island. Although it had a rated capacity of 1,000 passengers, the load on the return trips from the island on Sunday evenings and on holiday evenings was more likely to be 2,000 persons. On return voyages, a message had to be transmitted to Long Beach Harbor advising the passenger count and how many passengers wished to use the "Big Red Cars" so that the Pacific Electric Railway would have the proper number of streetcars on hand. It was also mandatory to provide information as to how many passengers wanted taxis. Don handled this traffic without a hitch.

More important than the pay was the fact that he could now claim experience as a commercial operator. Once again Don "overhead-washed" his passage to San Francisco and passed his First Class Radiotelegraph operator's exam with a grade of 99.4 percent.

From that point on, during all vacations from high school, Don signed on as radio operator for ships sailing up and down the Pacific coast, some of which went a considerable distance up the Inside Passage north of Vancouver, B.C., to be completely loaded with cargos of lumber. Don found that he also could work as a longshoreman while the ship was in ports. As a high-school football player, Don wanted to gain more strength, so he would load and unload the ships whenever possible.

Speaking of football players, Don says antennas are like football players: A good big one is better than a good small one.

After graduating from Poly High in 1916, Don entered Hamline University in St. Paul, Minnesota, to study banking and business. His fascination with amateur radio remained as strong as ever, and shortly after his arrival on campus he obtained the permission of the college president to install a ham station. The "Old Main" administration building had a steeple 130 feet high. Don added a 40-foot pole and attached one end of his main antenna. The other end was attached to a church steeple two blocks away. Another antenna extended to the Ladies Hall, a block away, and still another ran to the university library, a mere half-block away. The results from this station were excellent, and Don soon became well known in the Midwest as the "Big Signal," a reputation he has never relinquished.

World War

When the United States

became involved in World War I, Don's friends rushed to join the Army, but Don's allegiance was more to the Navy since he had enjoyed his seagoing adventures. It was announced that Navy recruits living on the west side of the Mississippi River would be assigned to the West Coast, so instead of going to the St. Paul recruiting office, Don journeyed a few miles to Minneapolis on the west side of the river to the Navy recruiting office there. He was told to finish his first year of college so he could be given the rank of Second Class Petty Officer. So it was that after leaving Hamline he was immediately assigned to NPG in San Francisco, the main Navy radio station serving the Pacific Ocean. At that time, it was equipped with 300-kW arc transmitters and 600-foot towers.

Don arrived at NPG and the personnel officer told him to go into the operations room and observe the actions of the First Class Petty Officer who would show him what to do. After an hour of operations, the duty officer said that with an additional hour of instruction in Navy procedures, Don would be ready to operate the station. His code speed had already reached 35 wpm in both the International Morse code and the American Morse code, so when the famous "pink ticket" radio operator licenses became available (providing you could copy without error 30 wpm in International and 25 wpm in American code), he passed the examination without difficulty.

Readers may wonder why some individuals developed expertise in both codes. Part of the explanation for this was that until about 1908 or so, American Morse was the only code in use. When wireless came into existence, operators had to learn International Morse if they wanted to participate in the new method of communications. Thus, they became expert in both codes.

This photo shows Don's home in Long Beach in 1936 after he had been up all night transmitting pictures to Chicago of the floods and slides which had occurred in the Los Angeles area. Telegraph and telephone lines were inoperative due to the disaster, so amateur radio came to the rescue once again.

Another factor that increased the number of operators skilled in both codes was that shore stations owned by commercial radio companies such as Marconi Wireless and Radio Marine usually had a "pony wire" using American Morse operating from the station to the downtown Western Union office. Expertise in both codes was required to hold one of these shore station jobs. Even today, Don is equally expert in both codes and uses a special microswitch on his Palomar keyer to send the long dash representing the letter L in American Morse.

Don had a number of interesting experiences while assigned to NPG. On one occasion, the personnel officer reported that he hadn't heard from the lightship stationed 15 miles out from San Francisco Bay for more than a month. Don told him there wasn't a radio ever made that couldn't be repaired and suggested that he be assigned to make the repairs. He was sent out to the lightship on the next supply tug and had the repairs completed in about 90 minutes. When he requested permission to return to shore with the tug, it was denied and he was ordered to remain aboard the lightship for another two weeks.

He used that time to put the ship's five-kilowatt transmitter and all the receiving equipment into first-class condition. Then, noticing that there were no instruction books or manuals for the radio equipment aboard the vessel, he typed a 75-page booklet with service instructions and diagrams. Leaving a copy aboard, he brought the carbon copy of the booklet ashore and turned it over to the personnel officer to be used in case the original was misplaced.

After a quick visit to the Admiral's office, the personnel officer returned to inform Don of his promotion to permanent-grade Chief Petty Officer. He was 19 then and couldn't become a commissioned officer because he was less than 21 years of age.

Submarines and The President

Don next volunteered for submarine service where he served eight months. The "submarine-qualified" notation on his record added considerably to his Navy paycheck, but at six feet four inches he was just too tall to serve comfortably aboard submarines with their limited overhead clearances. He wanted to return to college as the war wound down, so he requested transfer from the submarine service to a receiver ship and was assigned to the Brooklyn Navy Yard.

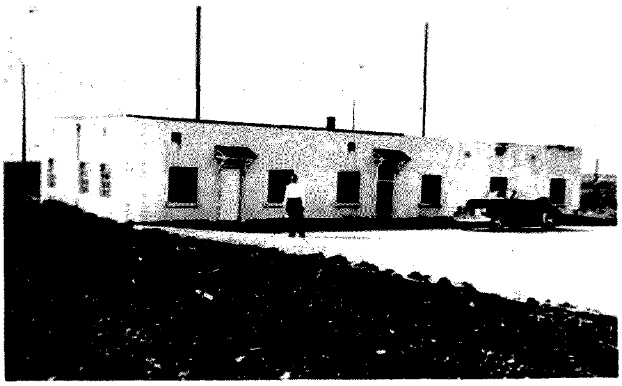
An officer there remembered Don's skill as an operator and asked if he knew anything about arc transmitters. He said the Navy was installing a 40-kW transmitter on the Presidential yacht, the *USS George Washington* (which was quite a "yacht" since it was 800 feet long), for President Wilson's use to and from the Peace Conference at Versailles. Apparently, none of the radio operators knew anything about the new transmitters, but Don did, since he had operated

and maintained similar equipment on the West Coast where arcs had been developed. Immediately he was put in charge of the radio operation aboard the *George Washington* and he accepted the appointment as Chief Radio Operator for the President of the United States after being persuaded to delay his return to college for a few months.

Don and the 35 operators under his command never missed a schedule with the new equipment. (Among them, incidentally, were Fred Schnell of ARRL fame and Harold Beverage, inventor of the Beverage wire antenna.) Shortly after President Wilson came on board for the trip to France, Don had established 40-kW radiotelephone contact with the Secretary of War, Newton Baker. On his arrival in the radio room to talk with Baker, President Wilson developed a bad case of mike fright and was unable to talk on the air. Don proceeded to talk with Mr. Baker for a few minutes until the President recovered his composure and was able to talk. Can anyone today imagine a President being afraid of a microphone? (After that, the President spent much of his spare time in the radio room.)

In addition to his radio duties, Don was an avid photographer, and he took hundreds of photographs during the trip. In subsequent articles about World War I and President Wilson, many of the photographs published were those taken by Don.

After the first day of negotiations at the Versailles Peace Treaty Conference, messages concerning it were dispatched by President Wilson back to the United States, using the facilities of a French 1,000-kW arc station at Lyon. However, mistakes were made in those first day's messages, so from the second day on, couriers with locked briefcases handcuffed to their wrists traveled between Versailles and Brest to transport all radio communications to and from the radio room of the *George Washington*. Completing his six-month mission aboard the *George Washington*, Don decided it was time, at last, to return to college.



Don poses here in 1945 at the entrance of the former receiving station of Press Wireless. Eight commercial radio operators operated 75 receivers daily here to bring the latest news to the Los Angeles Times, *while eight more operators labored at the transmitting facilities of the same firm in nearby Marina Del Rey. Don purchased this building and more than one hundred acres of land from Press Wireless in 1944 and has transformed this boxlike structure into an attractive ham shack with the addition of a peaked roof, landscaping, and porches on both sides of the building.*

The Twenties

Don Wallace returned to Hamline—and its football team, which became Northwest champions. He remained in the Naval Reserve since the annual pay was equal to two months of active-duty salary. Transferring to the University of Minnesota after two years at Hamline, he continued to play football on the university's team.

On the faculty there was C. M. Jansky, one of the greatest professors of radio of the time. Since Don was permitted to choose 20 percent elective courses not related to his business major, he decided to enroll in all of Jansky's classes.

The professor was elated to have an experienced radio man in his classes and soon assigned Don to duty at the university's broadcasting station and fine ham station every Wednesday evening. A different student was assigned with him each time and they would stay on the air all night, with Don filling the roles of Chief Engineer, MC, announcer, and program director. He would do live interviews with dignitaries such as the governor of the state, congressmen, and the president of the university. The guests would talk for ten minutes, and then Don played records or commented on the news. This was the first regular broadcasting in the northwest.

When the author of this article began hamming in 1930 in a remote corner of North Dakota, the achievements of Don Wallace were already legendary. Indeed, the November, 1924, issue of *QST* saluted him in a full-page article entitled "Who's Who in Amateur Wireless."

Calls held by Don in Minnesota included 9BU, 9DR, and 9ZT. Next, the Federal Radio Commission issued him 9XAX, which authorized him to operate on any frequency, any time, with any power. The FRC knew it could trust Don not to abuse the carte blanche privileges of such a license.

In 1923, Don was awarded the Hoover Cup for having the best amateur radio station in the United States. (There's no need to worry about the silver plating peeling off the cup with the passage of half a century. There is no plating to peel; the cup is constructed from a solid piece of silver.) When Herbert Hoover became President, the amateur radio signal of W6ZH operated by the late Herbert Hoover, Jr., from the White House, reached westward and sought out and found, on many Tuesdays, the long and high antenna of Don's W6AM.

Don had a part in the original bridging of the Atlantic Ocean by Fred Schnell and John Reinartz. Don's station, then located in the 9th district, was the furthest station worked by Leon DeLoy F8AB.

While Don was still at the University of Minnesota, the General Electric Company let it be known that they wanted a graduate to manage their radio department in Minneapolis. Don took the job and in six months was making more money than the president of the company. Don held that job with General Electric for 4½ years. Among the products he sold were those of the National Radio Company. When National's sales manager, George Hill, offered Don a position covering California and eleven other western states, Don accepted in 30 seconds. The Wallace family moved back to Long Beach, and Don wired his resignation to General Electric.

Also while at Minnesota, Don met Ed Johnson, a mechanical engineering student. Upon graduation, Ed started the E. F. Johnson Company to manufacture radio parts at Waseca, Minnesota. That company be-

came a very well-known supplier of amateur radio components and transmitters and is still in business today. (It has sold its patents and dies for the manufacture of telegraph sounders and keys to the Nye Company, which still does a brisk business in such items.) Don suggested the original designs of about half of the products that the E. F. Johnson Company manufactured.

When Don came to the West Coast in 1926 to represent the National Radio Company, he wrote to Ed that he would like also to represent the E. F. Johnson Company in the west. Johnson replied that manufacturers' representatives were a "bunch of bums" and that he didn't need a representative to sell his products. Don wrote up a dozen large orders and sent them to Ed with a note that these orders were for old times' sake and their friendship. Johnson filled the orders and sent Don a commission check. Don kept sending orders and Ed kept paying commissions. It wasn't long before Don had the territory officially and on an exclusive basis.

At the height of his career as a manufacturer's rep, Don represented a total of 19 manufacturers of electronic equipment. One account alone brought in a *monthly* commission check of five thousand dollars, and the other 18 accounts also paid substantial commissions. An order usually consisted of a railroad boxcar full of equipment; a half carload was considered to be a small order.

Don secured the two-letter call W6AM in 1926. In those days, the Department of Commerce assigned two-letter calls to amateur operators who also were commercial radio operators. The possession of a two-letter call was, of course, a mark of elitism indicating membership in the "first

Some years ago, Don's mobile rig was installed in the convertible pictured here.

family" of amateur radio. At that time if you wanted a license for a portable station, a separate license was required, and Don was given the call W6MA to cover that operation.

From 1926 until 1960, Don traveled extensively throughout twelve western states to call upon his customers. During all of those years, one of the pieces of luggage he carried with him was a "suitcase portable" containing an amateur transmitter and receiver. Arriving at some hotel, he would insist on having a top-floor room. If one was not available, he would move on to another hotel which did have one. After being shown to his room, he would open a window wide so that the drapes would hang outside the building, thus providing an easy means of locating his room from the roof of the hotel where he would suspend his antenna. After dropping the feedline from his antenna to the proper window and returning to his room, Don was soon in communication with his wife, Bertha, at home.

On these occasions, Mrs. Wallace would laboriously transmit code characters by looking at a code chart of International Morse which was under the glass on Don's desk at home. It wasn't long before she asked Don if she couldn't learn Morse, to eliminate that awkward code-chart method. Don's reply was, "Why not, indeed?" and a code-practice schedule of 30 minutes of intensive study daily was begun. Don added a proviso that if the prescribed practice was missed on any day, a *week* of additional practice would be the penalty.

One evening, with the Wallaces all dressed up and ready to leave home to attend a posh party, it was remembered that the practice for that day had not been done. Immediately they went to the ham shack and accomplished the code study necessary even though it meant being a half-hour late for the party.

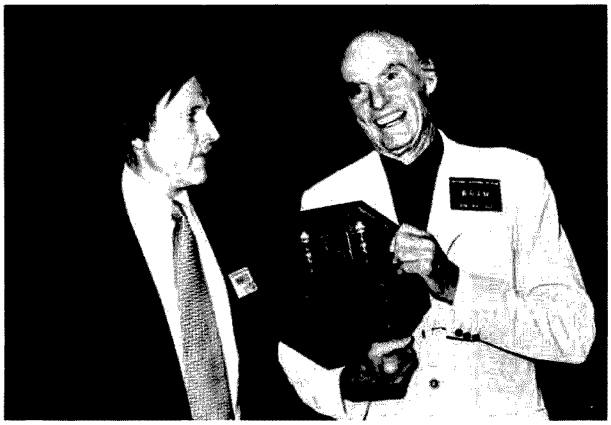
After two weeks of study, Bertha Wallace passed her amateur radio operator's examination and was assigned W6MA, and Don was told to use W6AM while operating portable in states other than California, followed by a slash bar and the number of the radio district in which he was operating.

Rhombic Farm

By 1938, a radio operator with whom Don had become acquainted during his Navy service, Tony Gerhardt, had become Chief Engineer of a new company called Press Wireless, formed by a group of twelve newspapers to transmit and receive their newspaper stories in order to avoid paying the high rates of the commercial telegraph companies. Gerhardt was charged with the responsibility of selecting a suitable receiving site to operate in conjunction with their transmitting location at Marina Del Rey, and he briefed Don on his problem.

From his earlier residence in the Long Beach area, Don had recognized the highest hill on the Palos Verdes peninsula as a superior location for an antenna farm, but had been unable to persuade the Vanderlip family, which owned 20,000 acres of prime land there, to sell any of it. Told of this, Tony said he had already tried but the Vanderlips still wouldn't sell. Don then reminded Tony that the *Los Angeles Times*, one of the owners of Press Wireless, was very friendly with the Vanderlips, running a full social page on the family every month. Don suggested that Tony contact Norman Chandler, publisher of the *Times*, and ask him to make the proposal to the Vanderlips.

Tony did this, with the result that Kevin Vanderlip agreed to sell Press Wireless a large parcel of land on the very top of the peninsula. Tony, a loyal friend of Don's, purchased all possible equipment needed for the new receiving station from the companies Don represented—including the wire and insulators for the eight 600-foot-long rhombic



Don is pictured being presented the DX Hall of Fame Award by Lloyd Colvin W6KG at the 1978 National ARRL Convention.

Shown here are the hams, editors, and writers (together with their local guides) from the United States who were guests of the People's Republic of China for a seventeen-day visit to that country in 1980. Don, third from the left, is easily recognizable as the tallest person in the group. The scene is the great bridge which crosses the Yangtze River.

antennas. Later, Don rearranged the antennas and erected nine new 1,000-foot-long rhombics, 140 feet high, which could be fed from either end to fire in eighteen different directions.

At the end of WWII in Europe, the FCC announced that shore stations such as Press Wireless no longer would be permitted to have radio links to their other stations since telephone lines were available. Press Wireless decided to move all its operation to the San Francisco Bay area (where it was headquartered) to eliminate the $32,000 annual telephone bill from the Palos Verdes station. Therefore, they purchased a site near Napa, California, and placed the 120-acre Palos Verdes site on the market in 1944.

Don's offer for the property was accepted. Press Wireless moved its 75 receivers to Napa, and Don moved his amateur equipment to the site, with its 35 major and 75 minor poles.

Since Press Wireless used poles which were only 75 feet high and some stood in valleys between hills, they provided an effective height of less than 75 feet. Don, in accordance with his lifetime policy of using long and high antennas, made 140-foot poles by placing two 75-foot poles butt to butt, securing them together with four 20-foot pieces of heavy four-inch angle iron, with eight heavy bolts through each pole.

Don, who is as spry and alert as a man half his age, has a pair of custom-made shoes constructed especially for the purpose of climbing poles, and he has done the maintenance of his antenna system for many years, although he has had some help recently on the 140-foot poles.

QRO Mobile

Don's super-powered mobile rig (1 kW on low bands; 250 W on 2 meters) had a valuable fringe benefit in addition to providing communications around the world from Don's automobile. Before her death, Don often drove his wife, Bertha, to one of the posh department stores in Long Beach and left her there to shop while he ran his own errands in other parts of the city. After an hour or two, he would return to the vicinity of the store and speak into the mike of his mobile rig as follows: *"Mrs. Don Wallace, will you please come to the front door of the store?"*

The store's PA system, overwhelmed by the powerful signal of W6AM, would always faithfully reproduce Don's announcement loud and clear everywhere within the store, thus saving him the trouble of parking and searching the store for Mrs. Wallace.

While Don's "broadcast" to his wife was intentional, his startling of patrons of Long Beach's State Theatre and of a nearby huge used-car sales was not. Movies were interrupted by, and the car-lot speakers picked up, an occasional "W6AM calling CQ."

Don won the first DX contest sponsored by the ARRL in 1926, and his record as champion DXer of the world is extremely well known. Wallace has talked to radio amateurs in more countries since 1955 than any other ham radio operator: 365 places classified as nations by the ARRL.

"It's like being a world-champion golfer for 25 years or being the world's champion runner for that long," Don says proudly (and deservedly so). He modestly credits his antennas for his DX success.

When the ARRL announced that a $25 plaque was available to amateurs for *each time* they headed the DXCC list, Don sent in his order for whatever number of plaques he was entitled to and asked that he be billed for their cost. However, *QST* determined that Don had headed the DXers list more than sixty times and that the cost of his plaques would be $1775. It asked for confirmation of such a large order before proceeding with it, and Don compromised and ordered only two representative plaques, one for CW and one for phone.

There wouldn't have been room for all of the plaques, anyway, since three of the four walls of Don's thirty- by forty-foot ham shack already are plastered with plaques, cups, and awards for his accomplishments during 72 years of hamming.

When Don twists the knob of the rotary switch which activates the 108 relays to select the rhombic antenna needed to fire a maximum signal to some area of the world, the clicking relays sound a bit like a World War I machine gun nest. Once the proper antenna has been selected, however, all is quiet, and Don is able to work DX stations that other amateurs cannot even hear.

When he is questioned as to how he is able to maintain his position at the top of the DXCC list, he modest-

ly states that it is not because of his own efforts but those of scores of his friends and fellow DXers who cooperate by advising each other when a new country becomes available. Don says the game is not what many people think. One always helps one's competitors. When Don was vacationing in Palm Springs, one of his DX competitors telephoned him about a new station on Revillagigedo Island. Don drove several hours to get back to his home station, and, thanks to his friend's tip, made the contact for a new country.

Trying his fist in American Morse code at the 1980 meeting of the Southern California Chapter of the Morse Telegraph Club may have brought back memories to Don of operating a five-block-long telegraph line which he and a friend constructed in 1910.

Items

● In October, 1980, Don, along with ten other hams, editors, and writers, was the guest of the People's Republic of China for 17 days of sightseeing and seminars. That made 91 countries visited, and he operated amateur radio in most of them.

● During his lifetime, Don has devised over 100 improvements in amateur radio equipment which have been accepted and manufactured by various companies.

● At least once a year and sometimes as many as four times a year, Don conducts an open house at his Radio Ranch. Radio amateurs with less deluxe stations of their own come to the Palos Verdes peninsula and view with amazement a really superb ham installation. Don is very gracious about accepting requests from ham radio clubs to be their guest speaker and always provides great entertainment.

● When interviewed in the early twenties, Don said, "Amateur radio for me till ninety." He has only five years to go to achieve that goal.

● When interviewed by the *Los Angeles Times* in 1979, Don stated, "Clicking the key and talking to radio hams everywhere in the world is just as exciting to me today as it was when I was a kid."

With that kind of enthusiasm after 72 years of hamming and with a lifetime of extraordinary achievements in wireless and radio behind him, there is only one word adequate to describe Donald Clare Wallace: Superham! ■

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Courage for Would-Be Hams

Here's the inside story of how a worldwide network of hams is helping handicapped people get their licenses.

Would it surprise you to learn that your next QSO could be with a blind person, someone in a wheelchair, or a man who is allergic to almost everything?

More and more people with physical disabilities are discovering the fun and excitement of making new friends around the world through amateur radio. Among the organizations working to teach disabled people how to become hams is the Courage HANDI-HAM System.

The Courage HANDI-HAM System is an international network of able-bodied and physically-disabled hams dedicated to helping people with handicaps explore their interest in amateur radio and assisting them in obtaining or upgrading their licenses. Headquarters for the system is Courage Center, a United Way-affiliated rehabilitation organization located in the Minneapolis suburb of Golden Valley.

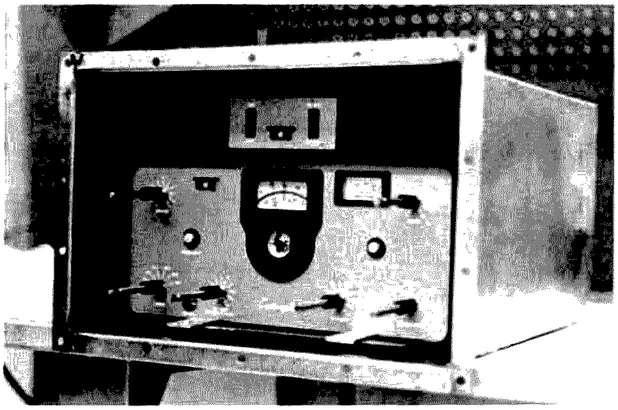
People with physical disabilities interested in amateur radio generally join the system after hearing about it from friends who are hams or reading about it in amateur radio publications. After contacting system headquarters, prospective students are matched with experienced members living in their areas for one-to-one instruction and counseling. Students are also loaned study materials and equipment. In return, they're expected to have a genuine desire to become amateur radio operators and must earn their own licenses.

Once students obtain

Blind HANDI-HAM member, Maureen Pranghofer KFØI, Minneapolis, is a student coordinator for the system. Though she feels amateur radio is an exciting hobby, her guide dog Allen isn't always that thrilled.

Blind HANDI-HAM Dick Eichhorn KBØAE, Minneapolis, is activities coordinator and station manager at the system's headquarters at Courage Center in Golden Valley, Minnesota.

During a typically busy morning at system headquarters, (L to R) John Balkus KØBFU, Minneapolis, and Malcolm Mackay III NØBQC, Minneapolis, check in with the nets while Rex Kiser WØGLU, Edina, Minnesota, "talks" to a hearing-impaired ham on a TTY hooked up to a standard transceiver.



The Courage HANDI-HAM System sealed this Century 21 transceiver into a stainless-steel box so it could easily be used by Bill Savada N5FLY, Falcon Heights, Texas, who is dangerously allergic to the plastic found in most equipment.

their Novice licenses, they can enjoy many other benefits of being HANDI-HAM members: participating in regularly scheduled nets to meet other members, enjoying the fellowship of other hams while improving their skills in contests and "Radio Camps," receiving instruction to upgrade their licenses, and enjoying the satisfaction of introducing other people with physical disabilities to amateur radio.

The Courage HANDI-HAM System was founded by Ned Carmen WØZSW and other interested hams in Rochester, Minnesota, in 1967. Carmen, who had long been fascinated with the idea of organizing a network of handicapped radio operators, finally decided to act on his idea following a thunderstorm watch in Rochester on April 30 of that year.

During the watch, Carmen asked two Catholic sisters in Rochester, Sister Lauren Weinandt WNØRRJ and Sister Judith Simon WNØQVN, to activate their respective stations, "Sky Wave" at St. Mary's Hospital and "The Voice of Assisi" at the Assisi Heights convent, and join in a weather watch.

The watch worked so well that Carmen invited the sisters to help organize the "Minnesota HANDI-HAM System." A 14-member steering committee was formed which met on the air every week to suggest policies and discuss problems. The steering committee soon became the system's board of directors, with a six-member management committee serving as its chief officers.

By the fall of 1967, the system had helped four new Novices receive their licenses. In September of that year, Carmen was honored by the Rochester Chamber of Commerce for teaching amateur radio to homebound people and obtaining equipment and transportation for them. His work also earned him the "Good Neighbor" award, given by WCCO, a clear-channel commercial radio station in Minneapolis. By that time, the system had ten students enrolled.

As time went on, the Minnesota HANDI-HAM System gradually began to make a name for itself. In 1968, the Piconet (Public Information Convenience or Necessity Network) and the Rochester Amateur Radio Club invited the system to co-host their Winter Hamfest. By the summer of 1969, the system made itself known to the nation's amateur radio operators when 26 of its severely disabled members took part in the National ARRL Convention in Des Moines, Iowa.

Sister Alverna McLaughlin WAØSGJ, Minneapolis, Educational Services Coordinator for the system, was a member of the group that attended the convention, and she wrote about the experience in a recent issue of the system's "HANDI-HAM World" newsletter:

"The great HANDI-HAM caravan left for the National ARRL Convention in Des Moines at 7:10 am on Friday, June 20, 1969 . . . ten-meter handi-talkies were in each vehicle so we could communicate with each other when necessary . . .

" . . . The HANDI-HAM display at the convention was adorned with promotional posters explaining the steps, in pictures, of how a HANDI-HAM member gets his amateur ticket . . . From the comments of the guests who stopped by, we had the nicest booth there . . .

" . . . The HANDI-HAM System was the talk of the convention. Hams who were blind pushed wheelchairs and the hams in wheelchairs told the blind people which way to go . . ."

Once the system became known to the amateur radio community, it grew steadily as more able-bodied hams volunteered to be instructors and more people with disabilities eagerly signed on to learn the hobby. Before his untimely death from a heart attack in 1972, Carmen, with the support of several individuals, companies, and organizations throughout Minnesota, expanded his Minnesota HANDI-HAM System into a network of 70 students and 240 disabled and able-bodied members.

To further expand its services and streamline fundraising, the system affiliated itself with Courage Center in 1974. The organization now boasts 3160 members in all 50 states and 27 countries.

But the real story of the Courage HANDI-HAM System is its disabled members who have unlocked the door to a broad new world through amateur radio:

● Hams chewing the rag with Maureen Pranghofer KFØI, Minneapolis, never suspect she's blind, and that's just the way she likes it.

"When people talk to me on my rig, they can't see that I'm blind," says 26-year-old Pranghofer. "Because of this, they're generally more re-

Long-time HANDI-HAM member Jim Mowery KØZWG (left), Fargo, North Dakota, who has cerebral palsy, checks out a rig at headquarters while Dick Eichhorn KBØAE helps out.

laxed and relate to me rather than to my disability."

Pranghofer was introduced to the system when she was a sophomore in high school and was so captivated by ham radio that she earned her Novice license after only two months of intense study.

"I learned my code from braille and memorized it almost overnight," she said. "The electronics theory was tougher because I had to memorize it from tape recordings."

Nowadays, Pranghofer, the proud owner of an Extra-class license, works full-time as a student coordinator for the system, while sharing housework with her husband Paul, a computer analyst who is himself disabled, born without arms and legs.

"I don't get on the air as often as I used to, but I try as often as I can," she says. "Amateur radio is a satisfying hobby for disabled people because it's something they can do that many able-bodied people can't."

She adds that her involvement in the system has rewarded her in many ways.

"The Courage HANDI-HAM System got me started in amateur radio by providing me with the equipment, instruction, and encouragement I needed," she said. "Now that I'm the student coordinator, I enjoy the challenge of turning other disabled people on to ham radio."

●Marlin Gilman WAØAUX has used a wheelchair for over 30 years because of severe arthritis, but that hasn't prevented the 45-year-old Earlham, Iowa, man from making DX contacts in 50 countries.

"Amateur radio has helped me socialize with others and generally become more involved in life," he says.

A next-door neighbor introduced Gilman to amateur radio in 1960, and he has since progressed to his Advanced license, operating a station on his family's farm.

"I'm active on almost every band, and I check in with various nets all day," he says. "I enjoy staying in touch with old friends and making new ones."

But ham radio isn't all fun and games for Gilman, who takes his obligation to public service seriously.

"Back in 1967, Missouri was hit by a heavy snowstorm and cars and trucks were getting stuck left and right," he said. "I helped relay emergency calls to the police from motorists and truckers."

Gilman credits the system with allowing him to join a growing family of disabled and able-bodied hams.

"The people on the air are warm and friendly and I get a big kick out of chewing the rag with hams all over the world," he says. "The Courage HANDI-HAM System has opened a world to me that accepts me for what I can do and ignores what I can't do."

●Amateur radio is even more important to General-class Bill Savada N5FLY, Falcon Heights, Texas, because it helps him ease the isolation of living by himself in a porcelainized stainless-steel trailer located in a sparsely inhabited corner of the state, 60 miles south of Laredo. He can't live in a city, because it would probably kill him.

Savada has universal allergy, which brings on violent, often dangerous, seizures when he's exposed to everyday materials most people take for granted, such as synthetic clothing, cosmetics, plastics, pollen, air and water contaminants, and a host of others.

In 1979, the ARRL put Savada in touch with the system because he faced a tremendous obstacle: He couldn't operate standard radio equipment because he's allergic to the plastic found in most rigs.

System director Bruce Humphrys KØHR, Minneapolis, with the help of several Twin Cities area engineers, companies, and organizations, designed a non-allergenic stainless-steel box with stainless-steel control extentions into which he sealed a standard transceiver. The box was shipped to Savada in March, 1980. Over the phone they agreed that Savada would test his rig by attempting to contact Humphrys at 11:00 am that April 1.

"I was really worried," Humphrys said. "I was worried about whether we'd sealed the box tight enough so Bill wouldn't react to it, worried about whether or not the box had been damaged in transit, and worried about whether or not the rig would overheat and blow up!"

But suddenly, a slow, strong, steady stream of code came over the air. It was Savada, signaling the end of his total isolation.

●The Courage HANDI-HAM system is always looking for new members, either disabled or able-bodied. Able-bodied hams are needed to serve as one-on-one instructors and to help set up rigs and antennas for disabled members.

In addition, people wishing to clean out their basements of old or surplus equipment and parts will find a ready taker in the system, which relies heavily on donated equipment. For information, contact Bruce Humphrys, Director, Courage HANDI-HAM System, 3915 Golden Valley Road, Golden Valley, Minnesota 55422, (612)-588-0811. ■

Ron Toller WO4L, ex-KF4EO
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```
                    K F 4 E O
                    _ _ _ _ _

15-METER PREFIXES & COUNTRIES:  LAST UPDATE 09/20/82
--------- -------- - ----------  ---- ------ --------

PREFIX:                         COUNTRY:
-------                         --------

3B8                             MAURITIUS
7X4                             ALGERIA
CT2                             AZORES
EA3                             SPAIN
EA6*                            BALEARIC ISLANDS
HB0                             LIECHTENSTEIN
KZ5                             CANAL ZONE
PJ8                             ST. EUSTASIUS
SP9                             POLAND
W/K/N                           UNITED STATES

ZD8                             ASCENSION ISLAND
ZP5*                            PARAGUAY
NUMBER OF COUNTRIES = 12
                              * = UNCONFIRMED
```

Fig. 1. Alphabetical printout by prefix.

```
1 LPRINT CHR$(30):LPRINT CHR$(31)
2 LPRINT TAB(14)"K F 4 E O"
3 LPRINT TAB(14)"- - - - -"
4 LPRINT CHR$(30):LPRINT CHR$(128)
5 ' DX-COUNTRY WORKED/CONFIRMED PROGRAM - RON TOLLER KF4EO - 09/20/82
12 LPRINT TAB(12)"15-METER PREFIXES & COUNTRIES:  LAST UPDATE 09/20/82"
13 LPRINT TAB(12)"--------- -------- - ----------  ---- ------ --------"
14 LPRINT CHR$(128):LPRINT CHR$(128)
15 LPRINT TAB(12)"PREFIX:",TAB(42)"COUNTRY:"
16 LPRINT TAB(12)"-------",TAB(42)"--------"
17 LPRINT CHR$(128)
18 LPRINT CHR$(128)
90 CLS:PRINT:PRINT:PRINT:'KF4EO SORT PROGRAM
95 REM CODED BY R. TOLLER - 11/18/80
100 DIM S$(3000),G$(3000)
110 N = 1
120 READ S$(N),G$(N)
130 IF S$(N) = "END" THEN 160
140 N = N + 1
150 GOTO 120
160 N = N - 1
162 PRINT:PRINT:PRINT:PRINT"S T A N D B Y - - - -NOW  SORTING !":FOR BB = 1 TO 3
00 STEP 1:NEXT BB:CLS:PRINT:PRINT
170 FOR K = 1 TO N - 1
180 FOR J = 1 TO N - K
190 IF S$(J) <= S$(J+1) THEN 260
200 X$ = S$(J)
210 S$(J) = S$(J + 1)
220 S$(J + 1) = X$
230 V$=G$(J)
240 G$(J)=G$(J+1)
250 G$(J+1)=V$
260 NEXT J
270 NEXT K
272 L = 1
280 FOR J = 1 TO N
290 LPRINT TAB(12) S$(J),TAB(42) G$(J)
292 L = L + 1
294 IF L> 10 THEN 1000
300 NEXT J
310 PRINT
320 LPRINT TAB(12)"NUMBER OF COUNTRIES =";N:LPRINT TAB(40)"* = UNCONFIRMED":FOR
CC = 1 TO 500 STEP 1:NEXT CC
325 END
1000 PRINT
1010 FOR AA = 1 TO 1000 STEP 1:NEXT AA
1015 LPRINT CHR$(128)
1020 L = 1
1030 GOTO 300
1100 DATA CT2,AZORES
1111 DATA HB0,LIECHTENSTEIN
1121 DATA PJ8,ST. EUSTASIUS
1122 DATA SP9,POLAND
1130 DATA ZD8,ASCENSION ISLAND
1138 DATA W/K/N,UNITED STATES
1139 DATA EA3,SPAIN
1140 DATA KZ5,CANAL ZONE
1142 DATA 3B8,MAURITIUS
1143 DATA 7X4,ALGERIA
1154 DATA ZP5*,PARAGUAY
1164 DATA EA6*,BALEARIC ISLANDS
10000 DATA "END",X
```

Fig. 2. Program listing, alphabetical sort by prefix.

The active DXer needs a way to monitor a count on his countries both worked and confirmed. The program included here is ideal for a computerized station. The data can be inserted in any order and the sort portion of the program will alphabetize the prefix or the country.

The program is written for a TRS-80, but it can be modified for other computers. The sort portion of the program takes a little time (about 5-6 minutes for 100 countries), but that affords the operator time to make out QSLs or other QSOs while running.

The program as listed is the alphabetical sort by prefix; by changing lines 190 through 250, the program will alphabetize by country.

One thing must be noted: The computer places numbers prior to letters (i.e., 3B8, 7X2, 8P6); in other words, all country prefixes starting with a number will be listed prior to the alphabetical prefix routine.

This and my 2nd op make DX work a pleasure; it also saves time. ■

```
                    K F 4 E O
                    _ _ _ _ _

15-METER PREFIXES & COUNTRIES:  LAST UPDATE 09/20/82
--------- -------- - ----------  ---- ------ --------

PREFIX:                         COUNTRY:
-------                         --------

7X4                             ALGERIA
ZD8                             ASCENSION ISLAND
CT2                             AZORES
EA6*                            BALEARIC ISLANDS
KZ5                             CANAL ZONE
HB0                             LIECHTENSTEIN
3B8                             MAURITIUS
ZP5*                            PARAGUAY
SP9                             POLAND
EA3                             SPAIN

PJ8                             ST. EUSTASIUS
W/K/N                           UNITED STATES
NUMBER OF COUNTRIES = 12
                              * = UNCONFIRMED
```

Fig. 3. Alphabetical printout by country.

```
190 IF G$(J) <= G$(J+1) THEN 260
200 X$ = G$(J)
210 G$(J) =G$(J + 1)
220 G$(J + 1) = X$
230 V$=S$(J)
240 S$(J)=S$(J+1)
250 S$(J+1)=V$
```

Fig. 4. Line changes necessary for alphabetical sort by country.

Robert Schlegel N7BH
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Warning: Your Time's Up!

Don't get taken by surprise. This timer add-on will tell you when to ID before it's too late.

Ken Henry's ten-minute-timer design[1] caught my eye as an interesting and worthwhile project. I immediately proceeded to assemble this digital gem and it has been counting out the minutes without a flaw ever since. Although to some a timer may be considered a minor convenience, I find it very helpful in cutting down on the reporting of callsigns. Once in ten minutes is enough!

However, I soon discovered that it is very easy to become overly dependent on the ten-minute alarm. Often I forgot to watch the readout and "timed out" when I could not immediately report my call. Finally, I decided that a warning to draw my attention to an approaching ten-count was a necessity. Fortunately, this proved very easy to do.

Fig. 1, the connection diagram for the 7447/7448 decoder, reveals that a blanking input is available at pin 4. When a low is applied to this pin, all segments of the readout are turned off. Therefore, applying an alternating high-low input to pin 4 will flash the time count and provide a visual warning of an approaching ten-count.

The main problem was to find a logic source to initiate the blanking input at the desired time count. Note, in Fig. 2, that decoder-input D logic is low till the end of the seven-count and then goes high for the last two counts. This high, used in combination with input A logic, can provide a flashing display at the eight- or nine-count as desired.

All that remains is to convert the input D logic source to an alternating high-low at decoder pin 4. This is done easily with a single 7400 NAND gate. As shown in Fig. 3, to obtain a flashing nine-count, pins 1 and 2 of U1A are connected to pin 7 (input A) and pin 6 (input D) of the decoder. At the eight-count, pin 6 goes high. Since pin 7 is low at this time, nothing happens. However, at the nine-count, pin 7 also goes high. With both pins 1 and 2 of U1A high, pin 3 goes low, forcing U1B pin 11 high which in turn is connected to U1C pin 4.

At this point, we need only to provide an alternating high-low logic input to pin 5 and the job is done. Fortunately, the once-per-second pulse at the output of IC2 pin 11 in the timer counter chain provides the perfect source. With U1C pin 4 high, and a high-low input to pin 5, pin 6 will go low and turn off the display once per second.

If you prefer a two-minute warning, connect U1A pin 1 to Vcc with a 2.2k resistor. This holds pin 1 high

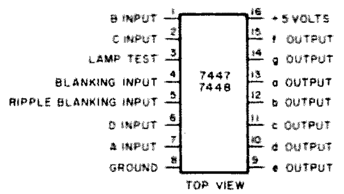

Fig. 1. 7447 or 7448 connection diagram.

Decimal	Input D C B A
0	L L L L
1	L L L H
2	L L H L
3	L L H H
4	L H L L
5	L H L H
6	L H H L
7	L H H H
8	H L L L
9	H L L H

Fig. 2. BCD-to-7-segment decoder truth table.

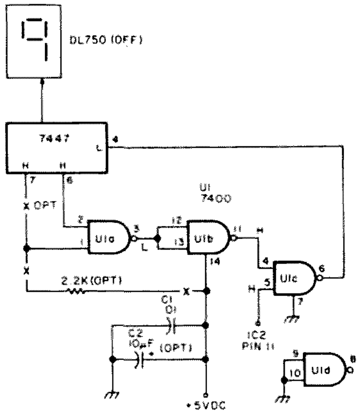

Fig. 3. Schematic diagram of the display flasher. Logic indicated is with display off.

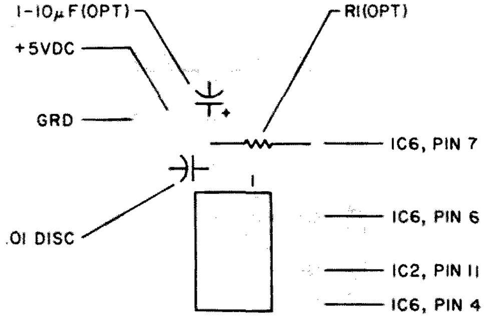

Fig. 4. Foil side of the circuit board and the connection diagram.

so that when pin 2 goes high at an eight-count, flashing action will begin. Pins 9 and 10 are connected to ground, or one pin to Vcc, to force output logic high. Avoid floating inputs on unused gates.

See Fig. 4 for a PC board layout. This circuit is so simple that perfboard is probably more appropriate. Be sure to connect C1 as close to pin 14 as possible. C2 can be any value between 1 and 10 uF and is required only if the power supply is not on the circuit board. Connect C2 at the point on the board where the Vcc lead is attached.

The K3VTQ timer is a terrific project for the aspiring builder. For those of you who do not have a copy of the May, 1977, issue of *73*, an SASE will bring a copy of the original article along with a later article[2] which provides a circuit-board design. ■

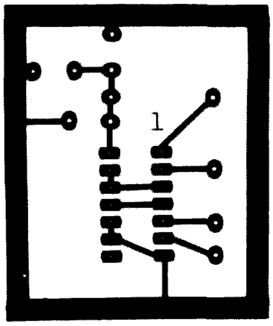

Fig. 5. Circuit board.

References

[1] "Stop Timeouts!", Ken Henry K3VTQ, *73*, May, 1977; "A Three-Digit Timer For TTL Illiterates," Ken Henry K3VTQ, *73*, November, 1979.

[2] "'Stop Timeouts!' Revisited," Kenneth D. Williams WB3ELV, *73*, September, 1978.

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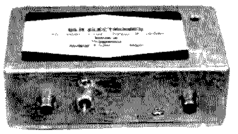

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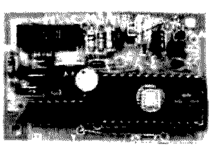

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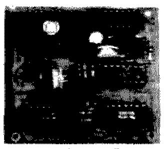

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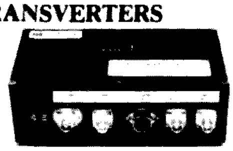

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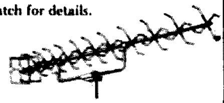

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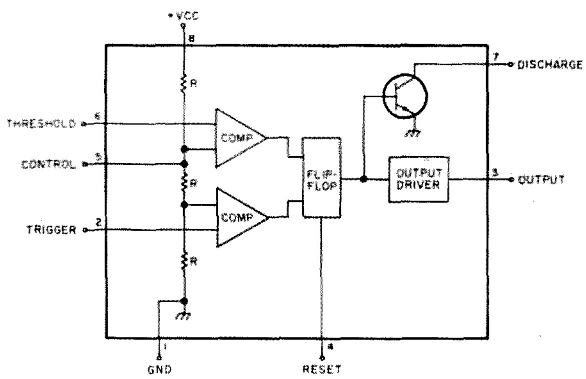

Fig. 1. NE555 timer block diagram.

Many solid-state repeaters nowadays use large lead acid batteries for standby emergency-power sources. One problem that our repeater club had with such a system was that of keeping the battery charged without overcharging it. Keeping a charger on it continuously would have tended to boil the acid out of it after only a short time, rendering the battery useless. Repeated trips up the mountain to replace or refill batteries were out of the question, so a simple regulator was designed to charge the battery when needed and discontinue charging when the battery reached full charge.

The Circuit

The key element in this simple circuit is the good ol', ever popular NE555 timer integrated circuit. No, the circuit does not time the charging, but it does make use of the 555's internal voltage comparators.

The block diagram of the 555 is shown in Fig. 1. The 555 has a resistive divider composed of three equal resistances connected between power and ground.

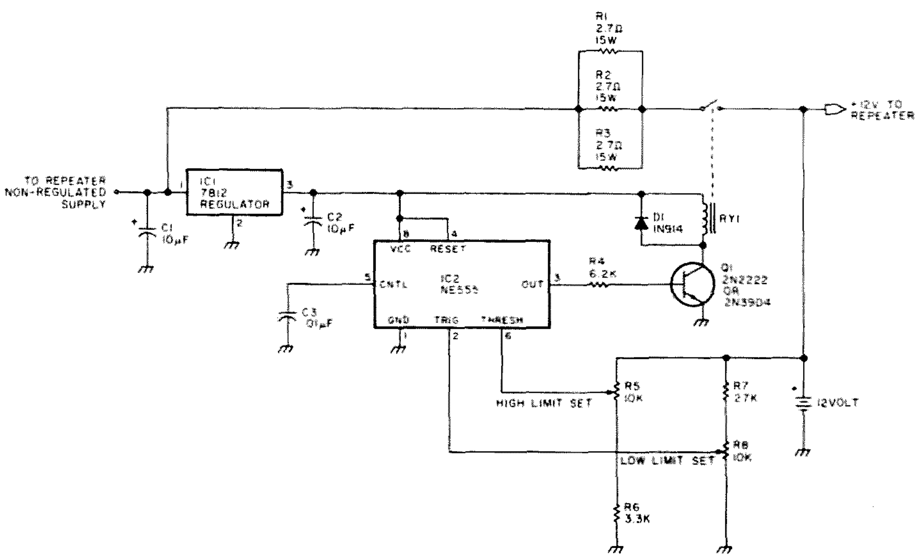

Fig. 2. Regulator schematic.

Two comparators are connected to this divider network in such a way as to provide comparisons between 1/3 and 2/3 of the supply voltage. A flip-flop controlled by the comparator's outputs turns on and off the output stage. The output stage is turned on whenever the voltage on the trigger input (pin 2) goes below 1/3 of the supply voltage. Similarly, the output is turned off whenever the voltage on the threshold input (pin 6) goes above 2/3 of the supply voltage. Therefore, to use the 555 as a charger regulator all we have to do is stabilize the supply voltage at 12 volts and scale down the trigger and threshold voltages. The schematic of the simple charger is shown in Fig. 2.

Resistors R7 and R8 form a voltage divider set in such a way that when the battery voltage falls to a lower limit (11 volts in our system), the voltage at pin 2 of the 555 is at 1/3 supply or, in our case, four volts. At this point, the output of the 555 (pin 3) goes high turning on transistor Q1 which in turn activates the charger relay, RY1. This relay connects a charging voltage to the battery through current-limiting resistors R1, R2, and R3. Charging then continues until the battery reaches a high limit (14 volts in our system). Resistors R5 and R6 scale this voltage so that the threshold voltage at pin 6 of the 555 is then at 2/3 of the supply voltage (in our case, eight volts). The output of the 555 then turns off, stopping any further charging. Simple, isn't it?

The unregulated output of our repeater's main power supply is about 16 volts. Since we set our lower charger trip voltage at 11 volts, we had a maximum voltage difference of five volts across the current-limiting resistors. We determined that a charge of around 6 Amps would be adequate. Ohm's law then showed that a resistance of slightly less than 1 Ohm at a power rating of about 30 Watts was needed. Three 2.7-Ohm, 15-Watt resistors from my junk box, wired in parallel, came close enough.

Adjustment

The circuit can easily be preset prior to installation at the repeater site. Connect a variable power supply set to 12 volts in place of the battery and a fixed supply of 14–18 volts to the 7812 regulator. Resistors R5 and R8 should be set to the center of their ranges. Now adjust the variable supply to your desired lower-limit voltage. Adjust R8 to the point where the relay is just activated. Then adjust the power supply to your desired high-limit voltage. Adjust R5 to the point where the relay just falls out. Check it by turning your power supply down to a voltage below your lower trip point. The relay should then pull in and stay energized until you adjust the power supply to a voltage higher than your upper trip point.

Conclusion

This charging circuit has worked flawlessly in our repeater for over a year now. It has shown no signs of rf sensitivity or any kind of malfunction. Although the repeater is remotely switched to battery operation every weekend, water has been added only once. No evidence of significant boilover has been observed. It is a simple circuit that works fine every time. It is just exactly the type of circuit that is needed for a very remotely located repeater.

One caution: Before connecting this circuit to your repeater's main power supply, be sure that the supply can handle both your repeater's maximum current needs and the maximum charging current going to the battery! Otherwise, popped fuses or components can result when the charger is connected. ■

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Parts List

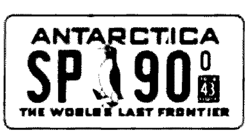
Designation	Description	Price Each	Total
R1–R3	Resistor, 2.7 Ohm, 15 Watt (see text)	$1.86	$ 5.58
R4	Resistor, 6.2k Ohm, 1/4 Watt, 20%	.06	.06
R5, R8	Potentiometer, 10k Ohm, 1/4 Watt	.59	1.18
R6	Resistor, 3.3k Ohm, 1/4 Watt	.06	.06
R7	Resistor, 2.7k Ohm, 1/4 Watt	.06	.06
C1, C2	Capacitor, 10 uF, electrolytic, 25 volt or greater	.59	1.18
C3	Capacitor, .01 uF, 50 volt, ceramic disc	.20	.20
D1	Diode, 1N914 or equivalent	.10	.10
Q1	Transistor, 2N2222, 2N3904, or equivalent NPN	.69	.69
IC1	Voltage Regulator IC, 12 volt, 7812 or equivalent	1.59	1.59
IC2	Timer IC, NE555	.39	.39
RY1	Relay, 12-volt-dc coil, 10-Amp contacts	5.99	5.99
Misc.	Perfboard, RS 276-1390	1.39	1.39
		Total	$18.47

See List of Advertisers on page 130

73 INTERNATIONAL

Each month, 73 brings you amateur radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Avery L. Jenkins WB8JLG.*



ANTARCTICA

Jonathan Lingel KA4EZV
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North Stratford NH 03590

AS FAR SOUTH AS POSSIBLE

The by-product of an effort to break from the eight-to-five norm was my trip to the south polar ice cap. The assignment was the construction of a 26-mile-long dipole antenna at the National Science Foundation's Siple Station.

Siple Station, located at 76° south latitude and 84° west longitude, conducts upper atmospheric and magnetospheric research. The lengthy dipole is used in conjunction with a 200-kW ULF transmitter and receiver in the study of Whistler-wave phenomena.

Whistler waves occur naturally as a phenomenon associated with distant lightning. The signals follow the Earth's magnetic lines of force, reaching altitudes of several Earth radii while traveling to the opposite hemisphere and often returning on the same path.

The antenna project offered an opportunity to venture over the horizon from Siple Station and travel where no humans had ever been. Because we had the antenna to follow, we were able to work when weather conditions were less than ideal. This provided a chance to witness unique weather.

When the sun was obscured by clouds, the horizon would vanish and the snow's surface would lose all definition. All perspective would be lost. A traveling snow tractor or a fellow worker would appear to float in midair. This condition is known as a whiteout. With a moderate to heavy fall of snow and the associated low visibility, a whiteout would take on a dimension that kept us secured at the station.

During free time, I had the chance to use Siple's amateur-radio station, KC4AAD. A regular schedule for phone patches was attempted using KWM-2A gear. A sloping-V antenna with 562 feet on each leg was used to radiate the signal. The transmitter was located 50 feet beneath the snow in the station proper. The station, built on the surface in 1978, has since been covered by the ever-accumulating snow. It was at Siple that I experienced working my first pileup from the "other end." Now that I've had time to think, I feel that I could have handled it better.

When the antenna project was completed, I was sent further south to work as meteorologist at Amundsen-Scott Station at the South Pole.

The weather at the Pole was extremely cold and quite dull. I never saw the temperature rise above −18° F or fall below −40° F (remember that this was summer). The continuous wind did not rise above 25 miles per hour. There was no snowfall. The air was too cold. Instead, a snow phenomenon known as diamond dust frequently fell from the deep blue sky, faithfully adding to the already phenomenal 9000 feet on the ground. The air had no fragrance, no depth. It was sterile. No birds flew, no wild animals sauntered by; not even bacteria lived outside the station at the South Pole.

I also found time to work the amateur station at the South Pole, KC4AAA. The station's Collins KWM-2A was fed into a six-element tribander up about 75 feet. The antenna's rotor was enclosed in a heated box.

After the phone-patch list was cleaned up (and barring any pileups), I would take time to do what I like to do: rag-chew. The 20-meter band would be searched for some lonely CQ in the night, and I would answer. I think that I received more of a thrill than the other station when I listened to the response of having contacted the South Pole! I also enjoyed armchair contacts with my old friends back home in northern New Hampshire. Once they even patched me into the Granite State FM Net on two meters via the Mount Washington K1OIQ repeater.

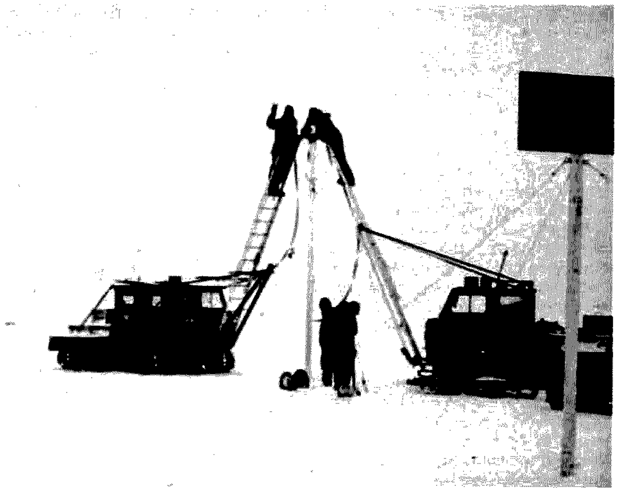
I was disappointed that Brian Combs KA3JXR and I did not get to use the controlled-current distribution (CCD) antennas sent to Brian by W4FD and W4ATE as mentioned in the July, 1983, issue of *73*. The powers that be had other plans.

I am looking forward to more fun in the deep south as I have accepted a contract position as radio operator/meteorologist at Siple this season. I may even get a chance to winter-over this year!

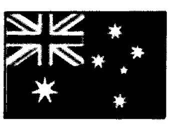
References

1. Harry A. Mills W4FD and Gene Brizendine W4ATE, "Antarctic Antennas," *73*, July, 1983.
2. Robert A. Helliwell W6MQG, "Whistler Waves and the Magnetosphere," *The Stanford Engineer*, October, 1982.

Amateur-radio station KC4AAD at Siple Station, Antarctica. Brian Combs KA3JXR is seated at the mike operating DX from "the other end."



The last connection is made on the 26-mile-long ULF dipole antenna at Siple Station. Four thousand feet of salt-free ice (accumulated snow) beneath the antenna provides insulation from earth ground.



AUSTRALIA

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Altona 3018
Australia

Many countries, to their credit, have had such famous sons as Marconi, Bell, and Morse, whose endeavors in the field of communications are world renowned. Other countries have had their own pioneers in the field of radio communications but they have not received, or perhaps wanted, the world recognition they deserve.

One such person was Alf Traeger, the designer of the Traeger Pedal Radio.

In the year 1907, at the age of 12, he designed his own telephone using the prongs of a pitchfork, two tobacco tins, and some charcoal granules, linking up the farmhouse and an outlying shed. In 1926, at the age of 31, he obtained his amateur license. When John Flynn (the father of the Flying Doctor Service of Australia) was looking for a transceiver that would be cheap and simple to operate on Australia's outback stations and ranches, he contacted Alf Traeger.

After much experimenting, Alf came up with a transceiver that operated on the bicycle-pedal system. It drove a dynamo, thereby leaving the hands free to operate a CW transceiver. This had its drawbacks, as not all people knew Morse code, so, after experimenting, Alf added to his transceiver a keyboard that could transmit Morse letters at a governed speed. And all this back in 1926!

His transceiver was crystal-controlled, and a steady frequency was maintained whether you pedaled hard or slowly. I, for one, spent many tiring hours pedaling away for the station owner's wife or children, while she gossipped or the children got the only education possible for them from a teacher who was 1000 miles or more away.

By 1937, the Morse keyboard was replaced by a radiotelephone system which, while pedaling, left both hands free to either adjust the knobs or swat flies.

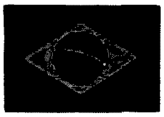
Pity the person who was either injured or sick before the advent of Traeger's transceivers. It usually meant a horseback ride of a week or more before help could arrive at some of the remote areas, with the patient either curing himself, suffering pain for a week, or dying. Unfortunately, many people did die. With the advent of Traeger's transceiver and the Flying Doctor, what was once a week's delay in medical help became only hours.

It was not all serious, though; it did have its lighter moments. For example, we had on our station a chap named Andy who had not been home to see his wife for six months. She lived in the nearest town, some 200 miles away. He finally decided to visit her for a get-together. While en route, we sent an on-the-air telegram to her (remember, everybody used to listen to these messages, all over the whole of

outback Australia). The text was "Coming home, feeling randy, hope you're the same. Love, Andy." He wondered why his reception at home alter six months away was lees than cool, until he was told of the prank.

With mates like us, who needed enemies?

Perhaps there is still a place today for the concept of pedal radio. Where there is no domestic power, flat batteries would be a thing of the past. How many DXpeditions have failed through generator failure in remote areas? If they took along a set of pedals with an efficient beam, they could still operate as all the Australian outback did, way back in 1926, thanks to Alf Traeger's Pedal Radio.



BRAZIL

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CW AWARDS

Since March, 1975, when the Brazilian CW Picapau Carioca Group (Carioca Woodpeckers Group) commemorated its tenth anniversary, a sweeping awards program has been offered to the world's radio amateurs. This was the first group created in Brazil, and it is now 18 years old.

Well-balanced rules for DX participants and an interesting program for Brazilian hams brought such great participation that a TRS-80 Color Computer has been brought into use to handle the whole business, including the PPC Hunters Club, an exciting competition developing extraordinary interest among Brazilian radio amateurs.

Special care is taken for DX operators, so it will be easy to find PPC members operating all DX bands. Quick delivery of QSLs and awards are considered important "musts" by the group.

Members are PP1IR(B&P), PY1AFA, PY1AN, PY1ARS, PY1AVV, PY1AYE, PY1BLG, PY1BOA, PY1BUL(YL), PY1BVY, PY1CBW, PY1CC, PY1CCE, PY1DFS, PY7CGV(YL), PY1CIP, PY1CKV, PY1CTP, PY4CZ, PY1DFF, PY2DHP(YL), PY1DMZ, PY1DUB, PY1DUJ(YL), PY1EIR, PT9EJ, PY1ETP, PY1ETY, PY2EW, PY1EWN, PY2FWR, PY2FWT(B&P), PY6HL, PY1HQ, PY4PZ, PY1RJ, PY1SJ(YL), PY1SW, PY1VB, PY1WA, PY1WDS, PY1TG, PY1AAU, PY1DMX, PY1EBK, and PY1DGB. We are very happy to invite you all to join the fun of the PPC CW awards program!

PPCAW—Work five stations of PPC members.

PPC*DX*—Work 50 stations, suffixes forming international prefixes, according to the ARRL list, e.g., WA2PY, SM1*LU*, UK2VE, using only two-letter suffixes. To form one-letter prefixes, use one, two, or three *same*-letter suffixes, e.g., KA4*F*, G3*FF*, or PY5*FFF*. Maximum of ten stations from the same country (except if from Brazil, where there are no limits). Endorsements or credits for each new 10 stations, until 100 total stations.

PPCPY—Work 27 different stations with two-letter suffixes which are the same as Brazil's 27 states' two letters: AC, AL, AM, AP, BA, CE, DF, ES, FN, GO, MA, MG, MS, MT, PA, PB, PE, PI, PR, RJ, RN, RO, RR, RS, SC, SE, and SP. Maximum of 6 stations with the same prefix, except for no limits with Brazilian station QSOs.

PPXA—Work 50 different prefixes from North, Central, or South America. Credits for each new 50 prefixes until you reach a total of 300 stations.

PPQRA—Work 17 different stations using suffix's first letters to form: P-P-C P-I-C-A-P-A-U C-A-R-I-O-C-A. Credits for same task but using second suffix letters and third suffix letters.

PPC3A—Work 25 countries in North, Central, and South America, ARRL list. Any band, but 3 Americas must be represented for the basic award. Credit for each new 10 countries in North, Central, or South America.

5BPPC—Work five different Brazilian prefixes on each of 5 bands, 10-15-20-40-80/160, and one PPC member per band. If it is in the same claimed band, the PPC OSL is valid for that task, too. The basic award is obtained for any complete band and PPC QSL. Same prefixes can be worked in other bands if different stations. Contacts valid only after 01-01-81 for 5BPPC.

QSOs since March 22, 1975, are valid for all awards except 5BPPC. No QSLs needed; just send logs signed by your radio association or two radio amateurs. Send GCR list indicating number, call, date, and declaration that all QSOs were two-way CW signed by association or two radio amateurs; include one of your QSL cards for PPC files.

GCR, log, and a 5-IRC fee for each award must be sent to PPC Award Manager, PO Box 18003, Rio de Janeiro, RJ 20781, Brazil.

For credits, send an SASE and 1 IRC.

CANADA

CARF News Service

Keeping a radio-station log is no longer necessary, except for Amateur-class operators who will need logs and QSL cards for proof of operation when applying for 10-meter and VHF phone privileges. DOC promulgated the change on June 22. Another change in the regulations made at the same time makes it easier for those with Amateur-grade certificates who live far from exam centers to obtain authorization for Advanced-class privileges, good for one year. Logs and OSL cards are also required when applying for this permission. Minor changes have also been made to the titles of the various Certificates of Proficiency.

DOC soon will ask for public comments on special considerations to be written into the regulations for handicapped candidates for exams. Also up for comment will be a change to require candidates for the Advanced-certificate code test to know figures and punctuation marks. At present, these are required only for the Amateur-class test. Comment will also be asked on a proposal to drop licensing of scanning receivers, a requirement which has proven practically unenforceable.

Good news for those plagued with power-line and appliance interference. DOC plans to proceed with regulations governing rf noise from these sources. Other regulations to cut the interference from electronic appliances, computers, and games are now being drafted by the Department. The regs will include what is termed "digital apparatus" and will be aimed at preventing dumping into Canada equipment which can't meet US standards.

COLOMBIA

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Colombia

NEW RADIO-AMATEUR RULES

The Colombian government, through the Ministry of Communications, has issued new radio-amateur rules which will be implemented in the coming months. They include some specific norms for the use of amateur satellites emphasizing the technical and experimental aspects of this service, in accordance with the international regulations.

Regarding radio-amateur licenses, they will be issued to hams from the age of fourteen: Novice; Third class, after holding a Novice license for one year; Second class, after one year of holding Third class; and, finally, First class to those hams having held a Second-class license for a minimum of two years and passed a stringent examination.

First- and Second-class licenses are permanent, while those below must be renewed every four and two years, respectively. Callsigns must be used at the beginning and at the end of each transmission.

One of the most interesting aspects of the new regulations relates to nationals holding foreign licenses. They can obtain a Colombian radio-amateur license without having to pass any tests. Besides, the Colombian license will be of equal category to the foreign one.

As for foreigners residing or visiting the country, their valid license will automatically be honored by the Colombian Ministry of Communications with the same category and privileges without having to submit to examination, and they will retain their own callsign followed by the HK prefix plus the number of the zone from which they are operating. A consular certification from the country of origin is required by the Ministry of Communications for the issuance of the permit.

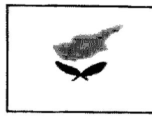
There are nine amateur zones in Colombia, namely, HK0 for the islands and maritime-mobile operation; HK1 for the Atlantico, Bolivar, Cordoba, and Sucre provinces (Departamentos); HK2 for the Guajira, Magdalena, Cesar, and Norte de Santander Departamentos; HK3 for Cundimamarca (this includes Bogota), Meta, and the Vichada Commissary (Comisaria); HK4 for the Antioquia and Choco Departamentos; HK5 for the Departamentos of Valle del Cauca and Cauca; HK6 for Caldas, Tolima, Huila, Quindio, and Risaralda; HK7 for Santander, Boyaca, and the Intendencia of Arauca and Casanare; HK8 for Narino, Caqueta, and the Intendencia of Putumayo, and HK9 for Comisarias of the Amazonas (the southernmost tip of Colombia bordering Brazil and Peru), Vaupes, Guainia, and Guaviare.

If a holder of a valid radio-amateur license is dead, any one of his relatives can keep the license provided he/she passes the tests and other requisites within one year of the original holder's death.

To operate a ham-radio station, there is also a new requisite besides holding a valid radio-amateur's license, in the form of a contract signed with the Ministry of Communications and the payment of a small tax. The contract is valid for periods of two years for Novice licensees, four years for Third class, and five years for those with First- and Second-class tickets, renewable for equal periods of time.

The use of phone-patch traffic continues to be prohibited except in emergency situations and for special cases involving communications from the so-called "National Territories" which are those sparsely-populated areas bordering Venezuela, Brazil, Panama, and Peru.

Finally, and most encouraging, is the proviso whereby the Ministry of Communications from now on will issue special honorific certifications (diplomas) and decorations to those radio amateurs (Colombian or otherwise) who have rendered special and distinguished (outstanding) services for the benefit of the community and humanity.



CYPRUS

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Limassol
Cyprus

THE CYPRUS AWARD

The Cyprus Award is being sponsored by the Cyprus Amateur Radio Society. It will be awarded to any licensed amateur-radio operator outside Cyprus who makes a specified number of two-way contacts with licensed amateurs on Cyprus.

To reduce as far as possible any advantage accruing to stations because of their geographical location and to encourage activity on the less frequently used bands, the certificate will be awarded on a points basis deteremined by the zone location of the station and the frequency bands used. This is shown in the table.

The total number of points required to win the award is dependent on the number of bands used:

If all contacts are made on only one band, 32 points are required.

If the contacts are made on any two bands, 24 points are required.

If the contacts are made on any three bands, 16 points are required.

If the contacts are made on any four bands, 12 points are required.

Any mode of emission may be used, but operation must be in accordance with standard amateur-service practice. Contacts must be made after April 1, 1973. A certificate awarded for contacts made in the VHF bands will be suitably inscribed. Contacts with any one Cyprus station can count only once per band.

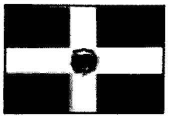
	Points per contact, by band (in MHz)							
	1.8	3.5	7	14	21	28	144	432
CQ Zone								
20	8	2	1	1	2	4	2	8
1, 2, 3, 6, 7, 10, 12, 19, 24, 25, 26, 27, 28, 29, 30, 31, 32	16	8	4	2	4	8	-	-
All Others	8	4	2	1	2	4	16	32

Cyprus Award points schedule.

To claim the award, copies of log entries with the following information should be submitted: date/time GMT, station worked, frequency band, and signal reports in and out. Each log sheet should be headed with the callsign, zone number, and full postal address, preferably typed or printed in block letters. These should be supported by the appropriate QSL cards or a certificate from the applicant's national society certifying that the QSL cards have been made available to them. In countries without a national society, a similar certificate signed by two other amateurs will suffice.

Log sheets accompanied by ten IRCs or US$2 or the equivalent should be sent to the Awards Manager, Cyprus Amateur Radio Society, PO Box 1267, Limassol, Cyprus.

The log entries will be checked and, at the discretion of the Cyprus Amateur Radio Society, the certificate will be awarded. Unsuccessful applicants will be notified of the reason for rejecting their claim.



DOMINICAN REPUBLIC

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Dominican Republic

Greetings from the Dominican Republic to all the readers of *73*. From now on we will cover interesting news concerning ham radio in this beautiful island in the Caribbean.

We will also be glad to help you in getting any HI QSL which you have failed to receive, work out a schedule for a particular band, or answer any of your questions pertaining to the ham scene here.

The Dominican Republic (HI) shares the Hispaniola Island with Haiti (HH) in the Caribbean Sea between Puerto Rico and Cuba. The Dominican Republic has a territory of 48,442 km^2 and Haiti has about 26,700 km^2. The capital city of the Dominican Republic is Santo Domingo; it holds one and a half million people of the total population of six million.

The country is divided into nine zones for ham-radio purposes. Zone 1 includes the islands of Beata and Alto Velo, which belong to the Dominican Republic, and some islets in the surrounding area. Zone 2 includes three islands, Saona, Catalina, and Catalinita. These first two zones are activated only in DXpeditions since they have no permanent ham-radio residents.

The first DXpedition to Beata Island (HI1RCD) was in 1979; it was run by a group from the Radio Club Dominicano. Zone HI2 was activated for the first time on Saona Island in 1977 by another group from the above-mentioned club. Later, in the years of 1980 and 1981, some DXpeditions were also made to Catalina Island, again by the boys of the Radio Club Dominicano.

The northern and central areas of the country correspond to Zone 3. At the present time, there are well-organized and very enthusiastic ham-radio operators among the Zone 3 members of the Radio Club Dominicano. They are very active on 2 meters and also on the other bands. There's great enthusiasm for DX and contests. Right now, we could state that this zone is the most active in ham radio in the Dominican Republic, having around 100 active ham operators.

Zone 4 holds only two active operators, while there's only one in Zone 5.

In the beautiful seashore area of the southwestern part of the country, in Palmar de Ocoa (which is included in Zone 6), we have Arturo HI8GB/6. He operates from his beach house during weekends. Arturo is a true DXer who speaks fluent English and also enjoys contests.

The eastern part of the country is Zone 7. Here we can find from 10 to 15 active ham-radio operators.

Zone 6 corresponds to the capital city which, as you would expect, holds the greatest number of ham operators even though the active ones number no more than 125. And Zone 9 contains only two operators, mostly active on 40 meters.

As it is clearly shown, the total number of active ham-radio operators in the Dominican Republic is close to 250, regardless of the 1500 or more that are listed in the *Callbook*. Due to this fact, HI is still considered good DX, especially on the 10-, 40-, 80-, 160-, and 6-meter bands, and it will be our purpose on these pages to keep you up to date with interesting information on when and how to make your contacts with HI in the different zones and on the bands that are more uncommon.

There is much more to come, but that will be in future columns from the Dominican Republic—the best well-kept secret of the Caribbean!

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Guayaquil
Ecuador

Here is the inside view of what happened at the recent meeting in Cali (Colombia), attended by our delegate, Gustavo Crespo HC2NW. The sponsor was the Cali branch of Liga Colombiana de Radioaficionados and the meeting took place on the 50th anniversary of the foundation of the Liga.

On the first day, June 6, the five work committees were formed. Ecuador took part as secretary of the "VHF/UHF Satellites Commission." The meeting was held in CIAT, the Centro Internacional de Agricultura Tropical, and it was superb. There were simultaneous translations for all of the participants.

The commission in which Ecuador took part came up with the following:

- Frequency assignations in the new bands, and a compromise between governments which would allow radio amateurs to use the new allocations shortly.
- The procedure of issuing licenses should be standardized and the delegates will work toward that goal.
- It was decided that July 1, 1989, will be the deadline for governments to open up the new allocations.
- Peru proposed outlines of how to use the new segments.

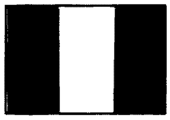
We should note here that most of the time, the decisions were unanimous.

A committee member from Japan gave a talk about the launching of the new JAS-1 satellite at the beginning of 1984 and explained how the funds were raised. One-third were donated by Japanese amateurs and the difference came from the government of Japan.

The committee also recommended that amateurs should give their QTH as standard calling procedure. If it is approved, we will say, for example, "This is HC2PP, latitude XX, longitude XX." It is a good idea, but it will take a while to catch on.

On the last night of the meeting, the Ministry of Communications gave away 500,000 postal stamps worth 12 Colombian pesos each, to commemorate the meeting of the IARU.

These highlights are a few words reflecting 800 pages worth of decisions at the meeting. The organization was fantastic, and there was always an HK radio amateur with every member or delegation.



FRANCE

Claude Guee F1DGY
11 Rue Emile Labiche
28100 Dreux
France

If you travel in France... try the 2-meter repeaters!

First of all, you have to ask for a French license. For this, apply to: DTRE-CGRP Service Radio-Amateur, 94002 Creteil (Cedex), France; phone (1)-569-96-20.

All of the information you need for a license will be sent to you. Don't forget, you have to submit your application early if you want to enjoy your FØ callsign.

Repeaters are very good companions for a trip in a foreign country. They can be very useful, too. At the very least, put an HT in your pocket and bring it along. Of course, it is better to have a car mounted with a 5/8-wave and 25 Watts (but keep customs in mind and have your bill of sale).

About 30 two-meter repeaters are located in "the Hexagon." They are in the upper part of the VHF band (144-146 MHz). Fifteen channels are scheduled, a little bit more than the IARU band plan calls for. To open a repeater, a 1750-Hz tone burst is required (you can also whistle). However, this tone burst is not necessary during the QSO. The time remaining after sending your callsign is sufficient. Transmit after the "K." Repeaters can be anti-chatter-protected. FZ1THF, for example, has a one-minute limit; it is very busy...

Some repeaters, such as F27THF, are equipped with voice synthesizers.

The shift is 600 kHz down, with a 25-kHz step between channels. Autopatch is not allowed, but on Tuesday evenings RTTY and SSTV are authorized.

Some home-brew equipment is heard on the air, but more often Icom, Kenwood, and Yaesu HTs are becoming popular for hikers and walkers.

Unfortunately, we also have intruders from time to time. They are called "Shaddock," from a famous cartoon on French TV.

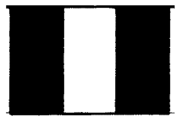
Generally, few QSL cards are exchanged, except for FØ.

Between repeaters, there is no QRM when normal VHF propagation occurs. The purpose here is to have a low density of machines. Eventually, you may have the opportunity of using some simplex channels, such as 145.500, .525, .550, and .575.

English is not the mother language here, so contacts will be easier if you speak French—even a little. And while using other languages, speak slowly!

Channel	Call	ORG	Dept.	QTH near:
R0	FZ1THF	145.600	92	Paris
	FZ3VHF		22	Saint-Brieuc
R1	FZ6THF	145.625	68	Colmar
	FZ7VHF		89	Auxerre
R2	FZ4VHF	145.650	87	Limoges
	FZ9VHB		84	Avignon
	FZ1VHB		77	Provins
R3	FZ8VHF	145.675	69	Lyon
	FZ9MCA		06	Monaco
R4	FZ3THF	145.700	61	Alencon
	FZ4THF		64	Pau
R5	FZ4VHB	145.725	33	Bordeaux
	HB9G		-	(Franco-Suisse) Geneve
R6	FZ2THF	145.750	80	Peronne
	FZ5VHF		81	Albi
R7	FZ3VHB	145.775	85	Cholet
	FZ7THF		39	Dole
	FZ9THF		13	Marseille
R8Bis	FZ2VHB	145.325	14	Caen
	FZ9VHF		66	Perpignan
R9Bis	FZ1VHF	145.350	27	Vernon
	FC1VHF		20N	Bastia
	FZ8VHB		73	Chambery
R10	FZØTHF	145.375	37	Tours
	FZ6VHB		67	Strasbourg
	FZ5VHB		48	Mende
R11	FZ2VHF	145.400	20S	Ajaccio
R12	FZ5THF	145.425	09	Foix
	FZ6THF		51	Chalon sur Marne
R13	FZ9VHC	145.450	04	Digne
R14	FZ8THF	145.475	63	Clermont-Ferrand

French 2m repeaters.

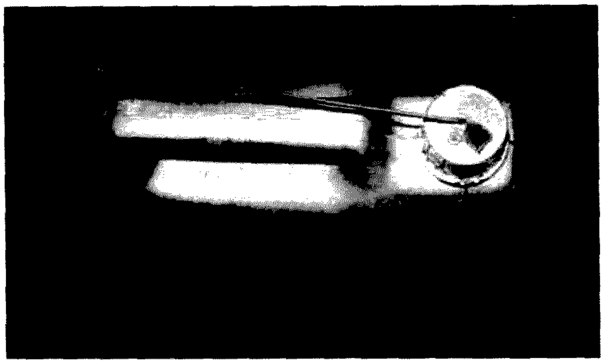


ITALY

Mario Ambrosi I2MQP
Via Stradella, 13
20129 Milano
Italy

The Italian QSL bureau has been reorganized and is now working at full speed. There is no backlog at the end of each month and the transit times have been substantially reduced. Cards are sorted by callsign at the QSL bureau and are bundled and shipped to the local radio clubs. In each of the clubs there is a manager responsible for local distribution.

Each member of the club has a box where he can find the incoming cards once a week during the meetings. There are about 200 of those clubs all around the



The oil-container transmitter case with antenna.

country; if you do not belong to one of them, you can have direct mail service to your address.

The biggest club is in Milano (more than 600 members). It is made up of a few rooms in a school building and has a conference room to accommodate all the members. The QSL service is now very fast, and from some random tests we have verified that it can take 3 or 4 months to receive a card from the moment you mail it to your bureau. But this is valid only if your correspondent does send you his card, which does not happen very frequently with US amateurs.

During the month of June, we had in Italy the first "League Clubs Contest." The participation was incredible in spite of the fact that this was the first edition. Being the contest manager, I was surprised to receive more than 3 feet of logs from 300 out of the 600 participants.

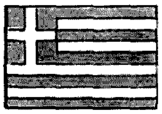
It has been a national contest and it will remain like that in 1984, but it could become international in 1985. The next contest will have an Icom HF transceiver as first prize and a VHF one as second prize. In the meantime, we will start a contest for SWLs that will have a general-coverage receiver for the top scorer.

A new award has been introduced by the ARI DX Blue Team—the IIA (Italian Islands Award). You need 10 points for it and you can get them by contacting stations in the Italian islands. It's easy to recognize them from the prefixes: IA1, IA5, IB0, IC8, ID9, IE9, IF9, IG9, IH9, IJ7, IL7, IM0, IS0, and IT9.

Islands with a local resident ham count 1 point; islands with no local resident ham count 3 points or 2 points (according to a long list that I can provide to anybody who needs it).

You can contact the same island on different bands and modes. There is an honor roll at 60 points and a 5-band endorsement for working 10 islands on 5 different bands. No need to send cards.

The cost is $8. The award is in full color on special paper and features an old map of Italy showing all the groups. All requests should be sent to ARI, Via Scarlatti 31, 20124 Milano, Italy, or to my address.



GREECE

Anastasios D. Panos SV1IG
PO Box 19063
Athens 11710
Greece

Repeater R1 at the top of Mount Parnis has been the target of some people for quite some time now. It is the most active repeater, especially during long weekends and holidays. A few days before Easter this year, a steady signal was at the input of the repeater, disturbing its normal use. After four consecutive days of night-only transmissions, we figured that the new beacon placed had a timing device that permitted it to work every evening. This made it difficult to trace, compared with the other two jamming beacons that had been on continuously in broad daylight.

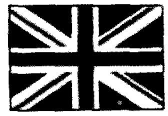
The four 19-element yagis of SV1OE gave us an indication that the bug was placed close to the mountain. With fingers crossed, SV1NN, SV1NK, SV1RJ, SV1RP, and I started the fox hunt. SV1RJ borrowed a wooden broom handle that was converted to a 4-element yagi of his own construction—with fine results. The small convoy of three cars stopped at the parking lot at the foot of Mount Parnis. No signal was heard on our FM rigs and no signal was received by the SSB rig on our vertical.

We unpacked the "broom-yagi" antenna and there it was. A small signal appeared when the antenna was pointed to the casino/hotel at the top of the mountain. Enthusiasm made us forget the low temperature and gave us the courage to continue. Close to the top of the mountain and three kilometers before the casino, a strong signal blocked our receivers. As we got closer to the casino, the signal was weak so we decided to return to the earlier point. Strong indications again, but we could not pinpoint the bug.

A Yaesu FT-290 and an Icom IC-2E were in use at the time. By midnight, we were circling 200 square meters of a mountain with trees and rocks. The signal was strong with no antenna, but the rf was reflected by the trees, which made things difficult. The broom-beam worked again and gave us two indications. After walking some 30 meters on the road, we found the bug at the base of a tree.

It was a very sophisticated device contained inside a 4-liter motor-oil can. (See photos.) The antenna was on the outside with a photo-resistor that permitted it to operate only at night.

Authorities were not in a position to handle the matter at the time, so following the instructions of the president of our association, we removed it. After a good exam at my lab for fingerprints, it was forwarded to RAAG and placed with the other two beacons. The whole construction was made on a 3 × 5 cm PC board which had a 72.338 crystal. Ten D-size batteries in series powered the beacon, which drained 25 mA when in operation and 70 uA when off the air.



GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire
England

THE UK SCENE

I am finding writing this just a little difficult having returned only yesterday from a holiday in HB9 (Switzerland). It's not jet lag that is the problem (it being only a one and a half hour flight), but rather the general lethargy that sets in when the sun is hot and the beer cold!

All Swiss people are nice, and the small population of radio amateurs particularly so. The mountainous terrain of Switzerland makes local communications difficult and provides a perfect setting for a network of 2m repeaters. Most of the peaks have skiing centers with access via chairlifts and power supplies, so it is relatively easy to site a repeater in a good location.

I did not this trip apply for a reciprocal license largely because I did not wish to take any equipment with me. In retrospect, the 30 Sfr fee (about US$15) would have been well spent. During our trip we visited Geneva and decided to take a tour of the United Nations complex. Since I had my RSGB membership card with me and could therefore prove I was a licensed radio amateur, I decided to try to visit 4U1ITU. (This is available to any visiting amateur on proof of holding a current license.) The guides at the UN visitor center knew nothing of the station, although they spent some considerable effort trying to find some details. Eventually, I gave up and joined the regular sightseeing trip.

On the way back to town, I found the station. Well, almost, for on top of the ITU (International Telecommunications Union) building opposite the UN is a 3-element HF beam plus a mixture of VHF/UHF beams. So, on the next trip to Geneva, it's the ITU building that will be stop number one.

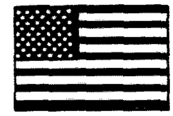
As usual on return from holiday, there was a mountain of mail. As well as some bills and a number of magazines (including 73), there were a few applications for the Cheshire Award which I manage.

The UK is divided into counties which correspond with something between counties and states in the US. The county of Cheshire is centered on county town Chester and is situated between North Wales and Merseyside. The Cheshire Award is available to licensed amateurs and listeners in three categories—Gold, Silver, and Bronze for 50, 30, or 15 points, respectively.

QSO points for US stations are 5 per CW/SSB contact, 10 per FM contact, and 15 per SSTV/RTTY or satellite contact. A QSO with Chester counts double points. Any readers interested in obtaining the Cheshire Award should send $3.00 to me with a copy of their relevant log extract (QSLs are not required). An application form with full details is available for $1.00.

I will return to the subject of UK awards later.

It seems no time since I started writing this column for 73 and yet this is already the sixth edition. You should by now have the measure of my approach to the column, but if you would like me to cover anything specific, please write to me. Remember, though, that there is a delay between writing and publication that makes coverage of topics such as contests rather difficult.



GUANTANAMO NAVAL BASE

James Sackey KG4SH/KA2SHH
Secretary/Treasurer,
Guantanamo Amateur Radio Club
PO Box 73
FPO New York 09593

The Guantanamo Amateur Radio Club (GARC) is alive and well at the US Naval Base, Guantanamo Bay. GTMO, as it is known in the Navy, the oldest US naval base on foreign soil and the only one in a communist country, is the assigned duty station of about twenty hams, ranging at present from a recently graduated and licensed Novice up to and including Extras.

As GTMO is outside of the FCC jurisdiction, the Commander Naval Base (COMNAVBASE) is authorized by the Department of the Navy, Navy Telecommunications Manual, to license and authorize amateur operations. To be licensed to operate from KG4-land, you must be stationed here, have in your possession a valid stateside license, and fill out the proper paperwork. Then the communications officer, under authority of COMNAVBASE, issues a 2 × 2 GTMO call. A ham can request any two-letter suffix.

Club president is Gary Murphy KG4DX, who, as you might expect from his choice of call, is very interested in working DX. Club meetings are held on the third Monday of the month at 2300Z, at the club station, located in hobbyland—the area of the base that houses the photo club, woodworking, and ceramics centers. Any ham visiting Guantanamo Bay is welcome to attend.

KG4AN, the club call, hasn't been too active recently since the Collins S-linear gear is on its last legs. The club is trying, through the Navy Special Service, to obtain funds for a new TR-7 and accessories. If the funds are available, the club might have the new gear on line by the end of this year.

This year, Tim Miller KG4TM/WB0RXX taught a Novice class that was both well received and successful. Of the seven who started the class, the only one not to be tested or licensed was a young boy who would rather play and be a distraction than study the code. The start of the classes was published in the base newspaper and broadcast over the local Armed Forces Radio and Television Service (AFRTS) radio and television stations on base. Among those who attended the class was a navy journalist who produced some of the announcements.

Not being content with only one ham class, KG4TM is again teaching prospective new Novices, so within the next months, listen for more KG4s on the Novice bands. For the information of newcomers to the ham ranks, KG4 counts as a country on the DXCC list. By the way, give new Novices a break—they will be scared silly when they first get on the air and are on the receiving end of a pileup...it's enough to make a guy wish he had studied something sane...like bomb disposal.

Speaking of DXCC, the GARC sponsors a Worked All GTMO award, which I will write about at a later date.

Continued on page 148

Make a Good L-Meter Even Better

Give the N5CC design a boost. Tack on this two-stage buffer and dodge those sneaky loading problems.

Carroll R. Bryan III WB1HKU/6
7311 Variel Avenue 4
Canoga Park CA 91303

Anybody who tried to run their W5JJ/N5CC L-meter (*73*, December, 1981) into their Max-50 or Micronta model 351 frequency counter probably got the same nasty surprise that I did—it didn't work. The display kept flashing, with a different reading each time, whether the counter was powered by a plug-in power supply or an internal battery.

The L-meter is a beautifully simple circuit, and I found it to be quite useful once I'd corrected the problem. The frequency counter is also a beautifully simple circuit, quite useful and relatively inexpensive. Anybody who owns one knows that he got what he paid for; part of what he didn't pay for, and didn't get, is a high impedance input and a buffering ten-to-one probe.

Using my scope, I saw that the counter input was loading the L-meter oscillator output way down and detuning it as well. Anybody who tried to make the connection work and who doesn't own a scope, now hear this: Pay off your analyst; it's not your fault; you've just got a little bit of work to do.

In my initial irritated reaction, I decided on some *QST*-style overkill. Perhaps a single buffer stage would do, FET or bipolar. But, I decided that if I was going to use this circuit as a bench instrument (it's sorely needed on my bench; have you ever tried to dip-resonate a ferrite toroid?), I wanted no sneaky loading problems to complicate things. Hence, the two-stage buffer with the "Are you really there?" 5-pF capacitor into the FET.

The figures tell pretty much the rest of story. I've included voltage measurements from my unit to aid you in bringing it up. Substitute parts anywhere you think you can get away with it, but don't be tempted to scrimp on the decoupling—mine motorboated at roughly 2 Hz until I filled in the missing capacitors. Any-

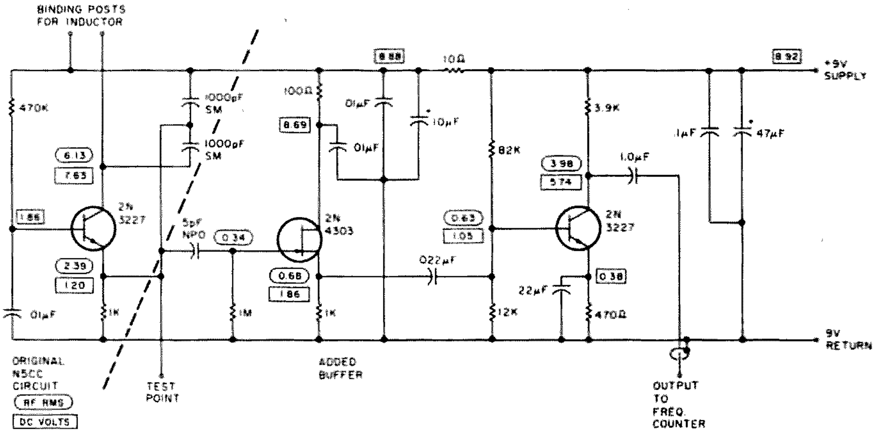


Fig. 1. Bipolar transistors can be 2N2222, 2N3904, etc.; FET can be HEP-801, MPF102, or another rf or general-purpose device. Dc voltages were measured with a 1k resistor in place of an inductor, using a Micronta/Sinclair DVM with 10-megohm input. Rf voltages were measured with a 100-uH Wee-Ductor inserted, using a VTVM-type rf probe into the DVM. My unit draws about 5 mA from a 9-volt supply.

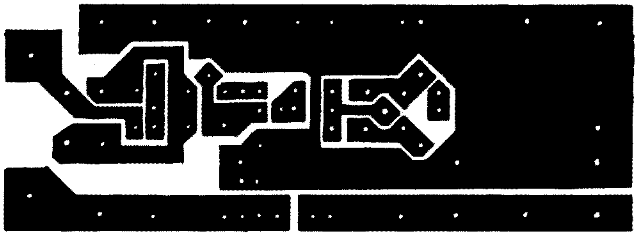


Fig. 2. Printed-circuit etch pattern. Drill holes are in a .1" grid; anyone using a drill/cut-and-peel technique, as I did, can use perfboard as a drilling template. With a little bit of fudging, the binding-post pads can be soldered directly to the wire terminals of a standard double binding post with ¾" pin separation.

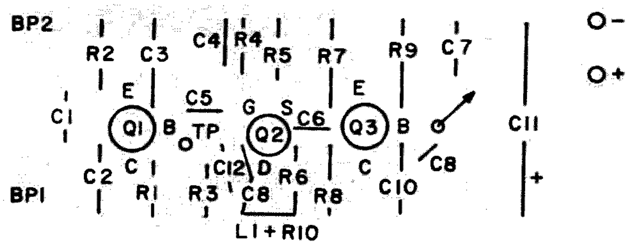


Fig. 3. Component layout. Use a piece of clipped lead for the test point. Check the data on your FET for pinout before installation.

Parts List

C1, C2	100-pF silver mica or polystyrene (NPO if available)
C3, C4, C10	.01-uF ceramic (.1-uF monolithic ceramic if available)
C5	5-pF NPO ceramic (silver mica is second best)
C6	.022-uF ceramic or polyester
C7	.22-uF ceramic or polyester
C8, C9	1.0-uF monolithic ceramic, ceramic, tantalum, or aluminum electrolytic
C11	47-uF aluminum electrolytic
C12	10-uF tantalum or aluminum electrolytic
L1	1 or 2 ferrite beads—FB43-101
Q1, Q3	NPN switching transistor—2N3904, 2N2222A, 2N3227
Q2	N-channel JFET—MPF102, 2N4303
R1	470k, ¼-W, 5%, c-c or c-f
R2, R5	1k
R3	100 Ohms
R6	82k
R7	12k
R8	3.9k
R9	470 Ohms
R10	10 Ohms
BP1, BP2	builder's choice—5-way binding posts, Fahnestock clips

body who's starting fresh on this circuit might find my PC pattern useful; refer to the original article by Carl Drumeller W5JJ for calibration information.

My thanks to William Huffman N5CC, whose design is coming in mighty handy at my station. ■

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The Model 335A will deliver 35 watts of power using the latest state-of-the-art circuitry. The amplifier will operate SSB or FM and is compatible with most handheld transceivers, including the TR2400, TR2500, IC-2AT, Yaesu, Santec, and Ten-Tec. Only 300 mw input will deliver 5 watts out; 3 watts in will deliver 35 watts out. Maximum input drive level is 5 watts.

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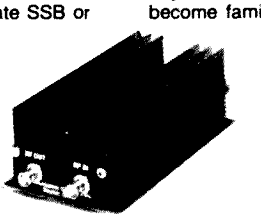

Model 335
Kit $69.95
Wired & Tested $89.95

VISA

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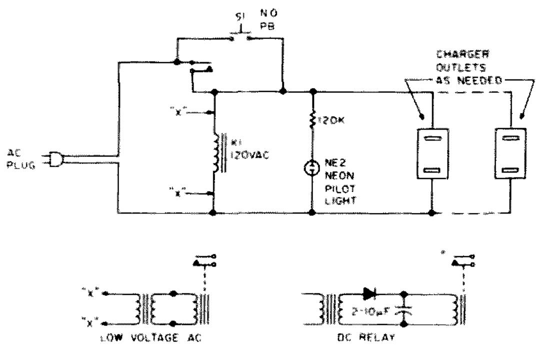
✓14

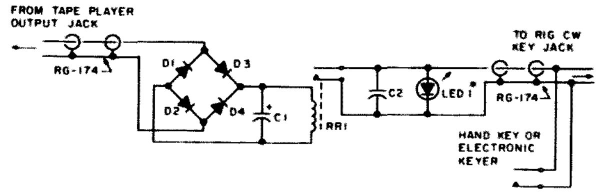
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

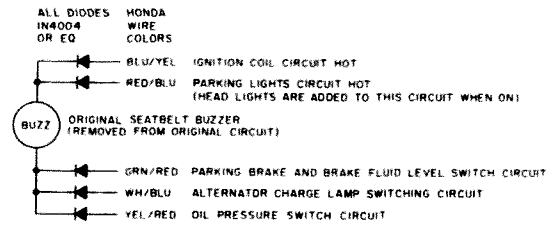
In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



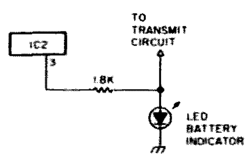
LIMIT YOUR CHARGE TIME: This circuit can be used with a 24-hour timer to limit the charging time of your batteries. To use, set a timer to have an on time equal to the charging time of your batteries. Plug the timer in and plug the circuit into the timer. Pushing switch S1 will energize the charger outlets for as long as the timer stays on. After turning off, the circuit will not reactivate until S1 has been pushed. The relay is a 120-V-ac unit, but a low-voltage ac relay can be used with a suitable transformer.—George Lundberg WA9JBH, Oak Forest IL.



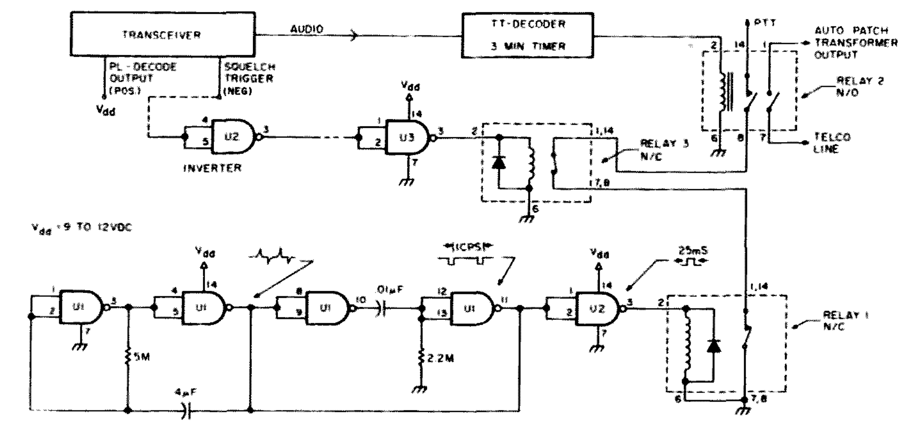
INEXPENSIVE MEMORY KEYER: By passing prerecorded audio from a tape player through a full-wave bridge rectifier, the audio is converted to on-off pulses which key the transmitter through a reed relay. Use a code-practice oscillator or sidetone generator to record the message. C1 holds the voltage across the reed relay (RR1) for the duration of the pulse. For use at speeds over 20 wpm, you will have to experiment with the value of C1. Also, be sure to record your message with enough voltage to operate the coil of RR1. D1-D4 are the rectifier diodes; C1 is a 200-uF 15-V electrolytic capacitor; C2 is a .01-uF disc capacitor; and LED 1 is an optional LED visual indicator. —William Edwards N8ARW, Niles OH.



IDIOT BUZZER FOR THE 1978 HONDA CIVIC: This circuit uses an existing seat-belt buzzer to indicate a fault condition in a variety of automobile systems. The buzzer will sound whenever the brake fluid level is low, when the oil pressure is low, when the alternator is not working, or when the parking brake is on. However, either the ignition or the headlights must be turned on for the circuit to operate. Correct wires must be found by testing as well as by color codes, because Honda uses the same colors for more than one circuit. Cars using idiot lights for the temperature instead of a gauge may include this feature by adding one more diode.—Franklin E. Swan W9SIA, Oak Forest IL.



RECEIVE INDICATOR FOR ICOM HTs: Use the transmit/battery LED to tell you when your 2AT, 3AT, or 4AT is receiving a signal. Connect a 1.8, ¼-W resistor between pin 3 of IC2 (the audio ouput amplifier) and the anode of the LED. IC2 is a single-in-line package located next to the speaker hole on the receive PC board at the front of the rig. Pin 1 is the pin toward the center of the board. Connect one lead of the resistor to the third pin and extend the other lead with a short piece of insulated wire. The wire should be soldered to the pad where R56 connects to the wire going to the LED. When the squelch breaks, this modification will cause the LED to light, but transmit operation will not be affected.—Robin Rumbolt WA4TEM, Knoxville TN.



SIMPLEX AUTOPATCH RECEIVE WINDOW: This circuit will provide a 25-millisecond window once per second. It is especially suited to making your own simplex autopatch system. U1 and U2 are 4001 quad, 2-input NAND gates, Radio Shack number 276-241. U3 is a 4093 quad, 2-input NAND Schmitt, Radio Shack number 276-2493; relays 1 and 3 are Magnecraft DIP type W217 DIP 19 SPST-NC, and relay 2 is a Magnecraft DIP type W117 DIP 11 DPST-NO. Both types are available from GSN Electronic Components, 91 W. Passaic Ave., Rutherford NJ 07070.—David C. Smith WB2EPZ, Jupiter FL.

MULTI-PURPOSE CONDUCTIVE TAPE: The copper-foil tape used by stained-glass enthusiasts makes an excellent material for rf-proofing enclosures, custom-shaping ground planes and making PC-board layouts. The tape's adhesive is nonconductive, so when you are joining two pieces of tape, make sure you solder the joint. This copper-foil tape is available in a variety of widths at most crafts stores.—M. Rosenzweig WB2BOM, Steamboat Springs CO.

Frank Kalmus WA7SPR
Rf Power Labs, Inc.
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Woodinville WA 98072

Ironclad Repeater Control

With 12 outputs and tamper-free access, you can keep a firm grip on your repeater's operations. And this circuit keeps the price from getting out of hand.

My requirements in a tone decoder were to control a 220-MHz repeater system with an autopatch, amplifier, and several other functions.

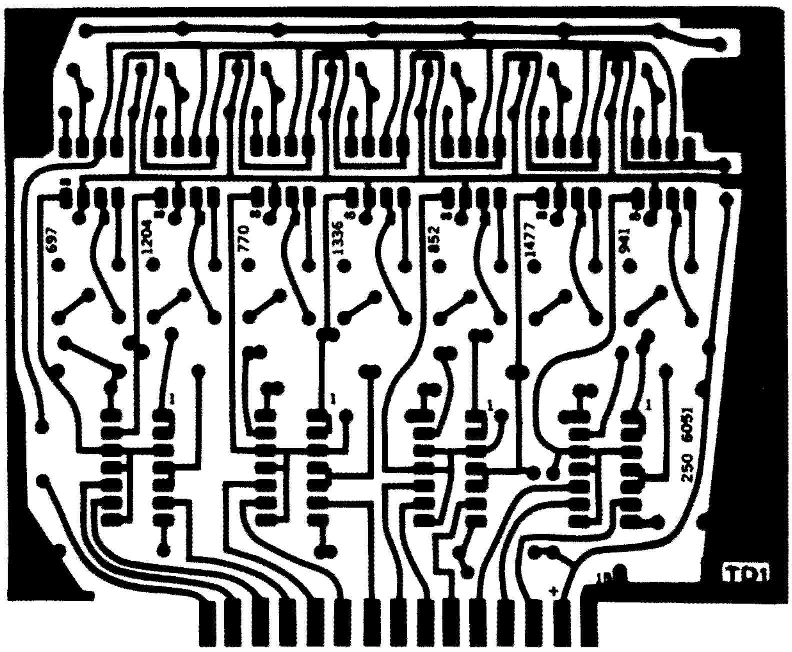

Fig. 1. Tone-decoder PC board, foil side.

The final design of this dual-tone, 12-output control board is used for selectable tone squelch, station identification, amplifier ON/OFF, and many security functions such as repeater and autopatch access through an access-control board requiring three-digit commands.

The tone-decoder board (TD-1) is constructed on a standard plug-in card and utilizes the type LM567 phase-locked loop and the National-type CD4025BCN Cosmos logic gates to detect audio tone pairs and provide 12 outputs.

The PLL's free-running frequency is set by means of potentiometers R8 through R14, in conjunction with resistors R15 through R21, and capacitors C17 through C23. In the presence of an audio tone of proper amplitude (20 to 200 mV/rms) and frequency, a

Tone-Decoder Parts List

R1–R7	4.7k Ohm
R8–R14	5k Ohm
R21–R28	10k Ohm
R15, R17, R19	8.2k Ohm
R16, R18, R20	3k Ohm
C1	22-uF electrolytic
C2–C8	1-uF electrolytic
C9–C15	2.2-uF electrolytic
C17–C23	.1 uF
C16	6.8-uF electrolytic
C17	.68 uF
U1	5-V reg.
U2–U8	PLL-type 567
U9–U12	Triple NOR 4025B
PCB	TD-1

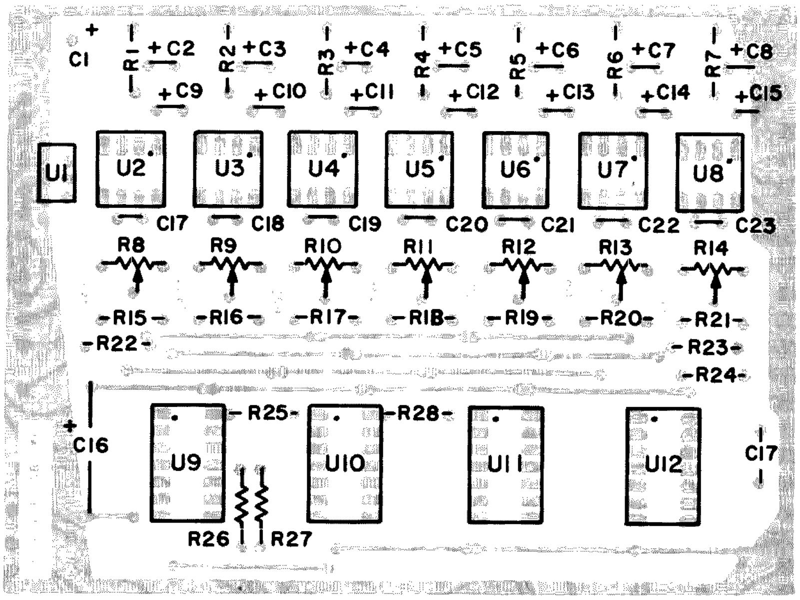

Fig. 2. Tone-decoder PC board, component side.

PLL will lock to the incoming signal after a variable number of cycles, depending on the amplitude and phase relationship at the moment the tone starts. When the PLL locks, its output changes from a high to a low condition (pin 8 of the 567s).

Pairs of one high- and one low-band tones will activate two of the decoders, which will result in low outputs. One of the logic gates in the 4025 integrated circuits will detect the combination and produce a high output. The board is intended to work with power supplies from 7 to 15 V. The voltage regulator, U1, provides 5 V for the 567 ICs. If 5-V operation is required for all the board, U1 can be removed and a jumper used to connect the 12- and 5-V lines together. Three input NORs are used for lower output impedance and circuit layout symmetry.

Testing

Using a frequency counter, check pin 5 of each 567. Set the free-running frequencies for the marked values ±5 Hz by using the corresponding potentiometers. 20 mV/rms of each tone should be sufficient to lock the PLLs.

If a frequency counter is not available, a tone encoder can provide the necessary test tones. The amplitude used should be reduced to the point where locking takes place (close to 10 mV or so), in order to guarantee the smallest bandwidth to the decoders and the best setting.

I am sure you will find many station-control applications for this decoder. A touchtone™ pad near your operation position can consolidate commands for automatic ID transmissions, changing antennas, or starting up the coffee pot.

The PC layout shown is a double-sided board. Parts for this project are available through many sources or you can buy the entire TD-1 board, fully assembled and tested, from Frank Kalmus WA7SPR, 7016 N.E. 138th, Kirkland WA 98033, for $39.00, postpaid.

Access-Control Board

This access-control board

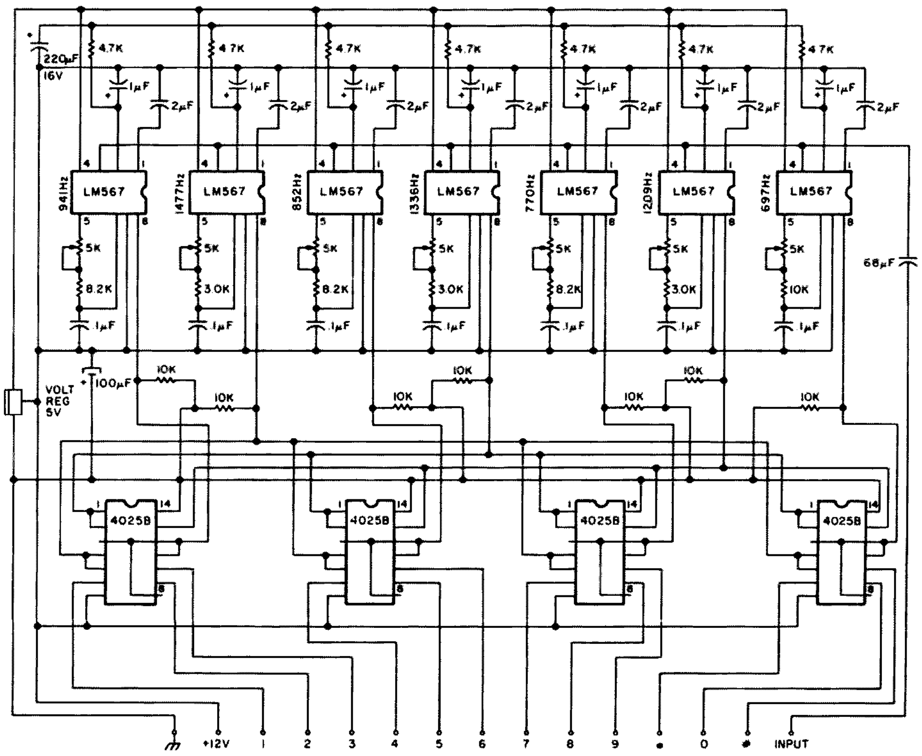

Fig. 3. Tone-decoder schematic.

will provide you with an exclusive access-security system. The access-control board is a logic unit designed to be used anywhere that sequentially-coded remote control is needed, i.e., with your tone-decoder board. The access-control board will provide five independent, three-digit coded circuits to use for repeater control, two-way radio systems, etc.

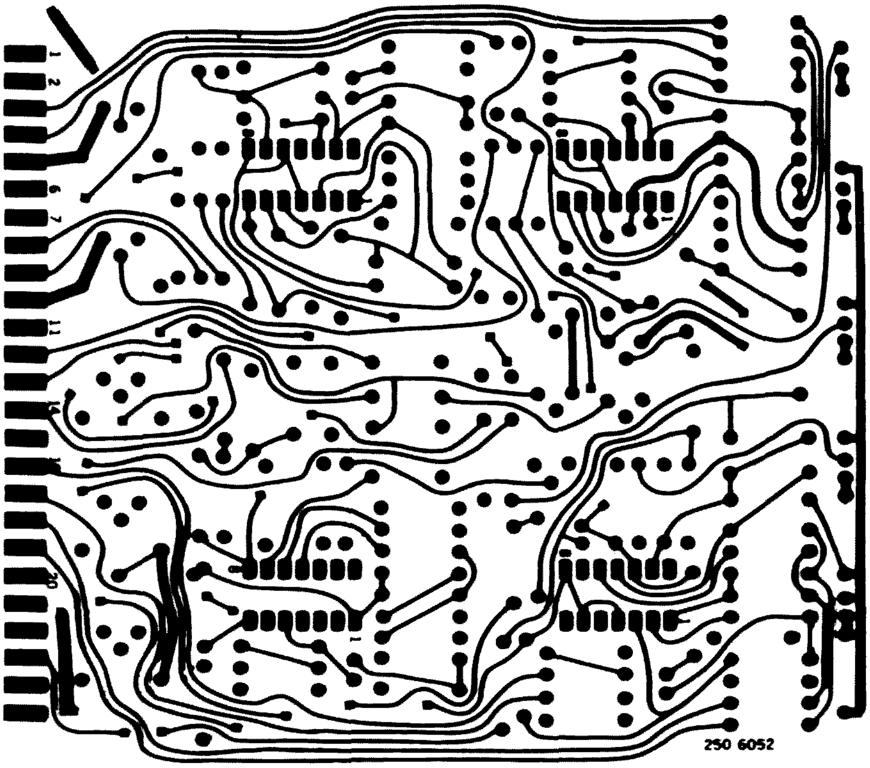

Fig. 4. Access-control board, foil side.

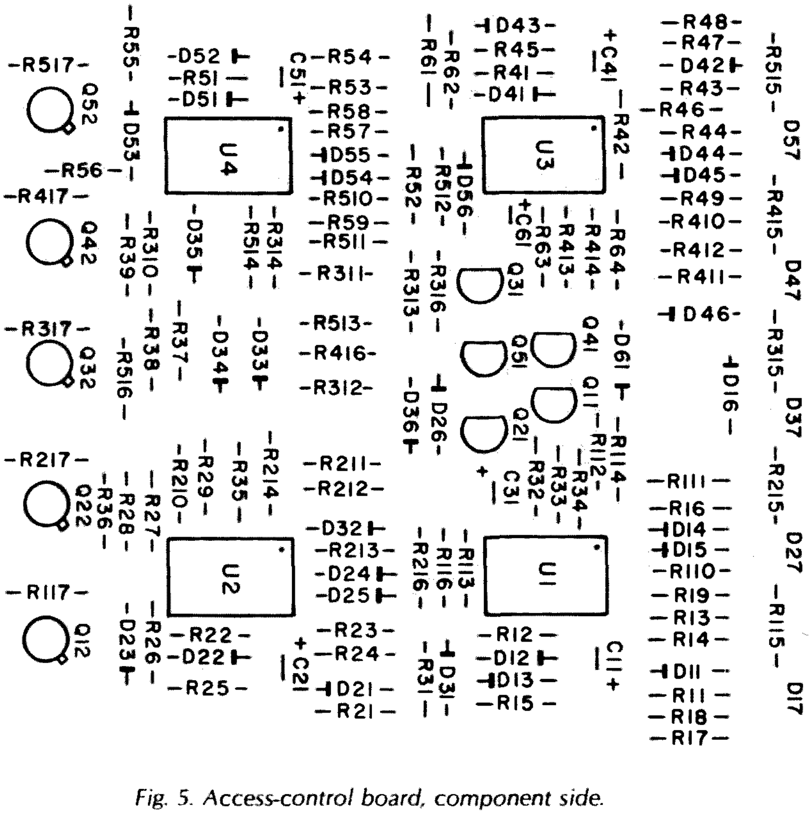

Fig. 5. Access-control board, component side.

The access-control board works with power supplies from 4 to 30 V and interfaces across any existing logic or analog system. Each of the five channels has four inputs. When three of the inputs are driven high in the proper sequence and within the preset time, the output will go ON or OFF, depending on the input used in the third place. In other words, the third and fourth inputs decide the output condition when inputs one and two have been previously activated.

The timing section in each channel defines how much time can be used to perform the complete sequence. The power ON reset is built-in, and a clear line is available to disable all channels at any time, if needed. Five LEDs are used to monitor the output condition of each channel.

The following theory of operation refers to one of five identical channels. When activated, the first stage works as a timer and enables the second input. The input threshold is roughly (Vcc/2 + .7)V. Once the input is above the threshold level, the output of the comparator goes high and enables the input of the second stage. At the same time, capacitor C1 is charged through R2. When the input goes low, C1 starts discharging through R2 and holds the comparator high for the timing period (recommend 2 seconds). The threshold of input 2 is Vcc/2. Once this threshold is overcome, the comparator goes high and diode D3 will hold that condition as long as the first comparator is also high.

The second stage gates both inputs of the third

through D4 and D5. This final comparator is designed in a bistable mode obtained by using proper feedback (R11 and R13) and input isolation (R9 and R10).

The transistor, Q1, drives the monitor LED which lights when the output is ON. Q1 is the output transistor which is open when the output is high and conducts in the low condition. The circuit operates anywhere from 4 to 30 V. Above 15 V, it is recommended that the value of R13 be increased in order to keep the LED current below 50 mA.

Testing

Apply 12 V to the board (all LEDs will remain OFF). Using a jumper, put 12 V sequentially in inputs 1, 2, and 4 of one channel, not taking more than approximately 2 seconds for the process. The LED will light after input 4 is activated.

Repeat the procedure, but ending with input 3 (the LED will shut OFF). During the timing period, the output can be switched ON and OFF by alternately touching inputs 4 and 3. Using a voltmeter, check the output voltage in the high (Vcc) and low (ground) conditions.

Repeat the same steps with the remaining four channels.

To check the "Clear" line, ground it using a jumper. All channels will shut OFF as long as the ground is present, whatever the input conditions are. ■

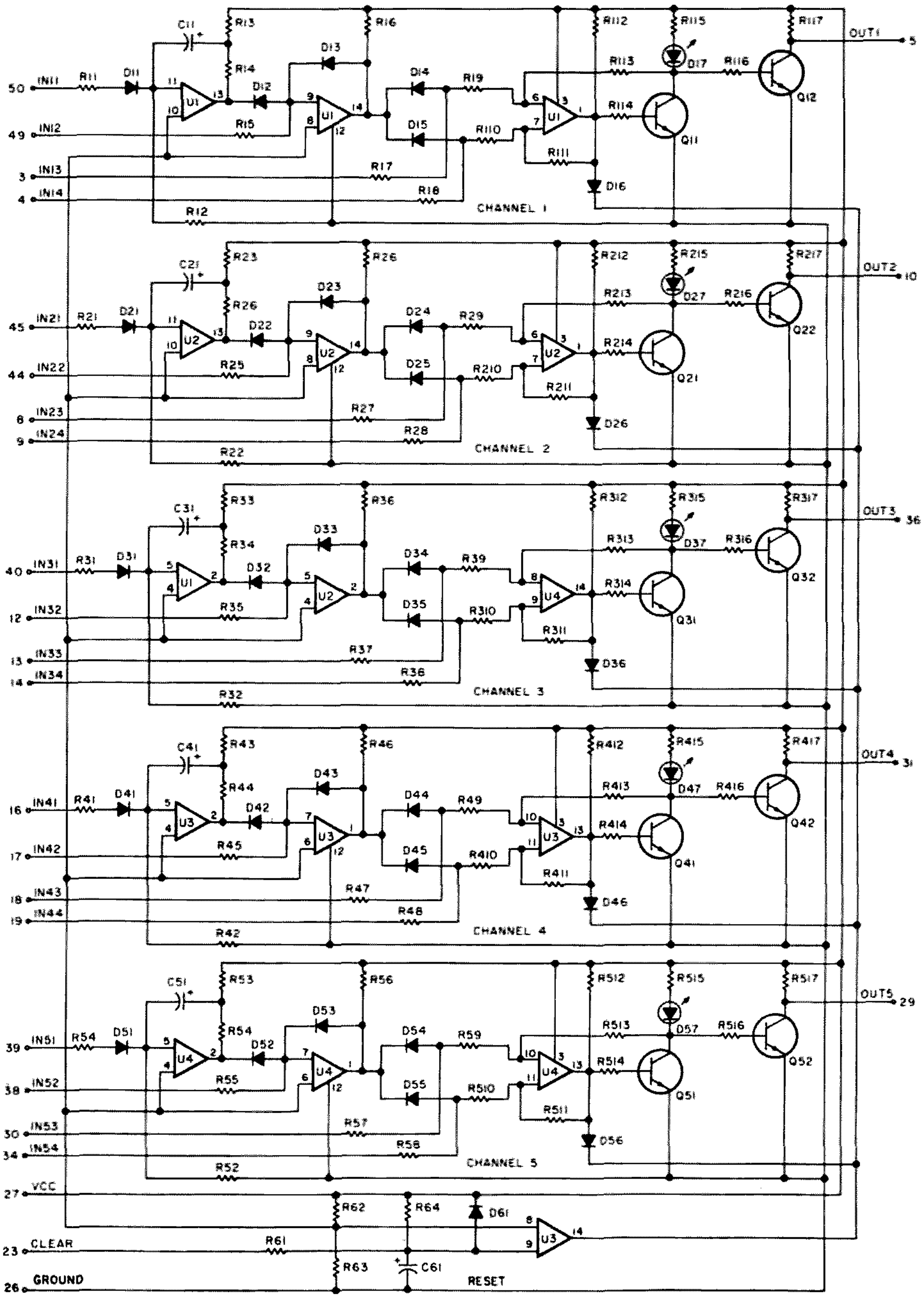

Fig. 6. Access-control board schematic.

Access-Control Board Parts List

Reference	Qty	Description
R15	5	Resistor, 330-Ohm, ¼-W, 5% carbon
R3, R17	10	Resistor, 1k-Ohm, ¼-W, 5% carbon
R1, R4, R6, R12, R14, R16	30	Resistor, 10k-Ohm, ¼-W, 5% carbon
R5, R7, R8	15	Resistor, 30k-Ohm, ¼-W, 5% carbon
R9, R10, R11, R13	20	Resistor, 100k-Ohm, ¼-W, 5% carbon
R2	5	Resistor, 270k-Ohm, ¼-W, 5% carbon
C1	5	Capacitor, 35-V, 6.8-uF electrolytic
D1 through D6	30	Diode, switching 1N914
D7	5	LED (Red) Monsanto MV 5023
Q1, Q2	10	Transistor, NPN 1 Amp, 45 V
U1-U4	4	LM339

		Reset Circuit
R61	1	Resistor, 330-Ohm, ¼-W, 5% carbon
R62, R63	2	Resistor, 10k-Ohm, ¼-W, 5% carbon
R64	1	Resistor, 100k-Ohm, ¼-W, 5% carbon
D61	1	Diode, switching, 1N914
C61	1	Capacitor, 35-V, 6.8-uF electrolytic
ACC-1	1	Printed circuit board

Standard parts are used throughout. If you have any difficulty locating these parts, contact Frank Kalmus WA7SPR, 7016 N.E. 138th, Kirkland WA 98033 for assistance. A completely assembled and fully-tested ACC-1 can be purchased for $37.50 postpaid.

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Microwave Filter Co.	Tunable TVRO Filter		FEB 102
Microwave Filter Co.	30-Meter Ant. Coil		JUL 119
Microwave Filter Co.	Maxi Baluns		OCT 102
Microwave Filter Co.	4408 FM/FF DC Inserter		DEC 118
Midian Electronics	Channel Scanner		JAN 142
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National Microtech	Apollo X-10 Antenna		JAN 142
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Non-Linear Systems	Test Adaptor		MAR 120
Non-Linear Systems	Test Leads		JUL 119
OK Industries	IC Inserters		APR 116
P.C. Electronics	Kreepie-Peepie		NOV 116
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PolyPhaser Corp.	Lightning Protector		AUG 116
Royal	Contact-80 RTTY Program		MAR 121
Russ Software	Data File Maintenance		MAY 128
Simpson Electric Co.	467E LCD DMM		JAN 142
Simpson Electric Co.	470 DMM		FEB 100
SMR, Inc.	Facsimile Recorder		JUN 101
Tayco Communications	CATV Converter		APR 117
Teltone Corp.	DTMF Receiver Kits		MAR 121
Ten-Tec	Antennas		JUL 118
Ten-Tec	2591 HT		AUG 116
TET Antenna Systems	Swiss Quad for 6 Meters		JUL 118
Thermax Corp.	TC25G Generator		APR 116
Tokyo By-Power Labs	VHF Linear		JUN 100
Tripp-Lite	DC Power Supply		JAN 143
Ungar	9300 Soldering Iron		JUN 101
Ungar	9000 Soldering System		JUL 118
Ungar	Soldering Irons		SEP 107
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Unique Communications	New Catalog		OCT 102
Universal Electronics	Multi-Mode Receiver		APR 117
Universal Electronics	RTTY Publications		JUN 100
US Fiberglass	Stage 2 Antennas		NOV 116
Varian Associates	Frequency Chart		JAN 142
Yaesu	HF Transceivers		MAY 124
Yaesu	FT-726R Transceiver		JUL 119

OPERATING

TITLE	DESCRIPTION	AUTHOR	ISSUE
Live, From Across America-It's Field Day!	television coverage	WB4EMI	JUN 22
Diary of a Partially-Sighted Ham	operating tips	WA6CNN	JUN 54
Kill Power-Line Interference	stop noise	K3UK	JUN 92
How to Increase Your QSOs	CW tips	N6HYK	SEP 34
Electronic Mail Comes of Age	HF mailboxes	K0VKH	NOV 86

POWER SUPPLIES

TITLE	DESCRIPTION	AUTHOR	ISSUE
Power-Line Protection: The Weak Link	stopping surges	N8ADA	FEB 83
Higher Voltage, Less Weight	voltage quadrupler	W7CSD	FEB 84
Pedal Power: A Perfect Field-Day Generator	bicycle-driven supply	KN6H	APR 12
Construct This Customized Power Supply	5 to 30 Amps	W9ODK	AUG 8
Construct the Callsign Power Supply	put your call in lights	KA1QZ	NOV 10
Unlimited Guarantee for Power Supplies	design parameters	KC0EW	DEC 20

RECEIVING

TITLE	DESCRIPTION	AUTHOR	ISSUE
Make Room for More Agc	flexible circuit	N7APE	FEB 86
The Magical Audio Filter	notch filter	W6QIF	NOV 14
Reveal the Receiver Behind the Specs	make sense from numbers	N6RY	NOV 36

REPEATERS

TITLE	DESCRIPTION	AUTHOR	ISSUE
An Alarming Procedure	repeater alert	WA1LCP,K1FNX	JAN 24
Superman's Repeater Control System	4 independent outputs	K3IJ	FEB 32
The Q-Master Cavity Filter	high-Q filter	KB6AL	MAR 74
The COR of a Reliable Repeater	simple relay circuit	WA7SPR	AUG 24
Ironclad Repeater Control	12 outputs	WA7SPR	DEC 100

REVIEWS

TITLE	DESCRIPTION	AUTHOR	ISSUE
Advanced Computer Cont.	RC-850 Controller	WA3VUP	JAN 126
AEA	CK-2 Memory Keyer	W1XU	FEB 104
AEA	BT-1 Code Trainer	WB8JLG	MAR 104
AEA	Moscow Muffler	W1XU	MAY 120
AEA	MBA-RC Converter	N8RK	JUN 103
AEA	KT-2 Keyer/Trainer	WB8JLG	JUL 120
AEA	AMTOR TU	AP2M	NOV 98
Alden Electronics	Facsimile Recorder	W1XU	FEB 102
Autek Research	QF-1A Filter	WB8JLG	MAY 116
Azden	PCS-4000	WB8JLG	MAR 104
Blacksburg Group	Fist Fighter	W1XU	APR 103
Buckmaster Publishing	Call Directory	WB8JLG	FEB 106
Computer Applications	Pathfinder II	N8RK	JUN 104
Connect Systems	Private Patch	AG9V	NOV 99
Cushcraft	A3/A73 Tribander	AG9V	JUL 122
Dovetron	Widget	WB8JLG	MAR 107
Electronic Rainbow Inc.	Satellite TV Receiver	WB9ZNU	JAN 126
Foundation Publishing	The Rest of Ham Radio	N8RK	APR 104
Galfo	Apple RTTY Program	AE5V	APR 104
Gordon West	Code Tapes	WB8JLG	JUL 120
Harvey-Brain	Seychelles Saga	W1XU	JUN 104
Heil Sound, Ltd.	HC-3 Mic Cartridge	WB8JLG	MAY 118
Hy-Gain	TH7DX Tribander	K1XR	JUN 104
Icom	R-70 Receiver	WA2VSN	FEB 102
Icom	TR-720	W1XU	NOV 100
Icom	IC-751 Transceiver	WB6TOV	DEC 109
International DXers	Shortwave Equip. Review	AG9V	DEC 109
James Anderson	Ghost Fighter's Guide	N8RK	OCT 110
Kantronics	Hamsoft RTTY Program	WB8BTH	APR 102
Kenwood	Panadapter	K1XR	MAY 116
Kenwood	TS-430S	WA4BLC	JUN 102
Kenwood	TR-8400	K1KA	OCT 108
Kenwood	TR-9500	K1KA	NOV 97
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Metheny Corporation	LJM2KR Storm Alert	K9MX	JAN 128
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Palomar Engineers	PT-407 Antenna Tuner	WB8JLG	FEB 105
RSGB	VHF/UHF Manual	WB8JLG	JUL 119
Santec	ST-uP Handie-Talkies	W2IVS	OCT 109
Ten-Tec	Corsair Transceiver	W1XU	MAR 105
Universal Electronics	RTTY Callbooks	WB8JLG	MAR 108
Yaesu	FT-102	WB8JLG	MAY 116

RTTY

TITLE	DESCRIPTION	AUTHOR	ISSUE
RTTY Tuning: The New Solution	tuning indicator	WB2OSZ	MAR 10
Unlock the New Electronic Mailboxes	how to use MSOs	WB7QWG/9	APR 44
The New Communications: VHF Mailboxes	computer communications	AP2M	MAY 48
Join the Packet Radio Revolution	digital communications	WA7GXD	SEP 19
Be A RTTY Rembrandt	designing RTTY pictures	WA2OQJ	SEP 28
Join the Packet Radio Revolution	Part II	WA7GXD	OCT 20

SATELLITES

TITLE	DESCRIPTION	AUTHOR	ISSUE
Up and Coming: Direct-Broadcast Satellites	new entertainment	N8RK	FEB 38
Work the Russian Robot Ops	Russian satellite use	K4TWJ	FEB 44
Uncover Equipment for OSCAR Phase III	flea-market shopping	K6KLY	MAR 18
Up and Coming: Direct-Broadcast Satellites	Part II	N8RK	MAR 26
The Secret Telemetry of OSCAR 8	decoding information	K5OM	MAR 52
Build the Armchair Satellite Tracker	OSCAR tracker	K3LF	MAY 84

TECHNICAL & THEORY

TITLE	DESCRIPTION	AUTHOR	ISSUE
Error Protection for Digital Transmissions	block coding	W9JD/2	FEB 64
D'Arsonval Dossier	how meters work	WIOLP	JUN 10
Smart Meters: The New Movement	error-correction system	W4RNL	JUN 42
Do You Know Where Your Signal Goes?	radiation pattern	N4UH	AUG 56
Propagation Explosion on 220	field test results	W9MKE	AUG 90

TITLE	DESCRIPTION	AUTHOR	ISSUE
TEST GEAR			
King of the Pulse Generators	multi-purpose	WA3RJS	JAN 100
4-Tone Audio Oscillator -Potent Troubleshooter	computer-controlled	W7BBX	FEB 20
Take Your IC's Temperature	keeping them cool	W3KBM	MAR 70
Save Money On Used Meters	meter tester	W3QOM	JUN 19
Construct the Cyclops Dip Meter	single-coil	W4ATE	JUN 26
Two Meters for the Price of One	using shunts	KB2JN	JUN 34
Get Accurate with the Digital-Grid Meter	power meter	N1I1	JUN 50
Hot-Spot Metering-- Automatically!	money-saving designs	W4RNL	JUN 56
Put Together the Shawnee Logic Probe	CMOS and TTL	Roth	OCT 66
Make a Good L-Meter Even Better	two-stage buffer	WB1HKU/6	DEC 94
TRANSMITTING			
ction Machine for 20	SSB transceiver	WB5IPM	JAN 12
un-Equipment evisited	transmitter & amplifier	WA0RBR	JAN 48
our January Bome- rew Project	SSB exciter	VE7DOD	JAN 92
he Fun-Vac: A ynthesis of Old & New	1-tube transmitter	WA0RBR	MAR 32
onstruct This Classic ransmitter	HF tube-type	W1BG	MAY 14
ore Stable Than A Rock	10-MHz generator	DJ3NW	JUL 32
The Six-Meter Vfo That Won't Quit	rock-steady	N7APE	NOV 48
TVRO			
Build the Deadeye Dish Controller	rotator control	W5JG	APR 84
VRO roubleshooting	helpful hints	N8RK	DEC 40
VHF & UP			
he Amazing Cylindrabola	microwave antenna	WA4WDL	SEP 54

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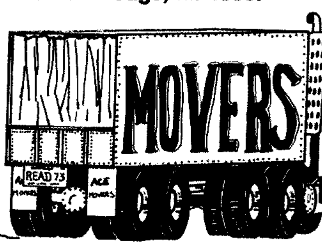

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HAM HELP

I have unfortunately lost the January, February, March, and April, 1961, issues of *73* as well as the November, 1962, issue. I will pay any reasonable price for those issues in good to fair condition.

William Ward DA2XA/W4PCK
USMCA Wuerzburg
CPO
APO NY 09801

I am looking for a manual for the Hammarlund HQ-100 receiver. I have manuals for the following available for trade: BC-348, ARR-16, Heath DX-40, Heath O-9 oscilloscope, TV-7U tube checker, ARN-6, and ARC-3-T67A.

Loren Willis
Box 282
Farmland IN 47340

I would like to find some CB radios that were made from 1968 to 1972. I do not care whether they work or not, as long as the transformers are not burned up and they have crystals in them.

Tony E. Byrum
1449 N. Midwest Blvd. #402
Midwest City OK 73110

I would like to hear from US and foreign teachers, students, and radio clubs that want to participate in an educational resource net for public schools. I can also provide advice to those who are beginning or reactivating a school station.

Michael Henderson N6JFD
Box 331
Somis CA 93066

I am trying to get information on using TTL logic devices to control 117-V-ac outputs. I am using the information to help disabled persons, and any assistance would be appreciated.

S. Raigner N7BNP
626 NE Floral PL.
Portland OR 97232

I need help in converting the "Open House" program, which appeared on page 72 of the January, 1979, issue of *Kilobaud Microcomputing*. The program was written in Wang Basic, and I would like to use it on a TRS-80 Model I, level II.

Lisle T. Hines K2QLA
4 Ellwood Ave.
Cortland NY 13045

I am looking for a schematic and power transformer data for a Knight wideband oscilloscope. I will pay shipping and duplicating costs.

Torgny Karlsson SM7CFQ
Sandormsvagen 7
S-260 41 Nyhamnslage
Sweden

I am searching for schematic diagrams, operating manuals, and service manuals for the Raynav 3000 LORAN-C navigation system. Please write before sending material.

Bruce Rahn WB9ANQ
410 Coronado Trail
Enon OH 45323

Wanted: info on the Electronica-360 10-meter mobile AM/SSB transceiver. I would like to modify the clarifier to operate on transmit as well as receive. I would also like to know if there is an American version of this European-market rig.

SSG Gary E. Kohtala DA2XF
USAFS-A, Box 1415
APO NY 09458

Can anyone provide information on the Airadio model TRA-10; Hewlett-Packard SHF generator model 670JM; AN/SRD-11 direction set; BC-1141-C and BC-1140-H mine detector set; PP-63 power supply; and 1-IJ-8 radio compass adapter, manufactured by Electronic Supply Co.?

John C. White WB6BLV
560 North Indiana
Porterville CA 93257

I am desperately in need of the schematics and operating manuals for a Hallicrafters S-107 receiver and a Globe Scout model 680 transmitter. I will gladly pay for the cost of copying and mailing the documents.

Richard Metro KA2QWH
201-D Springmeadow Drive
Holbrook NY 11741

I want to substitute a 4CX250 tube for the two 572B tubes in the Heath SB-200 linear. I think I have seen an article on it in one of the ham magazines. Can anybody help me locate that article?

Pete Govorko K6MMT
336 Demming Rd.
Sequim WA 98362

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DX

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Santa Rosa CA 95402

XU KAMPUCHEA

Late this past summer, several stations appeared on the amateur bands from Kampuchea (formerly Cambodia). These amateurs were operating under all international amateur-radio regulations, from within the internationally recognized borders of that country. Their licenses were granted directly by the prime minister of the government. In fact, the callsign of the first amateur station, XU1SS, reflected the initials of the prime minister, Son Sann. Yet the chances of contacts with XU1SS counting for DXCC credit are slim.

The XU1SS and other XU callsigns generated an understandable amount of commotion on the DX bands. Understandable because no legitimate Cambodian station has been on the air in many years—since the last Americans left in the early 70s. But this excitement is likely to be to no avail, since the XU1SS QSL cards will probably suffer a fate similar to those of XZ5A: as curios, not DXCC counters.

The amateur-radio operations in Kampuchea do bear a striking similarity to those in nearby Burma. The XU1SS operations were conducted under the auspices of the KPNLF (Kampuchea People's National Liberation Front), which is the "exile" government of Kampuchea. The KPNLF is the leading member of a loose coalition of political parties called "Democratic Kampuchea." Democratic Kampuchea is the officially recognized government of the country, even though they physically occupy one tiny corner of the country.

The socialist Kampuchean government, which gained power through force of arms, lacks international recognition (by non-communist countries). The Democratic Kampuchea coalition retains the United Nations seat. But for "practical" purposes (as opposed to diplomatic purposes), the socialists are in charge. And they don't like amateur radio. So where does this tangled web of international politics leave XU1SS? Probably out in the cold.

You can't fault the XU amateurs for trying. The amateur operation is part of the international support for the many thousands of Cambodian refugees near the Thai-Cambodian border. Each day many volunteers from all over the world, including several Japanese amateurs, crossed the border with day passes, to aid in the refugee work. These Japanese hams set up an amateur station in Ampil, near the Thai border, on aptly named "Ham Avenue." The Japanese hams were restricted to daytime operation, because of their volunteer border passes, but they trained some native operators for late night contacts and to continue on the air after the Japanese returned home.

So here we have a bunch of hard-working volunteers, setting up and training hams in a much-sought-after country, working with the direct support of that country's president, and it still doesn't count for DXCC. How did we get into this ridiculous position?

We have to go back more than 10 years to come to the root of the problem. Before Don Miller got caught lying about his operating location, the ARRL DXCC branch generally assumed an amateur operation was legitimate. In other words, the operation took place from within the "country" indicated and was not against the law of that country. But after the Don Miller lawsuits, the League's DXCC gang started getting fussy about proof that the operation took place as claimed. And to avoid offending any potential votes at the WARC international frequency-allocation conference, the DXCC gang tried to avoid giving even their limited "recognition" to amateur operations that did not have the full support of the country's government. At the same time, popular sentiment has led to a change in the rules for defining what is a DXCC "country," so that individual rocks and islands don't wind up as "countries," as we had with St. Paul Island off Nova Scotia, for example.

That attitude may have been a good idea at the time, but its continued application has stifled DX. The flood of new and changing countries has slowed to a mere trickle. The fine band conditions of the past few years have brought up the DXCC totals of many amateurs to the point where new countries to work are essentially nonexistent.

This problem is not due to any lack on the amateur's part. Lack of courage in the face of unknown dangers is no obstacle, as we saw in the ill-fated attempt to activate the Spratly Islands. Nor is expense an overwhelming factor, as the DX community provided tens of thousands of dollars of support to several major DXpeditions recently. Nor have all the older DXers gone on to other activities. The XU stations generated good pileups, and many seldom-heard callsigns were in there calling. So the DXers are listening; they just don't hear much that excites them.

Japanese amateurs have been instrumental in restarting amateur radio throughout Asia, including Kampuchea. Kan Mizoguchi JA1BK was a key figure in the activation of China BY1P. (Photo via The DXers Magazine)

JA1BN's impressive shack.

A Modest Proposal

So what can we do to inject some new life into the DX world and reward the efforts of these hard-working and well-meaning amateurs, such as the XU gang, without opening wide the gates to encourage potential cheating? One way might be to initiate a "Wild Card" for DXCC. The ARRL DXCC group would have a middle ground, a third alternative to the present "accepted for DXCC credit" or "not accepted." The third alternative would be granted to operations such as the XU1SS effort, that is, to well-meaning amateur operations unquestionably within the borders of the country claimed but unable to meet full DXCC requirements. Other types of amateur operations which might fall under the same category would be times when the local authorities give verbal permission for amateur operation but won't grant a written license. Or an effort such as the 1S1CK DXpedition into the Spratly group. Each DXer would be allowed one Wild-Card confirmation each year, from the ARRL's list of eligible Wild-Card operations.

This proposal leaves the majority of the DXCC rigmarole unchanged while providing at least some incentive for amateurs on both ends of the pileup to keep trying. Any change in Honor-Roll standing or relative positions would be gradual, over a period of years. Longevity will continue to be the single most important possessior for Honor-Roll status, as each year of DX activity means another potential Wilc Card.

The DXCC branch should welcome the additional alternative, as it gives them ar "out" in otherwise sticky situations. Fo example, when we wanted to win Japan's support for the IARU's WARC band pro posals, the ARRL made 7J1RL, Okina Tor Shima, a separate DXCC "country" and later had to delete it. How much simpler i would have been to make 7J1RL a Wilc Card! Or take the case of 4U1UN, where the League either had to eliminate 4U1ITU, in Geneva, or say a separate "country" existed in downtown Manhat tan.

Will the League go for this idea? New ideas have not had a good history at 22 Main Street, especially around the D) desk. But DX sentiment is rising for some changes, serious changes, in the DXC(rules and administration. Some other pos sibilities are: scraping out the system and replacing it with a totally new one (ove the dead bodies of many hundreds of Hor or Rollers and near-HR DXers), or simpl granting "DXCC-Counter" status to an well-run DXpedition, regardless of the lc cation. Dry Tortugas? Water Island? Prib lof Islands? The League could defin guidelines for *how* the DXpedition opera ed, without regard as to *where*. Fred Las

K2TR would return to the sanitary landfill in the middle of Lake Ontario, where he activated WD2UMP back when the FCC issued such calls. And why not? Is this any more absurd than the system we have now? At least it would be a lot more interesting!

NOTES FROM ALL OVER

Tom Gregory TU2NW is up and running in Abidjan, Ivory Coast. Tom runs a Kenwood TS-830S with remote vfo into an Alpha amp. His antenna farm includes a KLM KT-34A at 60', a multiband vertical, and wire antennas for the lower frequencies. Look for Tom around 28555, 21300, 14155, 7070, and 3795 on SSB, and 20 kHz up for CW contacts. Tom likes contest operations and is looking for donations toward a contest keyer. Donations and QSLs must go via Mike Hayden AK3F, PO Box 573, Gettysburg PA 17325.

Don Mears KX6QO is trying to find former KX6 (Kwajalein) amateurs—both residents and DXpeditioners. Don hopes to forward some of the thousands of undeliverable QSLs piling up on Kwajalein. If you ever operated KX6, send your address to Don at PO Box 793, APO San Francisco CA 96555. Don also reminds DXers that KX6 calls with a single-letter suffix (KX6A–KX6Z) are in California, *not* Kwajalein.

Vic Rivera ZK1CG, in the Cook Islands, says he is the QSL manager for WA0QZW/6, one of the very few DX QSL managers for a stateside station! (Box 618, Rarotonga, Cook Is.)

Also out in the Pacific, Dave Patton KJ9W is knocking around the Guam area, especially in contests with Tom N7DZE. Dave hopes to hit spots such as CR9, DU, VQ9, 9V1, KH1-0, and KC6, mostly CW. QSL any contact with Dave via K9XR.

New QSL Address

BV2A—Charlie Moraller K2CM, Rt 1, Box 43, Grantsville WV 26147.

Jan Weaver N7YL handles QSLs for the following stations: T32AB, T3LAB, T3LA, VR3AR, W1DDV/C6A, C6ADV, and KA3BUJ/8R1 (1981-2). She also has logs from 1976-9 for VR1AG, VR1AF, FK8BG, and VK4FJ/LH. Jan's new address is: 2195 East Camero Avenue, Las Vegas NV 89123.

Follow-Up from Previous Columns

I asked the origin of a very funny "letter to an insurance company" bit (July). Three widely scattered DXers set me straight. The piece was part of the repertoire of Gerard Hoffnung, an English musician and humorist. Thanks to KF4AI, VE7BS, and N1BEF for the information.

Rich Kingston 7P8BC asked me to clarify some of my March column on Lesotho. Rich supplied information on only the amateur-radio activities in Lesotho; I dug up the background on the country myself. Rich writes, "Lesotho has a great potential as a tourist area with some of the most spectacular scenery in the world."

REVIEW

SHORTWAVE HOBBY EQUIPMENT REVIEW

The *Shortwave Hobby Equipment Review* is published by the International DXers Club of San Diego and is a book aimed at providing information concerning shortwave receivers and accessories to the shortwave listener. The *Review* is made up of reprints from the club's monthly bulletin and is updated by yearly supplements and quarterly updates. It's published in loose-leaf form so that updates can be added easily.

This book is unique because it attempts to deal with the technical area of receiver performance in a decidedly nontechnical way. These reviews, some written by members of the club and others reprinted from both domestic and foreign shortwave magazines, don't read like those in QST, or even in *CQ*.

They are more properly called user reports, and because several reports from different users are included for the most popular receivers, the book gives a good overview of the good and bad points of the equipment. There are some technical reports of receiver performance included, always with the editor's caveat that "I don't know what this means, but maybe you do."

Along with reviews, the *Review* contains modification hints (generally nontechnical), rumors about new receivers, editorials on receivers and antennas, and the random ramblings of Larry Brockman, the president and spiritual leader of the club. The book also includes a section on TTY "listening."

Although the emphasis of the book is on current shortwave receivers, some ham equipment with general-coverage capability is included. There is a fair amount of material covering vintage receivers, giving opinions as to good and bad models, as well as modification and spare parts info on some of the more popular boat anchors. Any book that tells where to find spare ballast tubes for an R-390A can't be all bad! Receiver preamps and preselectors also are well covered.

The non-review parts of the *Review* are in some ways the most interesting. Larry Brockman is apparently one of those fellows who's done a little bit of everything and has strong opinions about anything. I think he's a bit like Wayne Green—you either like him or hate him, but either way he's fun to read.

I don't think I can recommend this book for the ham with no interest in shortwave (as opposed to ham) receivers. There's just not enough material pertaining to ham equipment to justify the cost. If, however, you do play SWL and are interested in what the market has to offer in that area, the *Shortwave Hobby Equipment Review* may be the ticket.

For further information about the *Review* and about membership in the club, contact the *International DXers Club of San Diego, 1826 Cypress Street, San Diego CA 92154-1154.*

John Ackermann AG9V
Green Bay WI

THE ICOM IC-751 HF TRANSCEIVER

Considering the state of the integrated-circuit art, I suppose it was inevitable that an "amateur" transceiver of this complexity would be made available to hams and shortwave listeners. The Icom IC-751 HF transceiver is an incredible package of versatility, accomplishing in one unit what a few years ago would have taken an outboard microcomputer in addition to a transceiver.

As Table 1 shows, the IC-751 is really a complete amateur-band-only (including WARC bands) transceiver *and* an all-mode general-coverage receiver. In addition to what you might expect—CW/SSB/AM capabilities—there are also FM and RTTY modes along with 32 frequency/mode memory and scanning facilities, two vfo's, filters, noise blanker, passband and notch tuning, rock-solid stability, and even an optional synthesized voice to inform you of your frequency. This last feature is particularly intriguing for the visually impaired because frequency determination is probably the hardest parameter to represent non-visually.

For this review, I received the 751 and the optional IC-PS15 outboard power supply. There are a lot of options to come, says Icom, including internal power supply, external frequency controller, more filters, and other goodies. I carefully unpacked the two boxes and found that Icom had done an excellent job of protecting its products against shipping damage, and everything, including the documentation, was sealed in plastic. The 32-page instruction manual package also included some functional block diagrams and a complete schematic: a two-sided fold-out that requires a Sherlock Holmes type magnifying glass to read. But it's nice to know you have a chance of tracking something down should (dare I say it?) anything go wrong.

Band	Frequency Range (MHz)
160	1.800.0— 1.999.9
80	3.440.0— 4.099.9
40	6.950.0— 7.499.9
30	9.950.0—10.499.9
20	13.950.0—14.499.9
18	17.950.0—18.499.9
15	20.950.0—21.499.9
12	24.450.0—25.099.9
10	27.950.0—29.999.9

Table 1. Amateur-band coverage.

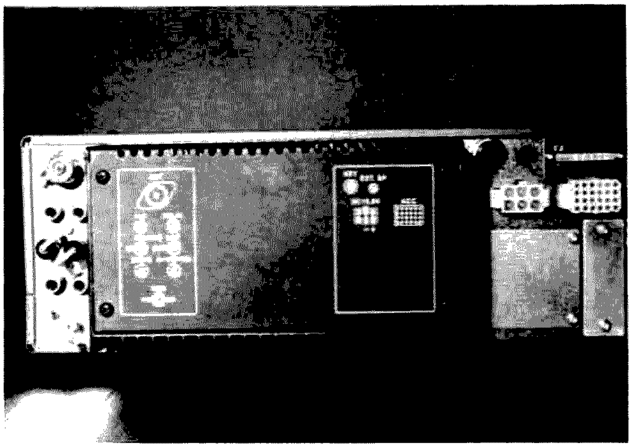
The only connections required are mike, key, antenna, ground, and power cable to the separate supply. The power supply then plugs into 115-V-ac power, and that's that. Also included is a hefty dc power cable should you decide to run the 751 directly from 12 V dc. But if battery power is contemplated, don't forget that at 200 Watts input you'll need 16–18 Amps at 12 volts.

As I perused the instruction manual, I soon found that this wasn't the sort of equipment you just intuitively know how to operate; there are over 50 operator controls, some of which function differently

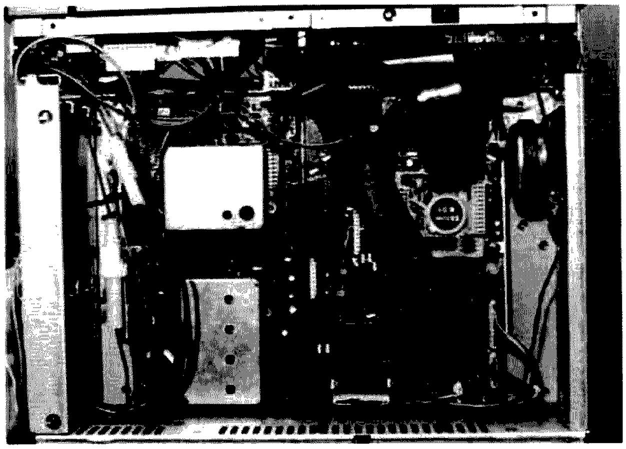
Mode	Display
USB	9.997.0
CW/RTTY	9.999.4
LSB/AM/FM	10.000.0

Table 2. 10-MHz WWV carrier frequency as displayed according to the scheme shown here.

The Icom-751 HF transceiver.



The back side of the 751. The legends identifying the connectors are much easier to read than the usual stamped-in letters. The vertical plate in the lower right is rumored to someday soon hold access to the microprocessor's address and data lines.



The underbelly of the 751. The optional internally-mounted 115-V-ac power supply mounts on the bottom cover and protrudes into the surprisingly open space.

depending on the position or setting sequence of others. But after a time of reading and experimenting and operating, most things began to make sense. I say most things because in spite of the 751's attempt to be the last word, it has some peculiarities worth mentioning. More on those later.

The 751 accommodates both the Icom IC-HM12 electret hand mike with fingertip frequency-scanning push-buttons and the IC-SM6 stand microphone. Both are wired for the 8-pin connector on the front panel. Included are a built-in speaker with very good intelligibility and a two-detent headphone jack for speaker, speaker/phones, or phone-only operation. An external speaker jack is also provided that disconnects the internal speaker when plugged in. Audio is clean, crisp, and very strong, and intelligibility seemed best to me with the TONE control at full treble.

My initial operation was with the general-coverage receiver because I figured I couldn't hurt anything by just listening. When you turn on the 751, there's a pleasant silence and the multi-purpose meter illuminates. The complex digital display is blanked for a second or two, but then with a definite relay click, the red and blue display comes to life.

The heart of the 751 is digital, including a microprocessor, and the logic is arranged so that on power-up the complex display indicates that the transceiver is in amateur (HAM) or general-coverage (GENE) mode (depending on how you last left it), vfo A is selected, and memory-channel 01 is queued up first. Ham-band coverage is confined to the band segments shown in Table 1, but general-coverage reception is continuous from 100 kHz to 30 MHz.

Operation

Suppose you wanted to check out the gang on 21.380. If you've previously programmed, say, channel 03, then you touch the VFO/M push-button and you're there. Along with the frequency, the digital display shows that you've automatically been put in USB, too. If no one is there and you want to try a favorite haunt on 15m CW, perhaps 04 in memory, a very slight twist of the main-tuning control clicks you instantly into 21.016 in the CW mode. No other controls need be touched. If 15 is dead and you want to try 40, a programmed 05 (or any other location up to 32) and another main-tuning-control twitch puts you there, along with auto conversion to LSB. A function switch enables you to change to USB or other modes if desired.

The 751 includes automatic carrier offsets for all modes—as shown in Table 2. So, when you change modes, the built-in calibration to WWV always reflects accurate carrier (or suppressed carrier) frequency. This is one of the little quirks that is kind of hard to get used to. This means that WWV on 10 MHz is displayed as 10.000.0 even when you know you are tuned off carrier frequency for AM reception. As far as mode selection goes, the amateur conventions of LSB on 7 MHz and below and USB from 10 MHz on up are followed.

If for some reason you have used up all 32 memory channels and would like to check propagation on any or all the ham bands, all you need to do is touch the BAND select push-button and turn the main-tuning control. The 751 is programmed to start near the bottom of each band, the exact location of which depends on operating mode—as shown in Table 3. A second touch of the BAND select push-button allows you to tune freely throughout the band.

When you reach, for example, the top of a band, the 751 jumps back to the bottom of the band. Similarly, when you reach the bottom of the band, the next step is back to the top of the band. When you decide to try the next higher or lower band, depress the BAND select switch and rotate the main-tuning control to click into the next band. For general-coverage applications, a similar sequence occurs, but in 1-MHz steps.

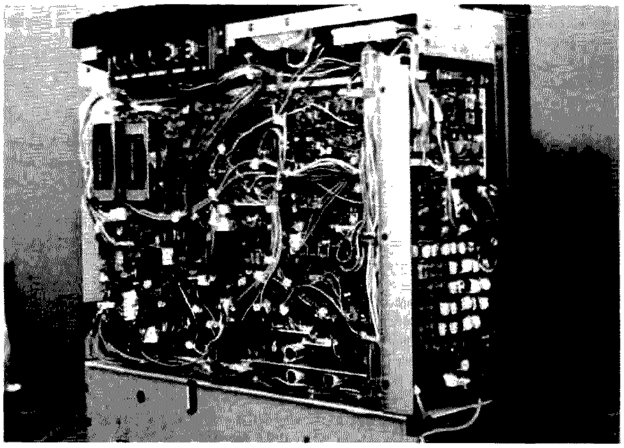
After you've made your coarse frequency selection via the BAND select push-button, you have your choice of several tuning-rate options. Slowest is about 2 kHz per rotation of the main-tuning control. If you physically tune faster, that is, spin the dial with a flick of the wrist, the tuning control automatically shifts into a faster rate—about 10 times as fast. Depressing the tuning rate push-button (labeled T S) really shifts tuning into warp drive—about 200 kHz per rotation. If all this sounds a little formidable, don't despair. You catch on rather quickly and it gives you enormous band, frequency, and tuning agility.

Because the front panel is already so full of controls and push-buttons, I guess Icom had to delegate some functions to a different geographical location—in this case, a small auxiliary panel on top of the transceiver directly above the display. Here you'll find a preamp/attenuator switch that lets you choose among straight-through, 20 dB of attenuation, or 15–20 dB of gain, as near as I could tell. The instruction manual doesn't say what the gain is, but the preamp does work well with little extra noise added in.

Also located on top are the MARKER switch and CALIBRATOR control. Because the internal logic of the 751 automatically compensates for carrier position and a central synthesizer is common to all bands, you need only dial in WWV on AM, set the display at 10.000.0 MHz, for example, and with the MARKER switch on, adjust the CALIBRATOR control for zero beat.

Unfortunately, I found this very difficult for several reasons. First, if the WWV signal is weak or exhibiting a moderate amount of QSB or flutter, the calibrate signal strength overpowers it so that it's

The non-ergonomic top-panel controls. Perhaps they are recessed because Icom knows hams love to stack equipment to the ceiling. But if you cover them up, how do you get to them?



With top and bottom covers removed, the 751 struts its stuff; it's not for the timid.

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80	3.550.0	3.549.4	3.547.0
40	7.050.0	7.049.4	7.047.0
30	10.050.0	10.049.4	10.047.0
20	14.050.0	14.049.4	14.047.0
18	18.050.0	18.049.4	18.047.0
15	21.050.0	21.049.4	21.047.0
12	24.550.0	24.549.4	24.547.0
10	28.050.0	28.049.4	28.047.0

Table 3. Displayed frequency after amateur-band selection.

tough to hear the beat note. Second, owing to the shape of the CALIBRATOR knob, it was difficult for me to make fine adjustments. I did find that by watching the S-meter fluctuations, I could zero-beat "visually" better than audibly. The little nub-like switches for the preamp and MARKER switches make it difficult to distinguish their positions, too.

Along with the preamp and calibrate controls are the MONITOR and ANTI-VOX controls, both of which are the same difficult-to-grasp shape. Luckily, these are not used often. And, in all fairness, considering the rock-solid stability of the 751, the calibrate controls won't get used much either. From early morning turn-on until late-night power off, I could detect only a very minute audible (or visual) calibration drift from WWV.

The transmitter, too, is completely solid-state with a "dial-your-power" control. It is protected from over-temperature by a two-speed, on-demand fan cooling system: Until the temperature of the final's heat-sink structure reaches about 50° C, the fan is off. When 50° C is reached, the fan comes on and stays on in both receive and transmit. Should the temperature climb to 90° C, the fan kicks into high and output power is reduced to 50 Watts. According to Icom, the temperature should never get this high unless there's a problem such as a mismatch or, perhaps, restricted air flow (contests and DXpeditions notwithstanding).

Icom also warns against operating into a vswr greater than 2 to 1, apparently because the protection circuitry can't cope. Reduced power and antenna tuners are also suggested for problem matches. Using the 751's built-in swr meter, I managed to load up easily on 80 through 10.

Although there isn't room in this review to explain adequately all the possible memory/vfo(s)/scan permutations, it quickly became obvious that from a frequency-handling perspective, the 751 should be great for contests and DX. There are two

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vfo's, a DUPLEX switch to set them up for splits, and both receive and transmit offset provisions. Vfo's can be equalized, that is, set to each other instantly by pressing A = B, and memory frequencies and modes can be dumped into the vfo's by touching another switch.

The 751 offers a very flexible scan mode along with squelch control. Basically, you can set it to scan (top to bottom) (1) the entire general-coverage band, (2) within the limits of the frequencies set in memory positions 01 and 02, (3) all the memory channels, and (4) all the memory channels with a certain mode (such as AM) that you specify. Depending on SQUELCH control setting, the 751 will pause for about 10 seconds on every active frequency before continuing on.

All in all, I would recommend that you get hold of a 751 and do a personal evaluation. You'll need some time, though, to really explore its capabilities. And if all the options promised by Icom materialize, bring a lunch. Versatility is the watchword, and Icom has it.

For further information, contact *Icom America, Inc., 2112-116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

Gene Smarte WB6TOV
Hancock NH

LETTERS

BIG GUN, BIG MOUTH

I read your magazine almost monthly and enjoy thoroughly some of the columns, especially the DX column by Chod Harris VP2ML.

The Heard Island story of August, 1983, was enlightening and my hat is off to the crew that brought that DXpedition to fruition. What courage, stamina, and financial burden that crew endured.

I was, however, upset at the boxed story accompanying the column, "Pileup Busting—By the Experts." What the experts had to say was helpful and based on knowledgeable operating and courteous common sense—except for the comments by K8CW. I find his comments very elitist. He eliminates transceiver-equipped stations by using wide splits. I would guess that he eliminates many average hams also. He also gives the edge to the big-signal stations—antenna farms and probably big amplifiers.

Based on K8CW's elitist attitude, I don't have much of a chance to ever work the big-time DXpeditions because, at present, all I have is a transceiver and a small 3-element beam—hardly an antenna farm.

Additionally, the time K8CW spends maintaining his blacklist could be better spent making quality contacts. I find his blacklisting 180 degrees out of phase with the tenets of amateur radio. Yes, I do agree that there are some inconsiderate operators out there when it comes to DX, but wouldn't it better to educate these people to the proper way of operating so that everyone gains?

Dick Jacovino KA1YP
Waterbury CT

HAM HELP WORKS!

My request in "Ham Help" for a manual on the Knight G-30 grid-dip meter has resulted in manuals, cards, and letters. How do I get them to stop?! The response has been outstanding, indicating the mutual concern of the ham family. I would like to suggest in such instances that a card or note precede the copying and mailing of requested material. I have felt obligated to reimburse those who sent the manuals and now have an adequate supply—plus!

James E. Smith K5PTC
Irving TX

PETER, PAUL, AND STUART

Several months ago you published a rather savage editorial criticizing the September/October, 1982, Peter and Paul expedition. I was a bit surprised, since none of the five operators had been checked for their side of the story of why the wide bandspread on 20 meters.

As the team leader, I must take full responsibility for what happened, despite the fact that I did not operate 20-meter phone when it became apparent that the situation was completely out of control. I can assure you that on my next DXpedition, I will utilize selective calling and keep the bandspread down to an extremely reasonable width.

I suspect you are not aware of the following facts:

- During the five days spent on the island, only two meals were provided by the Captain.
- Despite the equatorial location of the rocks, it was cold at night and there was insufficient foul-weather gear. The five of us crewed the vessel for five days and were exhausted when we arrived.
- The Captain refused to permit us to bring a table, so we made do with three pieces of plywood supported by loose basalt rocks for the stations. IDXF loaned us a 901 DM (which served on Spratly, 9M6, CR9, VS5, Desecheo, Navassa) and also a 101ZD which was used on Desecheo and Navassa. Both transceivers were disabled within the first four hours of operation. The band-selector shaft on the 901 snapped and one board failed. Carrier output was available but no audio and no receive could be obtained. The 101ZD received but no rf output could be obtained. Accordingly, for CW, K8CW and PY2CPU utilized a 101E belonging to K8CW and PY2BZD. N4BQW and I used a very old 101ZP with a bad front end belonging to PY2BZD.
- I had no problem working SSB and 10, 15, and 40. However, please bear in mind that the location of the rock is equidistant between Europe and the States, and despite the fact that the 101ZD had full rf attenuation, most signals were 30 over 9—no receiver can handle several hundred stations calling at the same time in a 20-kHz split. I am sure you are aware that 20-meter phone operators increasingly are using monobanders and full legal (?) limit amplifiers; many of them are using equipment without receivers. In other words, many did not listen. This created a problem for the policemen who were fighting with each other at 14.195. As soon as the operator concerned became aware of the problem and told me, I took the phone station off of 20 and put it on 40 where there was no trouble
- A recent Pacific Island trip to a quasi-rare spot produced the same incredible band split on 10-meter phone without complaint or editorials.

K8CW need not apologize for his performance. He made 6,000 contacts as PY9ZSC and 24,000 of the total 29,000 contacts from Heard Island. I did a respectable job on Desecheo and produced 6,000 contacts on Navassa in four days. Bearing in mind the adverse conditions, hunger, illness of three operators, tides which forced us to move the stations at night, sharks between the rocks, and a medical emergency which caused N4BQW to leave the island to attend an injured Brazilian sailor on a visiting boat for a period of eight hours, frankly, I am surprised that we produced 16,000 contacts in four days. I am also surprised that, despite our repeated requests for no duplicate contacts, station after station "duped" us, including many prominent DXers.

You are free to print this letter, and I would be interested in receiving your own thoughts. I plan to operate from another needed location in the next few months and from a very badly needed country as soon as licensing formalities can be completed. I can assure you that if there is another problem on 20 meters while I am operating, I will QSY to CW or drop the operation to 40 or 80 meters.

Stuart P. Greene WA2MOE
Peekskill NY

DISTORTED REASONING

I wish to comment on the dropping of the required facility in Morse code from amateur-radio licensing requirements.

I have been a ham since April, 1982, and hold a Canadian amateur-class license. I am restricted mainly to A1 operation on the HF bands but do enjoy limited phone privileges on 10 meters. I am also allowed phone privileges on various frequences in the VHF and UHF portions of the radio-frequency spectrum.

I am concerned about the current effort, both within and without the American amateur community, to integrate a codeless amateur license within the parameters of the American licensing program.

I do not believe a codeless license will attract a substantial number of newcomers to amateur radio. Further, there seems to be a belief that theory requirements should be made more demanding in order to attract technically-inclined individuals to amateur radio.

This kind of distorted reasoning is very unhealthy for amateur radio. In studying for my licenses, the learning of radio theory presented a greater hurdle to me in obtaining an amateur license than did the required facility in Morse code.

I enrolled in a ham-club-sanctioned licensing course, attended every lecture, and diligently studied all of the assigned readings. Of 45 individuals who began the course, only 6 students were successful in obtaining their licenses—a dismal 12% success rate. Had it not been for the kind help of a very good friend, I too would have failed in my quest for that coveted "ticket."

Judging from the comments of many, hams and non-hams alike, this is not a singular experience. It illustrates clearly that problems exist in the manner in which electronics is currently published and taught.

Currently, theory is presented in an often complicated, confused, and dry manner. Efforts must be made to ensure that the theory upon which our hobby is based is available to individuals in a simpler and more attractive mode. At the same time, efforts must be made to make the learning of code less of an obstacle to potential radio amateurs.

Because code is the simplest means of radio communication, it is, by its nature, something with which all amateurs have some familiarity. Consequently, it is not unreasonable to expect prospective amateurs to display competence in its transmission.

A common thread binds all amateurs together, that being the camaraderie and fellowship which is the essence of our hobby. The theory changes proposed by eager technophiles can only hurt amateur radio, due to the basic elitism inherent in any such proposals—elitism totally foreign to the essential spirit of hamming.

We amateurs must increase involvement by the community in amateur radio. To do otherwise will ensure our hobby will continue to be trivialized in the public mind. Thus, growth in the ranks of amateur radio will be very limited.

Arthur Cramer VE4ACM
Winnipeg MAN

Well, Arthur, I'm not sure where you are reading these things—certainly not in my editorials. While I am not a fan of the Morse code, feeling that it should have been eliminated as a requirement for a license at least 50 years ago and promoted as a fun means of communication in order to retain popularity, I don't recall ever claiming that dropping the code would bring in more hams. On the contrary, I doubt if this would make a lot of difference. If we want hams, we'd better start letting teenagers know about our hobby and promoting ham clubs in high schools like we used to when the hobby was growing.

I think we should have a legitimate technical, rule, and operations exam. The material doesn't have to be any more difficult than presently required. We should have the exams given by clubs so we can get away from the memorization/Bash syndrome. You sure are right about there being a need for a better book explaining the theory, though our study manual is pretty darned good in this line. Perhaps there is someone out there who would like to write a real fun introduction to electronic and radio theory.—Wayne.

CASH OR CREDIT

One of the amateur-radio-magazine editors has been decrying the lack of interest by young students in science studies. He claims that other nations' youth are passing ours by. There is credence in his utterances.

I am aware of one individual who has arisen to inform our youth about at least one facet of science. At Junior High School No. 22 in the heart of New York City, Joseph J. Fairclough WB2JKJ has been teaching his youngsters a course in "Ham Radio English."

Joe has wall-to-wall QSL cards decorating his classroom. His students happily talk over his station situated near his desk. I

have visited the school and I have talked to the students in his classroom via amateur radio. I know that Joe has given those kids a good course in English and successfully planted the seeds of amateur radio into their fertile minds.

During my high school days I was fired with enthusiasm for ham radio by membership in the school's radio club under the trusteeship of the school's physics department. That enthusiasm never died. It had a profound effect upon my career.

Recently, as a guest of the Martinsville, Indiana, Radio Club, I proposed the installing and maintaining of high school and junior high school radio clubs in the schools of our land wherever practicable, to be trusteed by a faculty member friendly to ham radio and to be sponsored by local QCWA, SOWP, ARRL, and other amateur-radio organizations. Sponsorship would include guidance, assistance in setting up a station, and follow-up to see that the station is properly operated (not devastated in the manner of many club stations). Of course, the local sponsoring club would have to be a viable, responsive group as well.

I feel that such a program would be more effective than the cash donations now given to gifted youth.

Paul L. Schmidt W9HO
Bloomfield IN

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

FARIBAULT MN
DEC 3

The annual Handi-Ham Winter Hamfest will be held on Saturday, December 3, 1983, at the Eagles Club in Faribault MN. Registration will begin at 9:00 am. There will be a Handi-Ham equipment auction and a dinner at noon. Talk-in on .19/.79. For more information, contact Don Franz W0FIT, 1114 Frank Avenue, Albert Lea MN 56007.

HAZEL PARK MI
DEC 4

The 18th annual Hazel Park Amateur Radio Club Swap and Shop will be held on Sunday, December 4, 1983, from 8:00 am to 2:00 pm, at Hazel Park High School, Hazel Park MI. Tickets are $1.50 in advance and $2.00 at the door. Tables are $1.00 per foot. Hot food and plenty of free parking will be available. Talk-in on .52 simplex. For tickets and table reservations, write HPARC, PO Box 368, Hazel Park MI 48030, or phone (313)-544-2965.

WEST ALLIS WI
JAN 7

The West Allis Radio Amateur Club will hold its 12th annual Midwinter Swapfest on Saturday, January 7, 1984, beginning at 8:00 am, at the Waukesha County Expo Center Forum (take I-94 to Co. F, then south to FT, then west to Expo). Admission is $2.00 in advance and $3.00 at the door. Tables are $3.00 in advance (reserved until 11:00 am) and $4.00 at the door on a first-come, first-served basis. Delicious food will be available. For tickets or more information, send SASE to WARAC, PO Box 1072, Milwaukee WI 53201.

SOUTH BEND IN
JAN 8

A hamfest swap & shop will be held on Sunday, January 8, 1984, at Century Center, downtown on US 33 Oneway North between the St. Joseph Bank Building and the river, South Bend IN. Tables are $3.00 each in a carpeted half-acre room. The Industrial History Museum is in the same building. Four-lane highways lead to the door from all directions. Talk-in on .52/.52, .99/.39, .93/.33, .78/.18, .69/.09, 145.43, and 145.29. For more information, contact Wayne Werts K9IXU, 1889 Riverside Drive, South Bend IN 48616, or phone (219)-233-5307.

YONKERS NY
JAN 22

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Auction on Sunday, January 22, 1984, from 9:00 am to 3:00 pm, at Lempko Hall, 556 Yonkers Avenue, Yonkers NY. Admission for buyers and sellers is $3.00 each; children under 8 will be admitted free. New and used equipment will be auctioned and can be inspected from 9:00 am to 10:00 am. There will be plenty of seats and parking and the auction will start at 10:00 am sharp. Unlimited free coffee will be available all day. The club will charge a 10% commission on the first $100 and 5% on the remainder on successful sales only. Talk-in on 146.265T/146.865R and .52 direct. For more information, write YARC, 53 Hayward Street, Yonkers NY 10704, or phone (914)-969-1053.

MANSFIELD OH
FEB 12

The Mansfield Midwinter Hamfest/Auction will be held on Sunday, February 12, 1984, beginning at 8:00 am, at the Richland County Fairgrounds, Mansfield OH. Tickets are $2.00 in advance and $3.00 at the door. Tables are $5.00 in advance and $6.00 at the door. Half tables are available. Talk-in on 146.34/.94. For additional information or advance tickets and tables, send an SASE to Dean Wrasse KB8MG, 1094 Beal Road, Mansfield OH 44905, or phone (419)-589-2415.

GLASGOW KY
FEB 25

The annual Glasgow Swapfest will be held on Saturday, February 25, 1984, beginning at 8:00 am Central time, at the Glasgow Flea Market Building, 2 miles south of Glasgow, just off highway 31E. Admission is $2.00 per person. There is no additional charge for exhibitors. The first table per exhibitor will be free, and extra tables will be available for $3.00 each. There will be a large heated building, free parking, free coffee, and a large flea market. Talk-in on 146.34/.94 or 147.63/.03. For further information, write Bernie Schwitzgebel WA4JZO, 121 Adairland Court, Glasgow KY 42141.

SIGNAL GENERATORS
RECONDITIONED AND LAB CALIBRATED

AN/URM-25 MILITARY SIG GEN, RANGE 10 KHZ THRU 50 MHZ, AM/CW, MODULATION 400/1000 HZ, CALIBRATED OUTPUT PRECISION 50 OHM STOP ATTENUATOR $285.00

AN/URM-26 MILITARY SIG GEN RANGE 4 MHZ THRU 405 MHZ, 400/1000 HZ MODULATION, CALIBRATED OUTPUT, SMALL COMPACT SIZE $285.00

TS-510/U MILITARY SIG GEN, RANGE 10 MHZ THRU 420 MHZ, OUTPUT VOLTAGE .5V TO 1V, MODULATION 400/1000 HZ AM/CW OR PULSE, SAME AS HP-608D $345.00

HP-614 SIG GEN, RANGE 900 MHZ THRU 2100 MHZ, AM/PULSE MODULATION CALIBRATED OUTPUT, IDEAL FOR AMATEUR 1.2 GHZ, MICROWAVE OR AIRCRAFT RADIO REPAIR $345.00

SG-557/URM-52 MILITARY SIG GEN, RANGE 3.8 GHZ THRU 7.8 GHZ, AM/PULSE CALIBRATED ATTENUATOR, MILITARY EQUIVALENT TO HP-618A, IDEAL FOR SATELLITE OR MICROWAVE REPAIR $345.00

TS-418/URM-49 RANGE 400 MHZ THRU 1000 MHZ, AM/CW OR PULSE MODULATION, CALIBRATED ATTENUATOR $225.00

TS-419/URM-64 RANGE 900 THRU 2100 MHZ, CW OR PULSE MODULATION, CALIBRATED ATTENUATOR $225.00

SG-13/U AIRCRAFT VOR/ILS MILITARY SIG GEN, RANGE 108 THRU 135.9 MHZ AND 329.9 TO 335 MHZ, OUTPUT SIGNALS INCLUDE VOR, LOC AND GLIDESLOPE AND 1000 CPS, SAME AS COLLINS 479T-2, OPERATES FROM 28 VDC AT 3½ AMPS BENCH POWER SUPPLY OR AIRCRAFT BATTERY, IDEAL FOR AIRCRAFT RADIO REPAIR $285.00

SG-66/ARM-5 AIRCRAFT OMNI SIG GEN, RANGE 108 MHZ THRU 132 MHZ, CALIBRATION OUTPUT AND MODULATION IDEAL FOR ALIGNMENT OF AIRCRAFT VOR RECEIVERS, MILITARY VERSION OF ARC H-14A $245.00

JERROLD 900A SWEEP GENERATOR, RANGE 0.5 THRU 1200 MHZ, 0.5 TO 400 MHZ SWEEP WIDTH, OUTPUT FLAT .5DB TO 800 MHZ, 1.5 DB TO 1200 MHZ, BUILT-IN RF DETECTOR $325.00

MARCONI TF-1066B AM/FM SIG GEN, RANGE 10 MHZ THRU 470 MHZ, INTERNAL FM OF 1 AND 5 KHZ WITH 100 KHZ VARIABLE DEVIATION, AM MODULATION OF 1 AND 5 KHZ, CALIBRATED OUTPUT. HAS MANY EXCELLENT FEATURES $550.00

HP 608E SIG GEN, RANGE 10 MHZ THRU 480 MHZ, CALIBRATED OUTPUT, PRECISION ATTENUATOR, INTERNAL AND EXTERNAL AM, CRYSTAL CALIBRATOR $850.00

MOTOROLA T-1034 FM SIG GEN, RANGE 25-54 MHZ, 130-175 MHZ, 400-470 MHZ AND 890-960 MHZ, VARIABLE OUTPUT FROM 0.1 MV TO 100,000 MV, CALIBRATED ATTENUATOR $385.00

WE SHIP BEST WAY, SHIPPING CHARGES COLLECT, 30-DAY MONEY-BACK GUARANTEE. SEND CHECK, VISA OR M/C. PHONE BILL SLEP, 704-524-7519.

Slep Electronics Company
P.O. BOX 100, HWY. 441
OTTO, NORTH CAROLINA 28763
✓367

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½"×11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I desperately need a circuit for an automatic line-voltage compensator for my 120-V, 12-A recreational-vehicle air conditioner.

Zoltan R. Bogar W3CJM
1921 Marymont Road
Silver Spring MD 20906

My husband, William Peuser W2BBS, passed away recently and I don't know what to do with his equipment. He had a Collins 75A receiver, Heath SB-220 linear, Heath SB-401 transmitter, Vibroplex key, Triplet frequency meter, Heath VTVM, and set of headphones. If anyone would like to buy this equipment, please let me know.

Veronica Pause
12-42 120th St
College Point NY 1135

I would appreciate information on adding FM capability to my Yaesu FT-301D. I would also like to find a service manual for it.

Dave Mastenbrook KA7BK
38682 Golden Valley Driv
Lebanon OR 9735

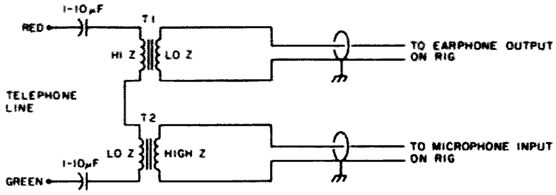
I would like to borrow a Heath IO-10 oscilloscope. I will pay the postage both ways and return it in two weeks.

Frank Aldrich N0AF
1094 Quinc
Boulder CO 803C

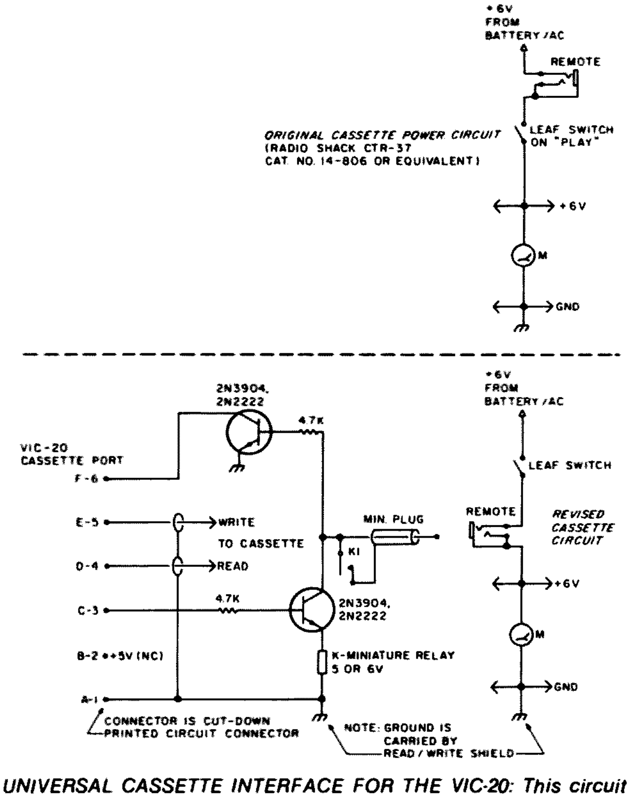
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

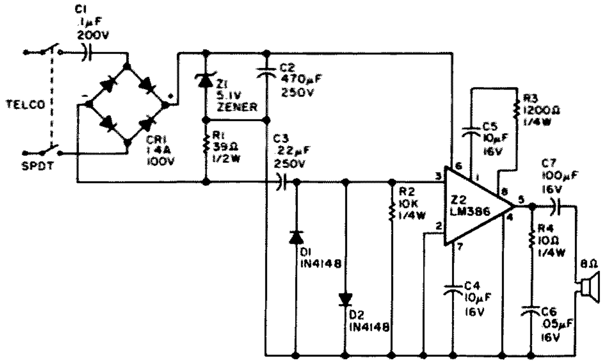
In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73 Magazine, Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



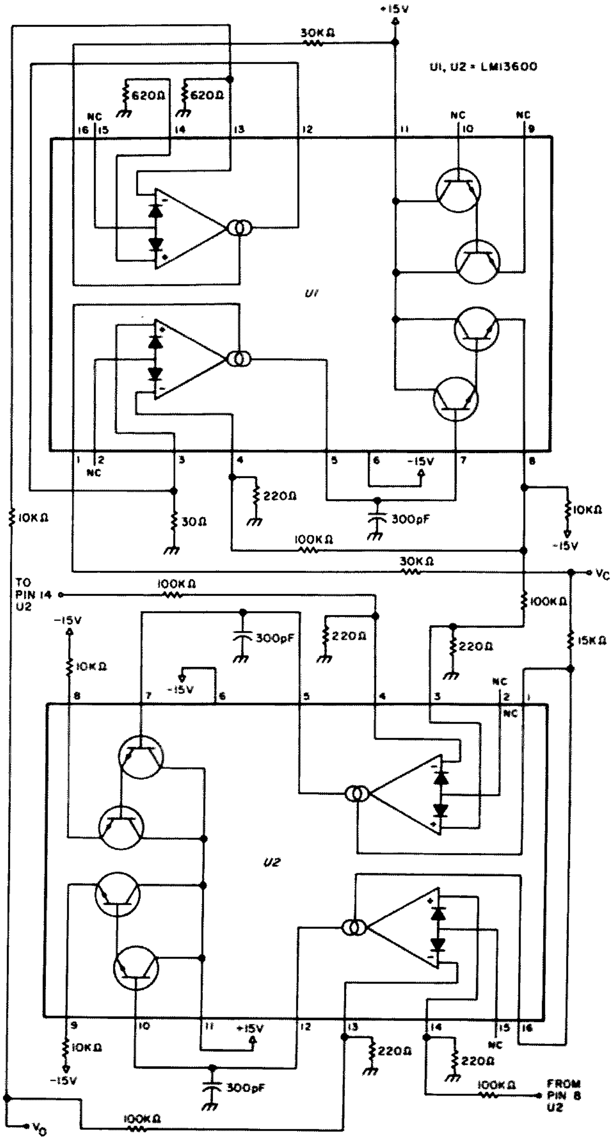
NO-COST PHONE PATCH: By scrounging two transformers from transistorized broadcast-band radios, you can make this phone patch for your HF rig. The low- and high-impedance windings were determined by using a VOM to measure the resistance; the transformers I used had about a 30:1 resistance ratio. It is possible to use VOX with this circuit if the anti-VOX is adjusted properly and the phone lines are not noisy.—Terry Fletcher WA0ITP, Ottumwa IA.



UNIVERSAL CASSETTE INTERFACE FOR THE VIC-20: This circuit will allow you to use any cassette recorder with the VIC-20, but does not prohibit normal use. To use the circuit, the recorder must be rewired so that power from the battery will go first to the leaf switch and then to the remote jack. The circuit is not critical and in operation, the normal "save," "verify," "search," and "load" commands apply.—George W. Allen N1BEP, Old Greenwich CT.



TELEPHONE LINE MONITOR: Using rectified audio as a power supply, this monitor will put the telephone-line audio into an 8-Ohm speaker. All of the parts are available from Radio Shack.—E. C. Sherrill W5TPP, Fort Worth TX.



SINUSOIDAL VCO: Using two National Semiconductor LM 13600N dual transconductance amplifier chips, this circuit provides a variable frequency output dependent on the input voltage. The circuit's frequency range is from 5 Hz to 50 kHz with a total harmonic distortion of less than 1 percent.—Paul F. Cavanaugh N2DLV/G5EHU.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

WASHINGTON TOTEM AWARD

The Washington Totem Award was initiated in 1973 by the Western Washington DX Club, thus becoming the first major W7 award available to the amateur community. It used as its motif the colorful totem pole, symbolic of the Indian culture of the Pacific Northwest.

The first award was issued to 9X5NA; to date, 133 awards have been issued to 61 DX countries. To qualify:

Applicants must submit proof of QSOs with 100 different Washington stations. Twenty (20) of these must be confirmed contacts with different Western Washington DX Club members. DX stations need only confirm twenty-five (25) Washington stations including ten (10) WWDXC members.

General certification rules apply. Submission of QSL cards is not required. Cards may be checked and certified by an officer of any recognized club or society. DX stations may submit log data in lieu of QSL card confirmation.

To be valid, all contacts must have been made January 1, 1973, or later.

Certified lists submitted must be in alphabetical order, with date and time in GMT.

The Washington Totem Award is free to all stations outside the United States. US stations must include an application fee of $1.00. If QSL cards are sent to WWDXC for checking, sufficient postage for their safe return must be included with the application and confirmation list.

Special endorsements will be issued for specific band or mode accomplishments if all supporting information is included with the application.

The WWDXC will furnish a current membership listing upon request (and SASE). Mail all inquiries to: Awards Manager, WWDXC, Inc., PO Box 224, Mercer Island WA 98040, USA.

I might hint to our readers wishing to seek this award that members of the Western Washington DX Club sponsor three DX nets daily. To be part of the "W7PHO Family Hour," tune to 14.225 MHz at 1400 and 2300 GMT and to 21.320 MHz at 0000 GMT daily.

BOEING AWARDS PROGRAM

The BEARS offer quite an array of incentives for parchment pursuers. Let's take a closer look at each one individually:

Worked Five Bears Award

This award is offered for those stations confirming contact with at least five (5) members of the Boeing Employees' Amateur Radio Society. There are no band, mode, or time restrictions. General certification rules apply.

Worked Three Bear Cubs Award

Issued specifically to any station confirming contact with at least three (3) Novice members of the Boeing Employees' Amateur Radio Society. There are no band, mode, or time restrictions. General certification rules apply.

Zone 3 Award

This award is offerd in four (4) levels of operating achievement:

Basic Zone 3 Award. This award is issued to those stations submitting written evidence of having worked an amateur in each state and Canadian province in Zone 3. These geographical limits would include Arizona, Oregon, California, Nevada, Utah, Washington, and the province of British Columbia. Contacts may be made in any amateur band and mode and must have been made on or after January 1, 1984.

Master Zone 3 Award. Applicant must follow the same rules as stated for the Basic Award with the exception that all contacts must be made with a station located in the capital city of each state and province in Zone 3.

Special Zone 3 Award. This special award recognition requires the applicant to work five (5) Zone 3 stations whose last call letters spell the word BEARS. All other rules for the Basic Zone 3 Award apply.

Extra Zone 3 Award. This award combines the difficulty of both the Master and Special awards and undoubtedly becomes the most sought-after in the Zone 3 program. To qualify, contacts must be made with stations located in capital cities of Zone 3 state and provinces. In addition, the last letters of their calls must spell the word BEARS.

All awards offered by the BEARS are available free of charge. Applicants must make a self-prepared list of required contacts, including the city and state of each amateur contact claimed, the date of each QSO, the band, and the mode. This list must be verified by at least two (2) amateurs, Technicians or above, an officer of an active radio club, or a notary public. In each case, the applicant must have written confirmations on hand for each contact claimed. Submit your award application to: The Boeing Employees' Amateur Radio Society, Willis Propst K7RS, 18415 38th Avenue, South Seattle WA 98188.

SRAL AWARDS

The Finnish Amateur Radio League award manager writes to inform us about the beautiful OH series of awards being offered by this dedicated organization in northern Europe.

All applications must be forwarded to the attention of the SRAL Award Manager, PO Box 306, Helsinki 10, Finland; it is suggested that QSL cards not be sent. Instead, claimed contacts should be verified locally by two licensed amateurs, a club official or a notary public.

To be valid, all contacts qualifying for the OH-series awards must have been made since June 10, 1947. The OH awards consist of the following:

OHA

Applicants in Denmark, Norway, and Sweden need contacts with at least 50 different OH stations, including 8 OH call areas on one band, plus 8 different OH call areas together on other band(s).

Other European applicants need contacts with at least 20 different OH stations, including at least 7 OH call areas. The maximum number of contacts per band is 15, so at least two different bands must be used.

Non-European applicants need contacts with 15 different OH stations, including at least 5 OH call areas on any band or combination of bands. Contacts made on 3.5 MHz will count for two contact points.

CW, phone, or mixed-mode contacts count. The minimum acceptable reports are 338 RS(T). Contacts with Finnish maritime mobile stations do not count.

The award fee is 5 IRCs, to be sent with each application.

The OH8 stations with suffixes ND, NJ, NS, NV, NX, OA, OB, OC, OG, OI, ON, OP, OO, OR, OU, OX, OZ, PA, PB, PD, PF, PL, PM, and PO are counted as OH9 stations if the contacts occurred before June 1, 1954.

OHA-100

The applicant must have worked at least 100 different OH stations, including all 10 call areas on one band plus (again) all 10 OH call areas on another (one) band. The 100 stations must all be different, but in order to meet the call-area requirement, the same station may be worked on different bands; in this case, the total number of contacts will be over 100. All authorized bands may be used, as well as CW, phone, or both.

The application list must be in district and alphabetical order (only callsigns and dates), giving separate declaration of the required 2 × 10 call areas/bands.

See also paragraphs 4, 5, and 8 of OHA rules above.

OHA-300

The applicant must have worked and confirmed at least 300 different OH stations, including all 10 OH call areas separately on each of three bands, i.e., 3 × 10 OH districts. The 300 OH stations must be all different, but in order to meet the call-area/band requirement, the same OH station may be worked on different bands. In this case, the number of OSOs will exceed 300. All bands, CW, and/or phone may be used.

This application list must be in district and alphabetical order (only callsigns and dates), giving separate declaration of the required 3 × 10 districts/bands.

OHA-500

This award will be available to any foreign applicant for confirmed contact with 500 different OH stations, regardless of time, mode, or band used. For OH applicants, only contacts made since February 1, 1967, will count.

A list of the 500 OH QSL cards on hand must be submitted to the awards manager. As with all OH-series awards, this list must be verified by at least two amateurs, a club official, or a notary public. The award manager reserves the right to call for any QSL to be submitted in support of any claim. This list must be written in alphabetical order by callsign, and no other details are necessary.

The OHA-500 is given to qualified applicants free of charge, compliments of SRAL.

WIA AWARDS

From down under, the boys at the Wireless Institute of Australia were kind enough to present the entire portfolio of WIA-sponsored achievement awards. We will review the well-known Worked All VK Call Areas Award.

This award is offered by the WIA as tangible evidence of the proficiency of overseas amateurs in making contacts with the various call areas of the Commonwealth of Australia.

The award may be claimed by any amateur in the world who is a member of an affiliated society of the IARU, but no Austra-

VK TERRITORIES

Territory	Call Area	QSLs Required
Australian Antarctica Heard Island Macquarie Island	VK0	1
Australian Capital	VK1	1
Lord Howe Island State of New South Wales	VK2	3
State of Victoria	VK3	3
State of Queensland Thursday Island Willis Island	VK4	3
State of South Australia	VK5	3
State of Western Australia	VK6	3
Flinders Island King Island State of Tasmania	VK7	3
Northern Territory	VK8	1
Admiralty Islands Bougainville Island Christmas Island Cocos Islands Nauru New Guinea New Ireland Norfolk Island Papua Territory	VK9	1

Table 1. In areas above where more than one confirmation is required, contacts may be made with any or all of the territories grouped together. VK9: Where a territory is no longer under Australian jurisdiction, contacts up to the date of independence will be accepted.

lian amateur will be eligible.

A handsome certificate will be awarded to any applicant who makes contacts with Australian amateur stations in the areas shown in Table 1. A total of 22 contacts must be made.

Contacts between overeas stations and Australian stations must have been made on or after January 1, 1946.

Contacts may be made using any authorized frequency band or type of emission permitted to Australian amateurs, but crossband contacts will not be allowed.

No contacts made with ship or aircraft stations in Australian territories will be eligible, but land-mobile or portable stations may be contacted provided the location at the time of contact is shown on the confirmation.

The applicant must submit proof in the form of QSL cards or another form or written evidence confirming two-way contacts have been made. Such verification must show the date and time of contact, call of the station worked, type of emission and frequency used, signal reports, and location (portable or land mobile stations only) of the stations contacted.

If the applicant is a member of a society which has a reciprocal agreement with WIA to verify claimed contacts for its members, submit your QSLs to that society, being sure to enclose sufficient postage fees for their safe return.

Applicants should submit their certified list of contacts and/or list of contacts with QSL cards to: the Federal Awards Manager, WIA, Postbox 150, Toorak, Victoria 3142, Australia. There is no fee for the award—it's compliments of WIA.

MARK TWAIN SPECIAL-EVENT STATION

The Connecticut DX Association will operate special-event station KO1R from 1300Z to 2000Z on Saturday, December 3, 1983, from the home of Mark Twain, The Mark Twain Memorial, in Hartford, Connecticut. The frequencies for both phone and CW will be the lower portion of the General and the upper portion of the Advanced bands. For a full-color QSL, send your QSL and SASE to: Connecticut DX Association, PO Box 181, Columbia CT 06237.

EVERGLADES ARC NATIONAL PARK SPECIAL-EVENT STATION

The Homestead, Florida, Everglades Amateur Radio Club will be operating special-event station W4SVI from 1300 UTC December 3 to 2200 December 4, 1983, in celebration of the 36th anniversary of Everglades National Park.

Operations will be 10 kHz up from the lower edge of the 40–10-meter General phone bands and Novice bands. W4SVI will also be on 146.52 MHz. A special certificate is available for a QSL and large SASE. Mail it to: W4SVI, c/o Dick Dowst WB4HZK, Everglades ARC, 14511 SW 287 St., Leisure City FL 33033.

HEN HOUSE GANG CHRISTMAS SPECIAL

W1FHP and the Hen House Gang of Bethlehem, Connecticut, will have its annual Christmas special from November 26, 1983, to January 7, 1984. They will be spreading Christmas cheer to children of all ages by relaying messages to Saint Nick. Operating frequencies will be on all bands from 40 to 10 meters. QSLs should be sent to the *Callbook* address with a 20-cent stamp.

NEW PRODUCTS

DC INSERTER FOR BLOCK DOWNCONVERTERS

The model 4408-FM/FF is used to block or insert dc power into a TVRO system downconverter. Operating frequency range is 220 MHz to 720 MHz.

When placed between the receiver and downconverter, dc power can be sent through the center coax conductor. Model #4408 comes with type F connectors, one male and one female, and you can specify a male or female input connector. Impedance is 75 Ohms, and the maximum insertion loss is 0.5 dB. Minimum insertion loss is 14 dB.

For more information, contact *Microwave Filter Co., Inc., 6743 Kinne Street, East Syracuse NY 13057; (800)-448-1666.* Reader Service number 480.

The 4408-FM/FF dc inserter from Microwave Filter Co.

PACKET-RADIO TERMINAL NODE CONTROLLER

GLB Electronics has announced the Model PK1 low-cost TNC for packet radio. This unit has a self-contained modem and requires a 12-volt power supply, a data terminal, and a radio transceiver for packet operation. The data terminal can be a personal computer, a "dumb" terminal (keyboard and display), or even a mechanical teletype machine. The terminal interface is RS-232 compatible and self-adapts to ASCII or Baudot at data rates ranging from 45 to 9600 baud. An adapter is available for converting mechanical teletype machines to the RS-232 interface.

On the radio-link side, standard Bell 202 tones are used, with a data rate of 1200 baud, making it compatible with Vancouver and Tuscon TNCs.

Utilizing a Z80A microprocessor, the Model PK1 has 8K of ROM and 4K of RAM as standard equipment. RAM can be readily expanded to 14K, using 2K "byte-wide" memory chips, and to 56K via modification using 8K chips. The VADCG protocol is available now, and AX.25 is to be released by the end of the year. Conversion to AX.25 is accomplished by means of exchanging ROMs at nominal cost.

The unit is ready to operate on power-up with a few simple commands, but there are over 50 total commands available for control and to set operating modes and parameters. Included are ways to operate in connected and unconnected modes and even to create custom protocols via a host computer. A CW identifier is also included.

In the "Queue-up" mode, messages or data are automatically stored in internal memory. They can then be taken one at a time or all at once at the operator's convenience. A "Block" mode is available for interfacing to a host computer, where all data is transferred via a counter, permitting unrestricted flow of data having arbitrary byte values and sequences. Numeric values can be set to decimal, hex, octal, or binary with or without leading zeros. Console echo is optional, as is automatic line feed, a terminal width limit, and automatic null insertion.

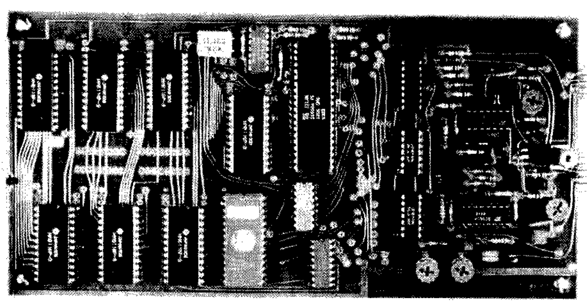
Besides information, display output optionally includes non-info data, packet headers, error indications, and current link status. Each of these fields can be independently disabled or enabled. So the user may choose anything from "pure" data to all the workings of the packet environment. Each field is uniquely identifiable by machine, simplifying automatic operation controlled by a host computer.

Applications include conversations, message handling, file transfers, automatic bulletin boards, etc.

The PK1 can be used as a "private" message-handling system in conjunction with a teletype machine. When a message is available it activates the motor, prints the message(s), and shuts off automatically. A user can select all-channel activity, messages from a specific station, or only those messages intended for him to be displayed.

The Model PK1 is a printed-circuit assembly, measuring 4.5 × 9.4 inches, including two 10-pin edge connectors. Power required is a single +12-volt supply at 1/4 Ampere. Connecting cables are also available.

For more information, contact *GLB Electronics, 1952 Clinton St., Buffalo NY 14206; (716)-824-7936.* Reader Service number 477.


GLB Electronics' Model PK1 TNC.

HUSTLER 440-MHZ FIXED-STATION VERTICAL

The new G6-440 delivers 6 dB gain in an omnidirectional pattern with the major lobe at the horizon, making it ideal for repeater use. The stack of 5/8-wave vertical radiators is sealed in a white fiberglass radome for all-weather use. Mounting support is aluminum with stainless-steel hardware. No tuning is required, since resonance is factory adjusted to 440 MHz with a bandwidth of 18 MHz under 2:1 vswr.

For more information, contact your local dealer or write *Hustler, Inc., 3275 North B Avenue, Kissimmee FL 32741.* Reader Service number 486.

MAXCOM ANTENNA MATCHER

The Maxcom antenna matcher will tune a dipole or longwire antenna configuration, from .3 MHz to 70 MHz, with a vswr of less than 1.5 to 1.

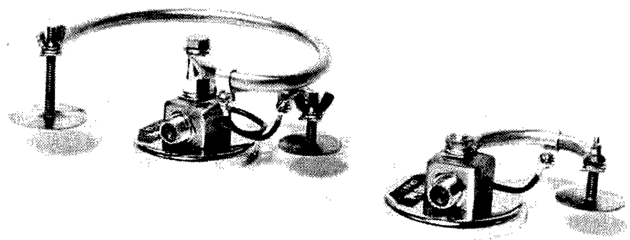
The small size and weight of the matcher makes Maxcom ideal for land, marine-base, and avionics applications. Originally developed for military applications, the broadband coverage provides the user with one antenna for operation on many frequencies, thus eliminating multi-antenna dipole and longwire installations which not only are unsightly but also, in most cases, interact due to space restric-

tions. Maxcom is small, lightweight, efficient, and almost invisible in comparison.

When used in a dipole configuration each leg of the dipole must be at least 35 feet long. Changes in angle and elevation will alter the directivity but will not affect Maxcom's ability to match the antenna. Inverted-V configurations have proven to be the preferred installation with Maxcom.

Longwires may also be used, provided that a substantial ground is connected to the correct terminal on the Maxcom. The Maxcom is particularly well suited for sloper configurations.

For additional information, contact *Magnum Distributing Inc., 1000 S. Dixie Highway W. #3, Pompano Beach FL 33060; (305)-785-2002.* Reader Service number 483.



Com-Rad Industries' CR2/4A and CR4A antennas.

MFJ-103 24/12-HOUR DIGITAL CLOCK

The MFJ-103 is a new 24/12-hour, solid-state, digital clock. It features blue, 0.6-inch vacuum fluorescent digits. This new clock has a battery backup to keep the clock on time during power outages. It requires a single 9-volt battery (not furnished).

It has an ID timer that alerts you every 9 minutes after you tap the ID/snooze button. This 9-minute timer gives you a full minute after the timer sounds to indentify and still be legal. It has a switchable seconds readout for accuracy. It can be synchronized with WWV.

The MFJ-103 has an alarm for schedule reminder or wake-up use. An alarm indicator tells you when the alarm is on.

For "observed-time" timing, just start the clock from zero and note the ending of the event up to 24 hours. It has fast and slow set buttons for easy setting and a lock function to prevent mis-setting.

The clock operates on 110 V ac, 60 Hz, and is UL approved. The handsome, black plastic case with clear front measures 5 × 2 × 3 inches.

MFJ provides a 30-day money-back trial period. If you are not satisfied, you may return it within 30 days for a full refund (less shipping). MFJ also provides a one-year limited warranty.

For additional information, contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762.* Reader Service number 476.

The new MFJ-103 24/12-hour digital clock.

DAIWA LA2155 150-W 2M LINEAR AMPLIFIER

Daiwa has introduced a new, high-power two-meter linear amplifier—the LA2155. The LA2155 delivers a 150-Watt punch with 25 Watts of FM, SSB, or CW input. The unit features an array of extras such as a switchable receive preamp, a high/low power option, fast acting protection circuitry, rf-activated transmit/receive switching with time delay and manual override option, and relative power output metering.

The LA2155 requires 12 V dc at 24 Amps maximum. For more information contact: *MCM Communications, 858 East Congress Park Drive, Centerville OH 45459; (513)-434-0031.* Reader Service number 478.

HEADLIGHTS

Headlights is a new portable light source for the repairman, handyman, and hobbyist, now available from Fogg and Egan. It directs bright light where you look while leaving both hands free to work. They light when you put them on, and there are no switches, wires, or battery packs. Headlights is designed to be worn with or without glasses. Two bulbs, 6 inches apart, flood the work area and are more effective than a single bulb in eliminating shadows in confined areas.

Headlights is ideal for times when the power is out, close-tolerance work, working in confined areas, reading in dim light, or performing any task where you need both hands free.

For more information, contact *Fogg and Egan, 17 Verdin Drive, New City NY 10956: (914)-634-5870.* Reader Service number 482.

COM-RAD'S 440-MHZ DDRR

Com-Rad Industries has added a 440-MHz DDRR to round out its family of rugged, low profile, flutter-free antennas for VHF and UHF service. The 440 unit is only 1-1/2 inches high and is made entirely from stainless steel and chromed brass (as are the units for 144 MHz and 220 MHz). The 440-MHz (CR4A) or the 220-MHz (CR3A) can be combined with the 144-MHz (CR2A) to form a two-band automatic bandswitching antenna using just one feedline.

These combination antennas are very useful when using the new dual-band transceivers that are coming on the market. Also, because of the low profile, the antennas can be mounted on the roof of a vehicle for maximum efficiency and a more uniform radiation pattern than is possible from a trunk or bumper. Both the 440-MHz and the new combination units incorporate the new capacity-disk tuning system which gives them an even lower profile and greater durability.

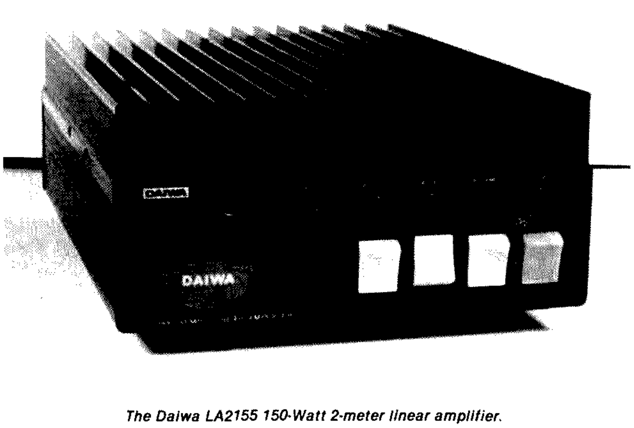
For additional information, contact *Com-Rad Industries, 1635 West River Parkway, Grand Island NY 14072; (716)-773-1445.* Reader Service number 484.

LARSEN TEST MOUNT ADAPTER

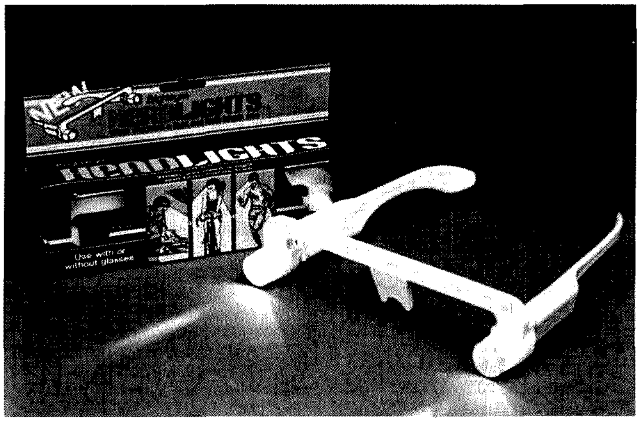
The new Larsen Electronics test mount adapter simplifies tracing problems in antenna or radio. It can check the antenna-feedline vswr and the radio power output at the same time. All you have to do is screw the adapter on the mount and apply a dummy load. Then check the coax, mount impedance, and connections.

The test mount has other uses as well. When you don't have clearance for a full antenna or just want to remote an antenna temporarily, you can use the adapter for a coax extension.

The test adapter is available for Larsen's NMO and NLA series mounts. For more information, contact *Larsen*



The Daiwa LA2155 150-Watt 2-meter linear amplifier.



Headlights portable light source from Fogg and Egan.

Electronics, PO Box 1799, Vancouver WA 98668; (206)-573-2722. Reader Service number 479.

NEW MODS FOR KENWOOD TRANSCEIVERS

International Radio, Inc., formerly Users International Radio Club, has released several modification kits for Kenwood transceivers.

The TS-930S 2.1-kHz cascade kit features two 8-pole crystal filters, two diode-switching boards, all parts, and instructions. This kit does not require removal of the large signal-unit PC board. All soldering is done from the top of the PC board, and no insertion loss will be noted. The filter will increase your selectivity at 6 dB from 2.7 kHz to 2.0 kHz, and from 4.0 kHz to 2.5 kHz at 60 dB.

The TS-430S cascading kit will add another 8 poles of filtering for a total of 16 poles. The added filter is patched in before the product detector and is in the receive mode only. The kit will improve your noise-floor figures and front-end dynamic range and increase selectivity. The kit consists of a pre wired, tested PC board with a 2.1-kHz filter installed and complete instructions.

The Magicom speech processor will increase the average signal power to the antenna by as much as 6 dB. In addition, a significant "talk-power" improvement will be realized over existing processing methods used in the TS-430S. The processor comes wired, tested, and with complete instructions and pictorials.

For more information on these and other products, contact *International Radio, Inc., 364 Kilpatrick Avenue, Port St. Lucie FL 33452.* Reader Service number 481.

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Well, it's December—time for our annual shopping spree. Last year, I used the pages of *73* as an avenue of shops. Your response to this approach was so good that I think we will do it again. I would like to preface this with the note that, unlike those reviews I have written about equipment tested or evaluated here at WA3AJR, the material presented this month is basically what the manufacturer claims, without much in the way of screening. I shall provide the addresses of companies for you to contact directly, should you be interested in any of the items mentioned. Since they all are *73* advertisers, I am sure the magazine will stand alongside you as well.

That said, let's take a stroll down *73* Boulevard. We are only going to look at those advertisers who directly address the RTTY crowd, even though antennas, receivers, and the like may be important. With the proliferation of RTTY equipment being offered, I think it is important to spotlight that stuff! Also, we will be using the October, 1983, issue of *73* as a guide. So, if your favorite advertiser was not there, we may miss him.

How about a copy of the 1984 *Radio Amateur Callbook*? Selling for $19.95, this is an indispensable aid to any active amateur. The book contains, besides the expected listing of all amateur callsigns, call changes, silent keys, census data, QSL bureaus, and more. A buck less buys you the International edition with information on almost a half million amateurs worldwide. No ham should be without one!

The Ham Shack takes a page to announce AEA's CP-1 Computer Patch Interface. This little box patches many popular home computers to run both RTTY and CW. It appears to offer both fixed-170-Hz and variable shift, automatic threshold, and a built-in AFSK generator. Looks interesting—it might answer the need of quite a few hams looking to interface their small computer with amateur radio.

Our old buddies at Microlog, here in Maryland, have a two-page spread to announce their version of the home computer-RTTY interface. Their AIR-1 is a single-board terminal unit and operating system that converts a VIC-20 to run RTTY and CW. Now why they chose the VIC-20, with its 22-character line, is beyond me—it would seem as though this would limit one's communication of most forms of RTTY—but they did. I would rather have seen an Atari or the like; maybe they will come out with one for that system. But for this one, they have an impressive package, display notwithstanding. Text buffer, autostart, WRU (who are you?) mode, diddle, and even a real-time clock are some of the features. This package, retailing for $199, is something to be dealt with.

Software is in abundance, and the W. H. Nall Company is advertising a disk for the Apple II with a program named Egbert II. This program allows RTTY, CW, or TDD (deaf TTY on telephone) with a software terminal unit. At $59.95, $39.95 if RTTY only is desired, this sounds like quite a bargain. Would be interested to hear from any readers who have used the program.

Macrotronics, a company that entered the computer-RTTY market rather early, offers their Terminall, a hardware and software system which sends and receives RTTY and CW on a TRS-80 Model I or III (4?), Apple II (IIe?), or Atari 400/800 (1200/1400/1450?). The box sells for $499 and is all you need other than a transmitter and a receiver to put these computers on the air.

Another old friend, MFJ Enterprises, Inc., offers their RTTY/ASCII/CW Computer Interface. Using available software, this is a demodulator and AFSK generator that will act as the hardware interface between your radio equipment and, in their words, a VIC-20, TRS-80C, Atari, TI-99, Commodore 64, or almost any other personal computer. Remember now, this does *not* include the software to turn your computer into a terminal, just the decoding of the audio from your receiver into tones and the encoding of your RTTY pulses into a form that your transmitter will accept. Nonetheless, at $99.95, it may be just the thing for the individual without adequate hardware.

Speaking of sources of software, Kantronics features a full line of programs along with hardware interfaces. Their original interface is a demodulator and AFSK encoder and sells for $169.95. Their new Interface II features a hotter front end, scope outputs, and a bunch of standard shifts. This new one sells for $269.95. In terms of software, Kantronics offers three programs which run with their own, or other (like the MFJ unit above), hardware. The basic Hamsoft program puts many popular computers on RTTY and CW with a full range of features. It is supplied on a ROM board for the VIC-20 ($49.95), Atari ($49.95), TRS-80C ($59.95), or TI-99/4A ($99.95). A disk version is also available for the Apple for $29.95. An advanced version, Hamtext, is available for the Apple, Commodore 64, and VIC-20. This features disk transmit and save modes, printer outputs, and more and sells for $99.95. Also available is Amtorsoft, one of the first programs to run the new AMTOR mode we discussed last month. Running on the same three systems as Hamtext, it sells for $89.95. Looks like an impressive line.

Okay, here comes the other printed material I mentioned. I am about to make my yearly pitch to subscribe to *73*; those of you who presently subscribe may skip to the next paragraph. Do you know how many articles have been published on RTTY in *73*? More than in any other magazine—even more than all of them combined! Yes, this magazine is ideal for keeping up with new knowledge, and at $19.97 (I don't know why the strange number, either—but then when this magazine was first published it went for 37 cents), a year's subscription remains one of the biggest bargains around.

Yet another computer interface is being offered by Contempory Technology, Inc. Their TMC-18 RTTY/CW interface appears to be a demodulator/AFSK keyer which is supplied with software for the VIC-20 and is supposed to run with other brands of computers with appropriate software. With cable and software, this unit sells for $299.35.

On the self-contained front, DGM Electronics presents its SRT-3000, a RTTY/CW/ASCII terminal. This keyboard-shaped unit features a full TTY line display of 72 characters, buffers, cassette interfacing, and stunt-box features. Its price is listed as $995, with an introductory offer of $795. I don't know how long the "introduction" is going on.

When it comes to AMTOR, AEA takes out an ad of its own to show its new AMT-1 AMTOR terminal. This sleek box will act as a demodulator and modulator for AMTOR RTTY, requiring only a terminal and transceiver. You can use a dumb "glass-TTY" type terminal, computer with terminal software, or even an ASR-33, I guess. At $499.95, this will make quite an impression in the growing AMTOR market.

Speaking of dumb terminals, RCA continues to offer used ASR-33 teleprinters for $300. These are pulled from service, and I have no idea what kind of shape any of them are in, but the price is comparable with most other reputable sources for these printers. This may make the ideal remote terminal for some systems or a low-cost printer for others.

Another TRS-80 interface is advertised by the Royal company. For $199 ($179 in cassette version), this disk program and interface will use an external demodulator to put a TRS-80 Model III or 4 on RTTY/CW/ASCII. Space is provided for stored buffers, split screen, diddle, and other features.

Finally, we come to Microfish, a creative name, which sells a cassette program for the VIC-20 to transmit RTTY in Murray and ASCII for $10.95. I presume an external TU is needed, but the price for the software sure sounds good!

Seven years ago, when I started this column, it was the rare advertiser who mentioned RTTY in an ad, much less took out a full-page spread to promote a product to our market. Times have sure changed! Next month, some more from me and you, here in RTTY Loop.

Companies Mentioned in this Month's Column

Radio Amateur Callbook, Inc.
925 Sherwood Drive, Box 247
Lake Bluff IL 60044

The Ham Shack
808 N. Main Street
Evansville IN 47711

Microlog Corporation
18713 Mooney Drive
Gaithersburg MD 20879

W. H. Nall Company
275 Lodgeview Drive
Oroville CA 95965

Macrotronics, Inc.
1125 N. Golden State Blvd.
Turlock CA 95380

MFJ Enterprises, Inc.
Box 494
Mississippi State MS 39762

Kantronics
1202 E. 23rd Street
Lawrence KS 66044

73 Magazine
PO Box 931
Farmingdale NY 11737

Contemporary Technology, Inc.
PO Box 1083
Salem OR 97308

DGM Electronics, Inc.
787 Briar Lane
Beloit WI 53511

Advanced Electronics Applications (AEA)
PO Box C-2160
Lynnwood WA 98036

J. H. Bell—RCA Service Company
Bldg 204-2, Route 38
Cherry Hill NJ 08358

Royal
407 Conkle Road
Hampton GA 30228

Microfish Software Products
PO Box 920342
Norcross GA 30092

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

HAMMING AROUND THE WORLD

Without doubt, amateur radio is a hobby unlike any other. While most pastimes are conducted in solitude or with a few close friends, ham radio is definitely a group activity. In fact, our hobby is one of few activities that just can't be conducted alone.

Unless sending code practice is your sole operating thrill, chances are you have dozens of ham friends. And if you hold a General-class ticket or higher, many of those friends are likely to reside overseas. Like no other hobby, amateur radio opens the door to worldwide communication and understanding. What a pity we so often waste this opportunity on meaningless signal reports and hollow chatter about the weather. Get rid of QSL cards and pass a law against the swapping of temperatures and I think we would have a much better hobby.

This month, FUN! takes a look at hamming around the world. It's time to discover what life is like at the end of that overseas microphone, key, or keyboard.

ELEMENT 1 TRUE-FALSE

	True	False
1) In Japan, a resident alien may obtain an amateur-radio operator's license but not a station license.	____	____
2) If you work a West German station with a "Z" suffix, you are communicating with a German Extra-class licensee.	____	____
3) In New Zealand, Field Day is held in February.	____	____
4) The callsigns LG5FL and SJ9WL both belong to the same station.	____	____
5) Bringing a radio into Greece, without the proper paperwork, can result in a $2500 fine and up to two years imprisonment.	____	____
6) In Hong Kong, a visitor's license costs $100.	____	____
7) Tim Chen BV2B is the only licensed amateur in the People's Republic of China.	____	____
8) Father Moran 9N1MM is the only active amateur in Tibet.	____	____

ELEMENT 2 SCRAMBLED WORDS

Unscramble the names of these countries:

NEWSED	JIIF
NAAPJ	LAPEN
BUCA	YTILA
NACFRE	AAISTRU
AAAILSTRU	LEBZIE

ELEMENT 3 MATCHING

Match the prefix to the correct country.

Column A	Column B
1) VU	A) Benin
2) YI	B) Argentina
3) 7X	C) Latvia
4) LU	D) Honduras
5) HR	E) Bangladesh
6) GW	F) Algeria
7) OX	G) Uzbek
8) UQ2	H) Sweden
9) SU	I) Iraq
10) GU	J) Wales
11) EP	K) Turkey
12) TY	L) India
13) PY	M) Venezuela
14) S2	N) Mexico
15) UI8	O) Brazil
16) TA	P) Egypt
17) 5N	Q) Iran
18) XE	R) Nigeria
19) YK	S) Greenland
20) YV	T) Syria
	U) Guernsey

ELEMENT 4 MATCHING

Column A	Column B
1) *Break-In*	A) Italy
2) *Radio Rivista*	B) United Kingdom
3) *Radio Communication*	C) United States
4) *73: Amateur Radio's Technical Journal*	D) Canada
5) *TCA*	E) New Zealand
	F) Spain

ELEMENT 5 MATCHING

Match the DX net to its frequency.

Column A	Column B
1) Forty-Meter DX Net	A) 7.270 MHz
2) Africana Net	B) 21.345 MHz
3) Arabian Christian Net	C) 21.355 MHz
4) Pacific International DX Net	D) 28.510 MHz
5) W7PHO Family Hour (15-meter version)	E) 21.280 MHz
6) W7PHO Family Hour (20-meter version)	F) 14.305 MHz
7) DX to DX Net	G) 14.225 MHz
8) 10-Meter DX Net	H) 14.265 MHz
9) P29JS DX Net	I) 14.265 MHz
10) Arabian Nights DX Net	J) 14.250 MHz
	K) 7.182 MHz

THE ANSWERS

Element 1:

1—True And he must notify the government before operating any station.

2—False Someone employed by the German Department of Telecommunications.

3—True Well, it's summer down there, I hope.

4—True The station is in a place called Morokullen, located on the border between Sweden and Norway. Morokullen, incidentally, means "fun" in both languages. You read it here first.

5—True Yeah, but those window bars make great radiators.

6—True In Hong Kong dollars, of course. That's $16 U.S.

7—False Only ham in Taiwan. On CW, he's BV2A.

8—False Other side of the mountain—Nepal.

Element 2:

(Reading from left to right): SWEDEN, FIJI, JAPAN, NEPAL, CUBA, ITALY, FRANCE, AUSTRIA, AUSTRALIA, BELIZE.

Element 3:

1 = L, 2 = I, 3 = F, 4 = B, 5 = D, 6 = J, 7 = S, 8 = C, 9 = P, 10 = U, 11 = O, 12 = A, 13 = O, 14 = E, 15 = G, 16 = K, 17 = R, 18 = N, 19 = T, 20 = M.

Element 4:

1 = E, 2 = A, 3 = B, 4 = C, 5 = D.

Element 5:

1 = K, 2 = C, 3 = F, 4 = H or I, 5 = B, 6 = G, 7 = E, 8 = D, 9 = H or I, 10 = J.

SCORING

Element 1:
Two points for each correct answer.
Element 2:
Two points for each country unscrambled.
Element 3:
Two points for each pair matched.
Element 4:
Two points for each pair matched.
Element 5:
Two points for each pair matched.

Are you a ham of the world?

1-20 points—Never traveled more than 25 miles from your QTH.
21-40 points—Once vacationed in Cedar Rapids, Iowa.
41-60 points—Know your way around a map.
61-80 points—A seasoned traveler.
81-100+ points—Home QTH is any DXpedition.

DR. DIGITAL

Robert Swirsky AF2M
412 Arbuckle Avenue
Cedarhurst NY 11516

DR. DIGITAL'S MAILBAG

Before we continue last month's discussion of dealing with sound using microcomputers, I am going to reach into the Dr. Digital mailbag and pass along some info I've received. Let me state once more: If you want a reply to your letter, please enclose a stamped, self-addressed envelope!

James J. Brown N2AXR asked about the 10-Ohm variable resistor in the VIC-20-to-ham-rig interface (September, 1983). Sorry about that, Jim—that was a misprint. It should have been a 1000-Ohm variable resistor. Actually, any small resistance variable pot will do; it serves to control the level so you don't drive the rig too hard.

For those of you who have TI-99/4A computers, you too can have cassette-port QSOs (see September, 1983, for details). Jim Ketcham KA4AFI tells me that his TI cassette port works fine through his 2-meter hand-held. Jim has been able to send and receive TI cassette-port data through his local repeater. He just has to time himself so the repeater doesn't try to identify during a data transmission!

It seems that the 1802 microprocessor still has a loyal following. Bob KC2WZ, WA2EGP, and K2ULR have been experimenting with this unique chip. Bob says that he "would like to see different makes of computers talk to each other." He also reports success transferring CoCo programs using the cassette port, although QRN has led to some transmission errors.

Atari computer owners would probably find the Atari Microcomputer Network useful. The net, organized by Jack McKirgan II WD8BNG, has a number of sections. Organization is as follows: National Net—14.325 at 1600Z, Sunday; Midwest Regional Net—7.235 at 1830Z, Sunday; West Coast Regional Net—7.235 at 11 am PST, Sunday; Southwest Regional Net—7.230 at 1800Z, Sunday; Pacific NW Regional Net—7.230 at 1800Z, Sunday; Southeast Regional Net—7.235 at 1800Z, Sunday; East Coast Regional Net—3.965 at 8 pm EST, Wednesday; International Net—21.4 at 2330Z, alternate Thursdays; Dayton, Ohio, Net—open channel on 146.445 simplex; Chicago Net—open channel on 147.570 simplex; Central Kentucky Net—145.45 repeat, 9 pm Wednesdays.

The Atari Microcomputer Network also puts out a very informative newsletter, *Ad Astra*. For more information on the newsletter or the net, write to Atari Microcomputer Network, Jack McKirgan II, 4749 S.R 207 NE, Washington Court House, Ohio 43160.

Joseph J. Fairclough WB2JKJ is doing something unusual with amateur radio and microcomputers: He's using them to help teach English. Joe has an amateur-radio station and a number of microcomputers set up in his classroom at Junior High School #22 in New York City. The high technology serves to create and maintain interest among the students. Using technical publications such as *73* as textbooks, the students in Joe's English class learn about writing. They compare writing styles, catch errors that the copy editors might have missed, and evaluate various publications. The computer and amateur-radio theme keeps the students interested and eager to learn. Joe's unique approach to teaching English has been very successful—he even received a letter from President Reagan congratulating him on the effectiveness of his curriculum.

SOUND: PART II

Last month, we discussed how to detect and measure sound with a computer. Now it's time to look at the other part of the problem—generating sound with a computer. For the purposes of this discussion, I'll divide computers into three classes: computers with no sound-generation hardware, computers with simple console speakers, and computers with separate sound-generating hardware. An example of the first class would be practically any business micro; the only way these can generate sound is through the terminal's beeper. The second type of computer would be the Apple II, Franklin, IBM PC, etc.; these computers have a speaker that can be controlled with software. Atari and VIC computers fall into the third category. These models incorporate circuitry dedicated to sound production. For example, the POKEY chip in the Atari computer can control up to 4 voices. It has a D/A converter, noise generator, and all sorts of options. The VIC computer works in a similar manner. DTMF

generation can be had with a few lines of simple software!

If you have a computer of the first class, don't despair. All you have to do is add an amplifier to one of the output lines of the parallel ports. (If you don't have a parallel port, then you can despair.) Be sure you put an attenuator between your parallel port and your amplifier—there is ±5 V coming out of the port. After you have this, you can consider your computer to be in the second class and use the software techniques that I will describe.

Apples and their relatives have built-in speakers. The speaker is mapped to a specific memory location. Accessing the location with a READ statement will cause the speaker to change state—the sound cone will move from "in" to "out" or vice versa. Note that on the Apple a WRITE to the speaker's location will cause the speaker to click. This is because a WRITE actually performs a READ before it executes.

Other computers with speakers, and those with an amplifier connected to a port, require an I/O statement to cause the speaker to click. The port's number must be determined (consult your hardware manual) and an assembly-language command, usually an OUT command, must be executed. For example, if you have a Z80-based system and have a speaker hooking you to the LSB (least significant bit) line of parallel port #1, the command OUT 1,A can be used to move the speaker's coil in and out. If there is a 1 in the accumulator, the speaker will move out. A zero brings it back in again.

Now that you have the ability to move a speaker in and out, the next step is generating a tone. To do this correctly, we must use assembly language. BASIC is too slow—only low buzzes can be generated under its control. (Some BASICs have built-in sound commands. These can be used, but they generally don't have too much flexibility.) Compiled languages are faster, but they don't allow direct control of the speaker. One doesn't know how long an instruction takes to execute. With assembly language, however, one can precisely determine timing delays. The program in last month's column demonstrated the cycle counting techniques.

The simplest program to generate sound would be (in a pseudo assembly language):

```
START   LOAD     SPEAKER,1
        CALL   DELAY
        BRANCH   START
```

The DELAY subroutine is time critical. It must produce a delay depending on the value of a register. For increased resolution, a 16-bit register should be used. On a computer with only 8-bit registers, a nested loop of two 8-bit index registers can serve the same function. See Listing 1 for a simple tone routine tor the Apple computer.

```
SOURCE FILE: TONE
----- NEXT OBJECT FILE NAME IS TONE.OBJ0
0302:                1          ORG  770
C030:                2 SPKR     EOU  $C030
0302:AD 30 C0        3 START    LDA  SPKR        ;READ THE SPEAKER LOCATION
0305:20 0B 03        4          JSR  DELAY       ;PAUSE FOR A MOMENT
030B:4C 02 03        5          JMP  START       ;GO BACK
030B:AE 00 03        6 DELAY    LDX  768
030E:CA              7 LOOP     DEX
030F:F0 06           8          BED  COBK
0311:0A              9          ASL  A           ;KILL SOME TIME
0312:0A             10          ASL  A
0313:0A             11          ASL  A
0314:4C 0E 03       12          JMP  LOOP
0317:60             13 GOBK     RTS
0318:               14 * I'LL LEAVE FREQUENCY DETERMINATION AS AN EXCERCISE
0318:               15 * FOR THE READER.
0318:               16 *
031S:               17 * THE VALUE IN LOCATION 770 CONTROLS
0318:               18 * THE PITCH OF THE TONE.
031B:               19 *
0318:               20 * PRESS RESET TO STOP THE TONE
0318:               21 *
0318:               22 * THE ROUTINE CAN BE STARTED FRON BASIC
0318:               23 * WITH A CALL 770 COMMAND.

*** SUCCESSFUL ASSEMBLY: NO ERRORS


 030B DELAY          0317 GOBK          030E LOOP          C030 SPKR
 0302 START


 0302 START          030B DELAY         030E LOOP          0317 GOBK
 C030 SPKR
```

Listing 1. Simple tone routine for the Apple.

The frequency of the tone generated can be easily computed as follows:

1) Determine the number of clock cycles that the delay routine takes to execute.

2) Add to this the number of cycles for the LOAD, CALL, and BRANCH statements.

3) Take the reciprocal of the computer's clock frequency in Hertz.

4) Multiply this by the total number of clock cycles for the tone routine.

5) Take the reciprocal of this product.

6) Multiply by 2 to get the frequency at which the speaker is oscillating.

Very accurate tone production is possible with this technique. Unfortunately, you are limited to a square wave (see Fig. 1).

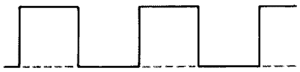


Fig. 1. The square wave.

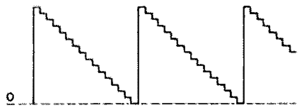


Fig. 2. Sawtooth wave approximated with the Atari POKEY chip.

The tone color of a square wave resembles that of a clarinet. It is not possible to generate complex waveforms, although it is possible to approximate them. As a matter of fact, dual tones and speech can be approximated using a square wave. In a later column, I'll discuss computer-generated speech and elaborate on computer-speech techniques.

Computers with sound hardware offer a great deal more flexibility. The Atari, for example, uses a custom chip. It is possible to have 4 tones with 8-bit resolution and to combine sound generators for higher resolution. Also, 16 amplitude levels are available, making it possible to generate a variety of waveforms (see Fig. 2). The waveforms aren't as pure as an analog wave, but they are reasonable approximations. Producing tones on the Atari is simply a matter of POKEing the correct values into the sound registers. Many things can be done directly from BASIC. Also, as the sound hardware is independent of the microprocessor, the sound can be playing as the program is running. It would be easy to use an Atari for any amateur-radio tone-generation task. SSTV, PL tones, and RTTY tones are three obvious examples.

Anyone experimenting with sound on the Atari computer should get a copy of the Atari *Technical Reference Notes*. This extensive manual gives the complete hardware description of the machine. It is a shame that Atari does not supply this information with the computers—you must buy it separately. I'm sure there are many Atari users out there who don't realize the sophistication of the Atari hardware. The documentation Atari supplies with their computers is useless.

Commodore's VIC and 64K computers have hardware similar to the Atari's. Sound generation is also done in hardware and many Atari programming techniques can be transferred to the Commodore line. VIC owners should have no trouble generating RTTY tones, slow-scan tones, or touch-tones with simple programs.

Next month, I'll have a listing of a DTMF generation program for the Atari. Also, I'll start to discuss computerized speech. I appreciate all the mail I have been receiving and will answer all letters if there is an SASE enclosed

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

CALENDAR

Dec 2–4	ARRL 160-Meter Contest
Dec 10–11	ARRL 10-Meter Contest
Jan 7	*73* 40-Meter World SSB Championship
Jan 8	*73* 75-Meter World SSB Championship
Jan 14–15	*73* 160-Meter World SSB Championship
Jan 14–15	Hunting Lions in the Air Contest
Feb 4–8	South Carolina QSO Party
Feb 11–12	Dutch PACC Contest
Feb 18–19	America Radio Club International DX Contest
Feb 18–19	YL-ISSB Commo System QSO Party—Phone
Feb 25	RTTY World Championship Contest
Mar 17–18	YL-ISSB Commo System QSO Party—CW
Mar 17–18	Bermuda Contest

ARRL 160-METER CONTEST
Starts: 2200 GMT December 2
Ends: 1600 GMT December 4

The object is for amateurs worldwide to exchange QSO information with W/VE amateurs on 1.8-MHz CW only. DX-to-DX QSOs are not permitted for contest credit. Operating categories include single operator and multi-operator (single transmitter only). Remember that W/VE stations may transmit only in the segments 1800–1825 and 1830–1850 kHz in conformance with the ARRL band plan. Please refrain from using the 1825–1830-kHz DX window.

EXCHANGE:

RST and ARRL section, DXCC country name, or ITU region (if maritime or aeronautical mobile).

SCORING:

Count 2 points per QSO with amateurs in an ARRL section. W/VE stations count 5 points for DX QSOs. Multiply QSO points by the total number of ARRL sections (74 max) and DXCC countries (W/VE stations only).

ENTRIES:

Official forms and logs are recommended and are available from ARRL headquarters for an SASE or 1 IRC. Logs must indicate time in GMT, call, and exchange. Multipliers should be clearly marked in the log the first time worked. Entries with more than 200 QSOs must include cross-check sheets. Entries must be postmarked by January 4 and addressed to ARRL, Newington CT 06111.

Certificates will be awarded to the top-scoring single operator in each ARRL section and DXCC country and to the top-scoring multi-operator stations in each ARRL division and continent. Usual ARRL conditions of entry and disqualifications apply.

ARRL 10-METER CONTEST
Starts: 0000 GMT December 10
Ends: 2400 GMT December 11

Contact as many stations as possible on the 28-MHz band using no more than 36 hours of the 48-hour contest period. Listening time counts as operating time! Entry categories include: single-operator mixed-mode (phone and CW), phone only, or CW only. Multi-operator class is for single transmitter, mixed-mode only.

No crossmode contacts are allowed. Mixed-mode single-operator and all multi-operator stations may work stations once on CW and once on SSB. One operator may not use more than one callsign from

any given location during the contest period. All entrants may transmit only one signal on the air at any given time.

EXCHANGE:

W/VE stations (including KH6/KL7) send RS(T) and state or province. DX stations send RS(T) and serial number starting with 001. Maritime and aeronautical mobile stations send RS(T) and ITU region (1, 2, 3). Novice and Technician stations sign /N or /T as appropriate.

SCORING:

Count 2 points per phone QSO, 4 points per CW QSO, and 8 points for QSOs with US Novice or Technician stations. Multiply the QSO points by the total number of US states, Canadian call areas, DXCC countries (except US and Canada), and ITU regions (maritime and aeronautical mobiles only).

ENTRIES:

Official logs and entry forms are recommended and are available from ARRL headquarters for an SASE or 2 IRCs. Logs must indicate time in GMT, mode, call, and exchange for each QSO. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs must include cross-check sheets. Entries must be postmarked by January 11 and addressed to ARRL, Newington CT 06111.

Certificates will be awarded to: the highest-scoring single-operator station in each category from each ARRL section and DXCC country; top multi-operator entries in each ARRL division and each continent; and additional entries as participation warrants. Usual ARRL entry conditions and disqualifications apply.

3RD ANNUAL 40-METER WORLD SSB CHAMPIONSHIP 0000Z to 2400Z January 7, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on 40-meter phone during the specified times of allowable operation. The same station may be worked once. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

OPERATOR CLASSES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the continental 48 United States and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contacts with W/VE stations located within the continental 48 United States and Canada. All other contacts score 10 points each. List points for each contact on your log sheet(s).

MULTIPLIERS:

1 multiplier point is earned for each US state, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the continental US and Canada).

FINAL SCORE:

Total QSO points times total multiplier points equals *claimed score.*

CONTEST ENTRIES:

Each entry must include a contest log, a dupe sheet, a contest summary, and multiplier checklist. We recommend that contestants send for a copy of the contest forms. Send an SASE to the contest address listed below.

CONTEST DEADLINE:

Each entry must be postmarked no later than February 12, 1984.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each operator class in each of the continental 48 United States, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms or to submit an entry, contact: 40-Meter Contest, Dennis Younker NE6I, 43261 Sixth Street East, Lancaster CA 93535.

BROWARD AMATEUR RADIO BULLETIN

NEWSLETTER OF THE MONTH

"Our immediate goal is to establish a viable, active, and properly trained Amateur Radio Emergency Service (ARES) for Broward County."

Those are the no-nonsense words of Peter Van WE4Q, editor of this month's winning newsletter, the *Broward Amateur Radio Bulletin.* And from the looks of it, Peter has the firepower to back him up—not the least of which is the club newsletter. Active public service is the focus for Broward County's amateurs. It takes the form of civil-defense preparedness, emergency communications, and the more mundane (but equally important) CW and theory classes.

The *Radio Bulletin* provides ample evidence of the Broward County hams' organizational abilities. For starters, the *Bulletin*'s front cover has a table of contents, and each area of interest has its own section. Other sources of information, such as the W5YI report, are cited in the news section.

Finally, the *Bulletin* is good-looking. It is printed in a pleasing combination of light-gold-colored paper and brown ink, giving it a handsome and somewhat formal appearance.

To enter your newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

RESULTS

1983 NEW JERSEY QSO PARTY

Top New Jersey Stations	
KC2ME	36,416
KX2W	34,068
W2XQ	22,440
WA2WJY (multi-op)	16,728
WA2UDT	14,850
KA2OIW	13,545
Top Out-of-State Stations	
N3DAY	3507
WA2WDT/3	1890
KA1ZX	1848
N1PL/1	1743
WB2IPX	1280
KA8IIN	1188
KK3V	1180
WA3UNX	1160

RESULTS

BERMUDA AMATEUR RADIO CONTEST 1983

UK	
G3UKS	256,500
Canada	
VE3JSZ	21,730
Bermuda	
VP9IX	1,001,160
VP9TAD*	294,480
W. Germany	
DL7OK	116,520
USA	
W1RR	157,750
W4HIR	27,690
K4FU	24,300
KA1CNI	16,300
KE1E	13,825
W1DO	12,960
WB2FSL	10,890
K3DH	10,850
K8PYD	10,260
N2BNC	9,200

*CW winner

3RD ANNUAL 75-METER WORLD SSB CHAMPIONSHIP 0000Z to 2400Z January 8, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on 75-meter phone during the specified times of allowable operation. The same station may be worked once. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

OPERATOR CLASSES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the continental 48 United States and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contacts with W/VE stations located within the continental 48 United States and Canada. All other contacts score 10 points each. List points for each contact on your log sheet(s).

MULTIPLIERS:

1 multiplier point is earned for each US state, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the continental US and Canada).

FINAL SCORE:

Total QSO points times total multiplier points equals *claimed score.*

CONTEST ENTRIES:

Each entry must include a contest log, a dupe sheet, a contest summary, and multiplier checklist. We recommend that contestants send for a copy of the contest forms. Send an SASE to the contest address listed below.

CONTEST DEADLINE:

Each entry must be postmarked no later than February 12, 1984.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each operator class in each of the continental 48 United States, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms or to submit an entry, contact: 75-Meter Contest, Jose A Castillo N4BAA, 1832 Highland Drive Amelia Island FL 32034.

5TH ANNUAL 160-METER WORLD SSB CHAMPIONSHIP
0000Z January 14, 1984 to 2400Z January 15, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal.

OBJECT:

To work as many stations as possible on 160-meter phone in a maximum of 32 hours allowable contest time. Multi-operator stations may operate the entire 48-hour contest period. Stations may be worked only once.

ENTRY CATEGORIES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the continental US and Canada transmit RS report and state or province/territory. All others transmit RS report and DX country.

POINTS:

5 QSO points for contact with W/VE stations contacted within the continental 48 United States and Canada. All other contacts earn 10 points each.

MULTIPLIERS:

1 multiplier point will be earned for each of the continental United States, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each of the Canadian provinces/territories (13 maximum), and each DX country outside the continental 48 United States and Canada.

FINAL SCORE:

Total QSO points times total multiplier points equals *claimed score.*

CONTEST ENTRIES:

Each entry must include log sheets, dupe sheet for 100 or more contacts, a contest summary, and a multiplier check sheet.

ENTRY DEADLINE:

All entries must be postmarked no later than February 19, 1984.

DX WINDOW:

Stations are expected to observe the DX window from 1.825-1.830 MHz as mutually agreed by top-band operators. Stations in the US and Canada are asked not to transmit in this 5-kHz segment of the band. During the contest, all W/VE stations are requested to utilize only those frequencies from 1.808-1.825 and 1.830-1.900 MHz.

DISQUALIFICATIONS:

Disqualification may result if a contestant omits any required entry form, operates in excess of legal power authorized for his/her given area, manipulates operating times to achieve a score advantage, or fails to omit duplicate contacts which reduce the overall score more than 2%. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each entry category in each of the continental United States, each Canadian province/territory, and each DX country. A minimum of 100 QSOs must be worked to qualify.

CONTEST ADDRESS:

To obtain information or entry forms (enclose an SASE) or to submit a contest entry, contact: 160-Meter Contest, Harry Arsenault K1PLR, 603 Powell Avenue, Erie PA 16505.

3RD ANNUAL RTTY WORLD CHAMPIONSHIP
0000Z to 2400Z February 25, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal and *The RTTY Journal.*

OPERATOR CLASSES:

(A) Single operator, single transmitter. (B) Multi-operator, single transmitter.

ENTRY CATEGORIES:

(A) Single band (B) Allband, 10-80 meters.

EXCHANGE:

Stations within the 48 continental United States and Canada must transmit RST and state or province/territory. All others must transmit RST and consecutive contact number.

MISCELLANEOUS RULES:

The same station may be worked once on each band. Crossmode contacts do not count. Single-operator stations may work 16 hours maximum, while multi-operator stations may operate the entire 24-hour period. Off times are *no less* than 30 minutes each and must be noted in your log(s).

QSO POINTS:

5 QSO points for contacts with W/VE stations located within the continental United States and Canada. 10 QSO points for all other contacts.

MULTIPLIER POINTS:

1 multiplier point is awarded for each of the 48 continental United States (a District of Columbia contact may be substituted for a Maryland multiplier), Canadian provinces/territories, and DX countries worked on each band (excluding US and Canada).

FINAL POINTS:

Total QSO points times total multipliers equals *claimed score.*

CONTEST ENTRIES:

Entries must include a *separate* log for each band, a dupe sheet, a summary sheet, a multiplier checklist, and a list of equipment used. Contestants are asked to send an SASE to the contest address for official forms.

ENTRY DEADLINE:

All entries must be postmarked no later than April 15, 1984.

DISQUALIFICATIONS:

Omission of the required entry forms, operating in excess of legal power, manipulating scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each entry category and operator class in each of the US call districts and Canadian provinces/territories, as well as in each DX country represented. Other awards may be issued at the discretion of the awards committee. A minimum of 25 QSOs must be worked to be eligible for awards.

CONTEST ADDRESS:

RTTY World Championship, c/o *The RTTY Journal*, PO Box RY, Cardiff CA 92007.

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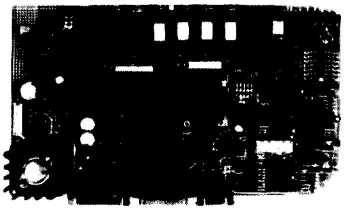

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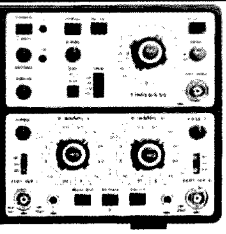

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W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 6

scriptions (surface mail) is $25 each.

Yes, I'm taking a beating at that rate, but I look at the bright side of it. With the apathy in amateur radio today, how many bucks can I lose? Maybe a dozen of you will probably have any feeling for how happy such a gift would make a foreign ham—particularly one behind the Iron Curtain where they can't subscribe even if they want to because they have Funny Money. I'm not worried.

GETTING INTO THE HAM BUSINESS

Just imagine if your ham shack was a business instead of a personal expense! Well, if you are one of the handful of people who managed to learn to both read and write in school, this blissful state might be achievable.

I got into the ham "business" some thirty years ago when my enthusiasm for amateur radioteletype got so out of hand that I started a monthly newsletter on the subject. This initially philanthropic effort quickly became commercial as the demand for the newsletter grew from the 400 I had envisioned to over 2,000. Philanthropy is fine—in moderation.

Suddenly I was in the newsletter business as a sideline, putting out a monthly publication. That meant I had to have an office in my home to type up the material, draft the diagrams, and take the photographs. It also meant that I could expense my ham purchases, now part of a part-time profitable business.

There are a number of ways to get into the ham business today, with the retailing of ham gear probably one of the very worst. Better to think in terms of writing articles for ham magazines such as this one. It was my RTTY column in *CQ* which leveraged me into the editor's chair there. And that paved the way for me to start *73* five years later.

What to write about? Good heavens! We need articles to encourage amateurs to get involved with new facets of the hobby. RTTY is still, even after all these years, in its infancy. There are dozens—no, hundreds—of needed RTTY articles. OSCAR is extremely underwritten. And the most desperately needed area of all for articles is ham clubs.

Clubs are the strength and the backbone of amateur radio. It's up to our clubs to get youngsters interested in the hobby. It's up to the clubs to have classes to train and license 'em. Clubs should have a wide range of activities to build up ham enthusiasm for the members. Meetings must be fun, even if they include some code practice, a theory discussion, a speaker, and a minimum of club business.

If every club meeting started with a short code-copying test at 10, 20, and 30 wpm, with a prize for the winners in each category, code might turn into being fun. Some members might even do a bit of practicing between meetings in order to get an edge.

DXers should have a chance to infect others with their particularly virulent sickness. Ditto contesters, certificate hunters, and all the other fanatics we breed. Club meetings are the best time to both enjoy and nurture these peculiarities.

There are so many exciting things going on in amateur radio that a writer should be able to turn out one or two articles a month. Some experienced writers look for amateurs who have built a small construction project. Obviously an article should be written, but more often than not, the builder is too busy, so he needs the help of a "professional."

Another area for making money in the hobby is the development of some small product or service which can be sold via mail order. Indeed, many of the larger firms in the ham business got started that way. Electrovoice got started in a garage. Apple, too, started in a garage. My publishing business started in a bedroom in Brooklyn.

Christmas has all sorts of possibilities. It's too late this year, but maybe if you get started planning some special ham Christmas cards or ham jewelry, you'll be ready for 1984.

All is not croissants with running a business in the home. Indeed, you can easily run up against the government bureaucracy with this. It seems that many cities have rather restrictive rules covering businesses in the home. A recent case in Chicago hit the papers when the city declared it illegal for people to use a personal computer in the home for business. And that would include writing articles for pay. If you have such a law in your town, perhaps it's time to get it changed.

Between amateur radio, security systems, and small computers, amateurs couldn't ask for better opportunities to get into small businesses.

POVERTY-STRICKEN HAMS

Now and then I get a letter from a reader whimpering about the price of a subscription or moaning about the high cost of ham gear these days.

As I read *Time* recently, I came across a big article on the bonanza in home protection. Ha! On at least two occasions I have editorialized at length on the opportunities for hams to get into this business. It's a natural for getting started in one's spare time and doesn't take much more than the average ham smarts.

Maybe a dozen hams have grabbed my lapels at hamfests to tell me that they took me seriously on this idea and have, as a result, done very well. Some of them have built up large businesses with dozens of employees—salesmen, installers, and so on.

It's an easy business to get into because there are several firms serving it with mail-order catalogs of the devices and information you need. Of course the business is getting ever more sophisticated, with radio alarms, slow-scan surveillance systems, and so on. That makes it a lot more fun than just putting in some switches, wires, and a big bell.

But the ham who wants to get into some sort of entrepreneurial business can find a wide variety of them where a knowledge of electricity and radio are a help. Some hams have set up television repair benches in their homes and make a very nice piece of change. It's a good cash business. Not a few have gotten into fixing microcomputers, and that could certainly develop into a huge business.

Some keep their eyes open for products which might be of particular interest to hams and be sold via mail-order ads in the ham magazines. Mail order is a clean, fun business. You're your own boss (unless it gets too successful) and it takes almost nothing to get started.

The growth of technology is opening more and more small-business opportunities all the time. But you have to keep your eyes and mind open to spot them. If your eyes are on your TV set, with a six pack and a bag of Doritos at hand, you're going to spend much of your life grumbling about not having *enough* money.

Computers are complicated, but if you passed your ham license honestly, you're halfway along toward understanding them. There are so many opportunities in the micro field that it is shameful. For instance, maybe you don't know it, but there are, even at this late date, virtually no manufacturer's reps in this field. That's right, there are over 450 manufacturers of microcomputers, all desperate for reps, and absolutely none are available. That's a need for over 6,000 reps right off the top.

What does a rep do? A rep acts as an area salesperson for a manufacturer. He goes to the factory for training on the product and its sales. Then it means getting his butt into every store selling computers in his area—which could be fairly large, if he can handle it.

Does it pay? Well, I have known a lot of reps and most of them used to drive Cadillacs. Now they're more into BMWs and Mercedes. You bet it pays. 10 percent is the norm. Heck, if you only have around twenty stores you cover and each sells only one of your computers a week, figuring the wholesale price around $2,500, that brings you a tidy $21,650 a month. Golly, that would even cover your gas costs, eh? A real hustler can obviously do a lot better than

that if the product is good and the factory support is first rate.

Maybe you aren't looking for the big bucks. Okay, in addition to those 450 micro manufacturers, there are another 2,000 manufacturers of support products—accessories, software, and information. Every one of these is an opportunity. Of course most reps take on a bunch of small non-competing products as well as a major. After all, once you're in the store, the hard part is over. And one good seller will make it a lot easier to write orders for other products.

Another nice home business is gathering information and putting it on a computer as a data base. We are coming to a time when we are going to be able to find just about any information we want via the telephone and a computer. I may want to know how many PBX systems there are when I am contemplating a new product. Okay, I'll be able to dial up a service somewhere which will tell me where to find that data, and then I'll dial up the data. I'll be able to get it in seconds.

Now is the time to start researching and entering this data. How many businesses in America have bought office copiers? How many firms are making modems and who are they? Data is increasing in value, so if you pick out some niche of your own and start your data base, you'll eventually have a marketable product.

It's a frame of mind. Everywhere I look I see opportunities for new and profitable businesses. I'm putting together teams to start at least a dozen right now and some of them have the potential for growing into whole industries. Other people can't find anything to do. If I had another 200 hours a week available, it wouldn't be enough.

Even so, I still get on the air an hour or so a week. That short schedule doesn't give me the time it takes to do an effective job of DX-hunting, but then what a silly way to waste a lifetime! I get my share of DX, but mostly I just sit and chat, often finding some extremely interesting people to talk with. Like the chap who designs fountains. Now it really never occurred to me that there were people who spent their professional lives designing fountains. There are, and one's a ham.

Of course you have to ask about a little more than what rig your contact is using—with all due respect to the manufacturers, who the hell cares? Or wonder about the weather, which most of us have all the time. What's he do? What's he interested in? There's where things could get interesting.

Getting back to making money, it's only your not taking the trouble to think about it and do something which is in the way. It's out there—lots of it. And on almost any pretext, people will thrust it at you.

The people who really have it made when it comes to making extra income are the retired! They have time and a half on their hands and a lifetime of experience available. There are probably dozens of firms around which would be interested in getting work done at home on a contract basis.

The retiree who was in advertising can get any quantity of work he can handle. If the person has learned to write, there are needs for writing about nearby interesting people, activities, and so on. Radio stations need part-time writers. Newspapers ditto. Companies need spec sheets, promotions, and so on. It's endless. Few of us manage to get through a lifetime of work without developing some marketable skills. So market them.

Now and then I hear someone complaining that there are no openings in his area. Balderdash! If you have a skill that a firm needs, you make the opening, you don't wait for it. Oh, this takes a bit of research to find some of the weaknesses of the desired firm that you might be able to help with. But if you come to them and point out the reasons why they can't afford not to hire you, no opening is needed.

There are certain skills which are of lifelong value. Salesmanship is one, and it's not that difficult to learn. My firm needs maybe 50 more salespersons. We've been scouring the woods of New Hampshire for months looking for non-smoking salespeople. Bookkeeping is another road to the gold.

No painter, electrician, plumber, carpenter, or so on will ever be short of work in this part of the country. The paint peels off the houses as fast as you put it on. The pipes freeze every winter. The wiring gets gnawed by mice. And zillions of shelves, new porches, repairs to clapboard, and so forth are needed. The retiree with skills can get work any time.

So let's stop with this nonsense about ham gear being expensive. Baloney, it's a fantastic bargain compared to fifty years ago—even twenty years ago. And magazine subscriptions are a steal. Lookie here, your damned five-cent ice cream cones of a few years ago are a buck now. Your lousy 37-cent cover price magazine should, by the same token, be around $7.40 instead of a crummy $2.495. Stop whining.

Subscriptions that were $3 back then should be around $60 now and they're a miserly $19.97, so what's the beef? And you get a whole lot more magazine for your money to boot.

A LOOK AT PIRATES

Bootleggers, as we used to call them in the early days of amateur radio—pirates today, or "Slim" as some DXers log 'em in—have been with us since the very beginning. In fact, those of you who have been reading *73* for a while will remember that the first transatlantic ham contact was made by a pirate! That's right, we've never found out who made that first big one!

Now that it's so incredibly simple to get a Novice license, we don't have the number of beginner ham pirates we used to. The first ticket used to be about equivalent to our Advanced-class license, a fact which encouraged newcomers to get their code practice on the air. Remember too that about 90 percent of all ham contacts in those days were on CW.

That heavy percentage of CW contacts may help to explain to some newcomers (those of you licensed after WWII) why so many old-time hams are so bound up with the importance of The Code. It really was, at one time, important, and old ideas die hard.

My own stratagem, back in 1938, was to pick a call which likely had been issued but which had not yet come out in the *Callbook*. Yep, the *Callbook* was around then, too. There was all the fun of making contacts and talking with people, with the only serious loss being the QSL card. I hung out on 40m, along with about 75 percent of all hamdom. That was the big band in those days. Of course, that was before foreign broadcasting moved in. And it was before the phone ops rose up against the ARRL, formed the National Amateur Radio Council, and got the FCC to okay a 40m ham phone band over the battered body of the ARRL, which really took a beating at the time.

Nope, 40m was a CW band, pure and simple. Everyone, and I mean everyone, was crystal-controlled, since this was before the Invention of the vfo. It was different from today and it was certainly fun. But we can't bring back the old days, we can just remember them.

During the heat of the CB craze when more and more of them were buying sideband rigs and slipping up above the legal channels, there was hysteria in the ham ranks that these turkeys would move into 10m and take over. I tried to reason with these Chicken Littles, but the League was sending their HQ professionals to hamfests preaching panic. The feared invasion never came off, of course.

The CB magazines could have raised hell with us if they had let their readers know the real situation. The fact is that amateur radio has virtually no defense against pirates these days.

In ye olden days, there was the terror of the Radio Inspector. That was followed after 1932 and the formation of the FCC by the fear that an FCC van would pull up in front of your home and an inspector would demand entrance, arrest you, and confiscate your equipment. This did, on rare occasions, happen, so it wasn't a totally unfounded fear.

The situation today is completely different. Sure, we still have laws requiring licenses to operate, but we have an FCC which has been slowly emasculated by laws protecting the guilty and a decreasing amount of money with which to work.

The ham bands are the best policed of any radio service as a result of our own self-policing. Thus the few FCC monitoring stations left seldom bother to even tune a ham band, much less sit there taking bearings on potential pirates and trying to track 'em down. Sending pink slips to erring hams doesn't make money, so it doesn't happen much.

A pirate really has to cause a lot of trouble before the FCC can get any action. Of course if the person has gotten a CB license,

then he's meat for the FCC grinder if he ventures onto the ham bands and actually gets caught red-handed.

About the only thing we have going for us to keep the pirates off our bands is their ignorance. Anyone with a good knowledge of amateur operating could make contacts for years, working DX, working through repeaters, and so on. Who's to know except a QSL bureau somewhere?

Of course getting certificates might present some problems, but then there are obviously going to have to be some sacrifices made by people wanting to avoid even the Bash instant memory system of getting a ham license.

Successful pirates have to change calls periodically, be evasive when talking about personal matters, and not be too blatant about their antennas. Local hams might eventually get curious if a 100-foot tower with a four-element 20m full-sized beam is swinging around their neighborhood.

Other than by a gross unfamiliarity with operating, there is virtually no way to spot 2m mobile pirates. There are so many operators there without even a vague understanding of theory, so a profound ignorance of electronics would never be discovered.

Then we get to the never-never land of marine operating. Once away from land and out of the fiendish clutches of the FCC, who is going to say boo about using the ham bands? This is why such a high percentage of the marine ham stations are pirates. The ITU, from whence all this stems, has no real laws, no police, no monitoring, and very little influence.

Then there are hundreds of religious groups in smaller countries who use the ham bands to keep in touch with each other. Many have even been issued ham calls. These are legal pirates, sort of.

I haven't even hinted at the fun that many licensed hams have by using bogus DX calls. I watched a K2 one time sign a very badly needed DX call in order to see if his rig was working out. It was and the pileup lasted for two hours just from his one CQ while he sat back and guffawed.

There are some hams who point out that if it weren't for an occasional lark like this, the DX chasers would go stir crazy. They need an occasional panic like that to keep fit. And remember the old DX-chaser adage —take no chances; if it sounds like a pirate, work it as fast as you can, just in case it isn't. Work 'em first and ask questions later.

Which brings to mind the antics of several of our more revered DXpeditioners. Like the chap who sat in a hotel in Casablanca and signed the calls of several very rare nearby African countries, making everyone happy. His cards counted for those countries, naturally. Once he paved the way, another DXer did the same thing from Mauritania, and I have his cards from a half dozen countries to prove it.

Those adventures brought on Mr. Big of DXpeditions. I don't know that he was ever at any time in the country he claimed, and I do know of one operation where he was 12,000 miles from where he said. And, yes, most of his QSL cards count for ARRL awards. Now that's pirating on a grand scale. This chap bragged that he was making over $50,000 tax free a year just from DXer donations and I have no reason to disbelieve him.

The drug business in Colombia and other South American countries has leaned heavily on amateur radio. The equipment is cheap. It's available with no questions asked in any quantities. The ham bands are, for the most part, fairly quiet outside of the US and Japan. And 2m—my, oh, my, a wasteland in many areas of the world. So these chaps buy HTs in large numbers, repeaters, the works.

Of course, I can understand the dealer's problem. How can he tell that it isn't a ham buying the equipment? The fact that the chap knows nothing about what he is buying is certainly no clue, right? But when he pulls out a six-inch roll of hundred dollar bills to buy 25 HTs and a repeater, one might expect some hint of question to arise. It should get even more curious when the chap doesn't demand a 20 percent discount but is satisfied to pay the retail price. There was a ham who did that once, but he died.

Are we okay on pirates now?

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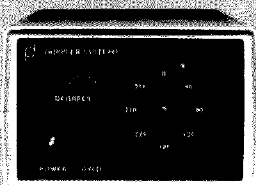

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SATELLITES

Amateur Satellite Reference Orbits

Date	OSCAR 8 UTC	OSCAR 8 EQX	RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
Dec 1	0126	111	0048	190	0126	206	0102	196	0052	190	1
2	0130	112	0043	190	0111	204	0052	195	0050	191	2
3	0135	113	0037	191	0055	201	0042	195	0047	191	3
4	0139	114	0032	191	0040	199	0033	194	0044	192	4
5	0000	90	0027	191	0024	197	8023	193	0041	193	5
6	0004	91	0021	191	0009	194	0013	192	0038	194	6
7	0009	92	0016	191	0152	222	0004	191	0035	195	7
8	0013	93	0011	192	0137	220	0153	220	0033	195	8
9	0017	94	0005	192	0122	217	0144	219	0030	196	9
10	0022	95	0000	192	0106	215	0134	218	0027	197	10
11	0026	96	0154	222	0051	213	0124	217	0024	198	11
12	0031	97	0149	222	0035	210	0115	216	0021	199	12
13	0035	99	0144	223	0020	208	0105	216	0018	200	13
14	0039	100	0138	223	0005	206	0055	215	0016	200	14
15	0044	101	0133	223	0148	233	0046	214	0013	201	15
16	0048	102	0127	223	0132	231	0036	213	0010	202	16
17	0052	103	0122	223	0117	228	0026	212	0007	203	17
18	0057	104	0117	224	0102	226	0017	211	0004	204	18
19	0101	105	0111	224	0046	224	0007	210	0001	204	19
20	0105	106	0106	224	0031	221	0157	239	0158	235	20
21	0110	108	0101	224	0015	219	0147	238	0155	236	21
22	0114	109	0055	224	0000	217	0137	238	0153	237	22
23	0118	110	0050	224	0143	244	0128	237	0150	238	23
24	0123	111	0045	225	0128	242	0118	236	0147	239	24
25	0127	112	0039	225	0112	240	0108	235	0144	239	25
26	0131	113	0034	225	0057	237	0059	234	0141	240	26
27	0136	114	0029	225	0042	235	0049	233	0138	241	27
28	0140	115	0023	225	0026	233	0039	232	0136	242	28
29	0001	91	0018	226	0011	230	0030	231	0133	243	29
30	0005	92	0013	226	0154	258	0020	230	0130	244	30
31	0010	93	0007	226	0139	255	0010	229	0127	244	31
Jan 1	0014	94	0002	226	0123	253	0001	229	0124	245	1
2	0018	95	0156	256	0108	251	0150	258	0121	246	2
3	0023	96	0151	257	0052	248	0141	257	0119	247	3
4	0027	97	0146	257	0037	246	0131	256	0116	248	4
5	0031	98	0140	257	0022	244	0121	255	0113	248	5
6	0036	100	0135	257	0006	241	0112	254	0110	249	6
7	0040	101	0130	257	0150	269	0102	253	0107	250	7
8	0044	102	0124	258	0134	267	0052	252	0104	251	8
9	0049	103	0119	258	0119	264	0043	251	0102	252	9
10	0053	104	0113	258	0103	262	0033	251	0059	252	10
11	0057	105	0108	258	0048	260	0023	250	0056	253	11

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TS-830S, VFO-230, $850; Azden PCS-4000, SS-32 tone generator, $255; Heath HW-2036A, TT mike, PS, $145; MFJ-949 tuner, $80; MFJ-484 Grandmaster keyer, $80; Heath bench VTVM, $40. All excellent; manuals. Les Kalmus K2SHL, 257 Central Park West, New York NY 10024; (212)-877-2735. BNB014

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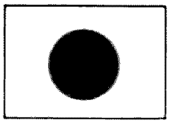
73 INTERNATIONAL

from page 92



JAPAN

Roy Waite W9PQN
Tomigaya Grand-301, 2-19-5 Tomigaya
Shibuya-Ku
Tokyo 151
Japan

AKIHABARA—PARADISE IN JAPAN

Any ham who has been to Tokyo knows about it—and probably will never forget it. Wives hate it. Anyone suffering from claustrophobia wouldn't want to go near it. But hams, and even a lot of non-hams (poor unfortunates, they are), love it and don't ever want to leave it after they get there.

What is it? It's Akihabara, pronounced "awe-key-ha-bar-a," a district of Tokyo in the northeast corner of Chiyoda ward, only 15 minutes by taxi from the center of the city. Akihabara is the electronics center of Japan, and probably of the world. It has to be seen to be believed.

There are more than 500 retail electronics shops here, offering everything currently on the electric and electronics market, including televison receivers, video recorders, tape recorders, computers, home appliances, stereo equipment, *ad infinitum*, and, of course, ham gear and parts of every description imaginable. Lots and lots of parts. It is truly mind-boggling. Even if you are not a builder, you will wish you were and maybe then and there will decide to become one.

Little stalls underneath the train tracks specialize: Several sell only knobs, another only wire, or transistors, or resistors, or transformers; one shop sells only pilot lights; another sells only aluminum chassis, boxes, and sheet aluminum. And as you walk along, you begin to notice shops that are clones of those you saw moments ago. If you couldn't find the right microphone you wanted at one shop, you can try another, and another. Is it any wonder that wives hate it? Of course, if your wife is also a ham, you'll both be broke before the day is over!

Saturdays and Sundays are the busiest days in Akihabara. Some stores close on Mondays, Wednesdays, or Thursdays.

Before the war, Akihabara was the bicycle center of Tokyo, but when the great war machine was switched on, materials became scarce and bicycle production was discontinued. After the war, a black market initially took over the district. The area did so well that electronics shops scattered around the city took note and decided to move in to take avantage of the big crowds milling around the district. That's when Akihabara began to take shape. As the economy improved, the black-market business began to fade somewhat while the electronics shops began to flourish. One by one they came, and they now dominate the area.

Daily, about 100,000 people shop here, including about 1,000 "foreigners." Many of the shops open at 10:00 am and close at 7:00 pm, so it's good to get an early start. Ham shops are not hard to locate. All you have to do is look up on the roofs for ham antenna arrays (some are magnificent!) and you've got it. Some of the stores will offer as much as 20% off list prices, but there are a few points to be careful about. First of all, the major manufacturers of ham equipment try to protect their dealers overseas. They would prefer that you buy equipment in your own country. If you buy it here, thus saving on shipping costs, the warranty may not be valid back home. Also, you'll play hell trying to get a manual in English. And the voltage here in Japan is 100, so you had better be sure that there is a 110-volt tap on the transformer. Most shops are reluctant to connect the 110-volt tap for you, so you may have to do it yourself when you get home.

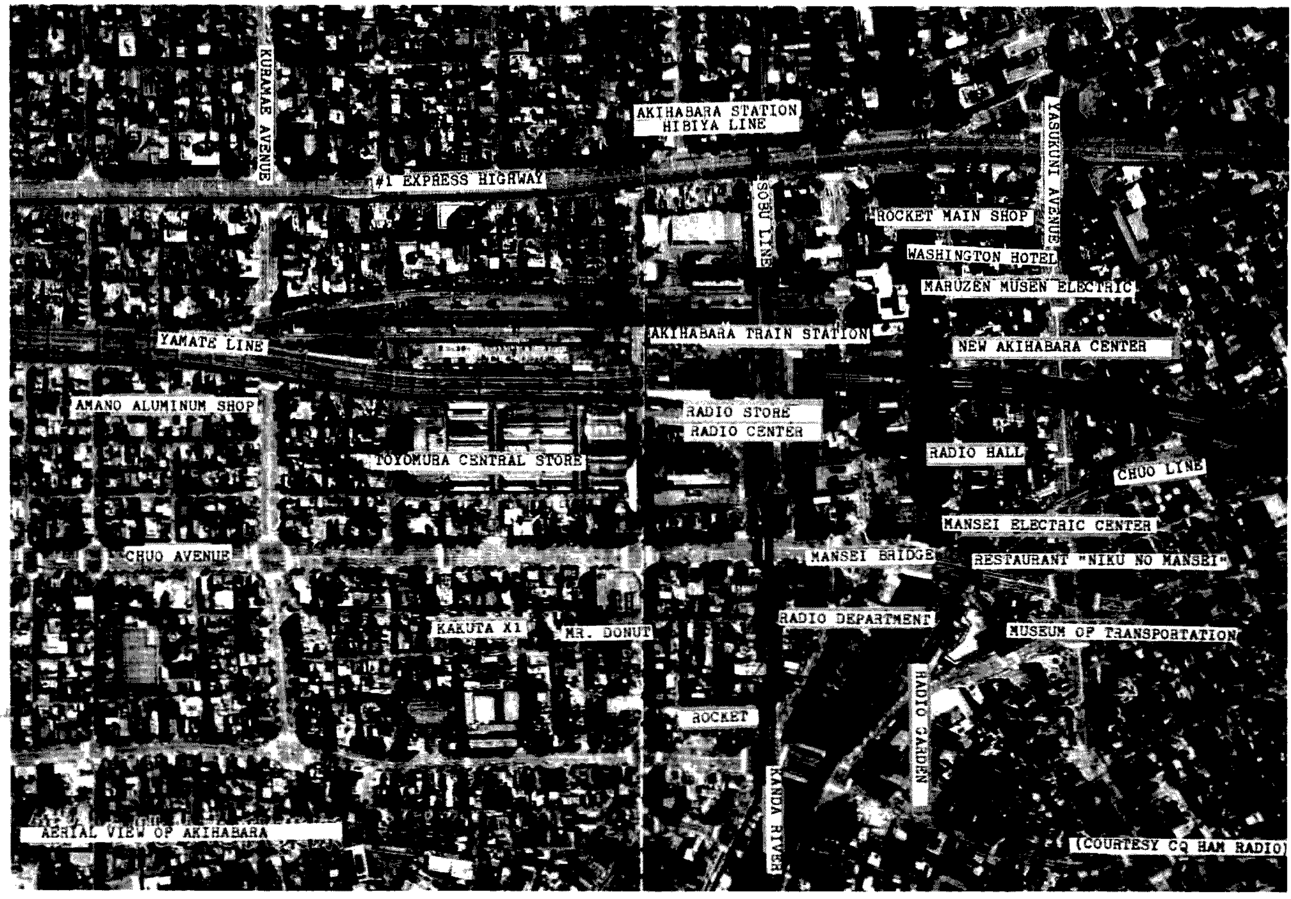
There are other pitfalls, too. The 2-meter rigs sold for use in Japan cover only 144 and 145 MHz. They are capable of operating on the full band, but you may have to make the modification yourself.

A further complicating problem is that most Japanese are not good in English, even though they will try hard to understand you. If anything really complicated comes up, you may come face to face with one of the most baffling language barriers you've ever encountered. If you can arrange it, it is best to visit Akihabara with a Japanese ham friend who speaks English or a professional interpreter, if you can afford it.

Not to be overlooked in Akihabara are the stores dealing in other electrical goods such as TVs, stereos, etc. For this purpose you will see signs displaying "Tax Free Shop," and those shops always have English-speaking people. Here you will find export models for almost everything (except ham gear). Some items will be cheaper than if purchased at "ordinary" shops, as you will be exempt from taxes. Japan does not have sales taxes as we do, but there are certain taxes that are built into the prices of certain items.

Be sure to carry your passport, since you will need it to prove that you are entitled to the tax exemption. Another reason, besides somewhat lower prices, for shopping at the tax-free shops is that they are familiar with the correct voltages and frequencies of each country. For instance, the Japanese FM broadcast band is from 76 through 90 MHz, so if you bought an FM radio in a store not selling export models, you would be stuck with a problem when you tried to use it in the US. There also are problems related to cycles, as half of Japan is on 50 cycles and the other half on 60.

If the sole purpose of your trip to Japan is to immerse yourself totally in electronics, then I would suggest you check into the Washington Hotel, right smack in the middle of Akihabara. No, George Washington hasn't slept here, but if he



Aerial view of Akihabara. (Courtesy of CQ Ham Radio)

Akihabara specialty stores. (Courtesy of CQ Ham Radio*)*

had, he wouldn't have been disappointed. It is not a large hotel, but it is brand spanking new and sparkles inside. Among the conveniences of this hotel you will find a steak house and a coffee shop that serves excellent French pastries.

Apart from the Washington Hotel, there is also a restaurant called Niku-no-Mansei right at the edge of Akihabara, serving delicious steaks, hamburgers, and sukiyaki, and the prices are right! Shopping can be tiring, especially in a crowded city like Tokyo, so you will welcome a place to relax for awhile. Another place worth knowing about is Mister Donut, a branch of the US chain right in the middle of Akihabara, where you can get a cup of coffee and a donut, making your choice from over 30 different varieties. Your feet, not to mention your stomach, will be glad you came.

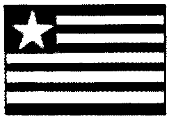
Back to ham-radio stores. There were about 20 at last count, but that number contracts and expands as conditions dictate. Some of the names to remember are Tomihisa, Rocket, Toyomura, and Tsukumo. Some have an occasional English-speaking clerk. For instance, at the moment, Rocket Radio has a Mr. Suzuki who can manage in English quite well. And, incidentally, Toyomura is the only store that deals solely in ham-radio equipment. All the others have branches dealing in electrical applicances, with ham radio only an afterthought.

I won't bore you here with all the details of traveling within Tokyo to get to Akihabara except to say that Akihabara is well served by trains and subways. The center of Akihabara is actually a large train station serving several lines. The subway lines are the Hibiya line and the Ginza line. Best bet is to get one of those subway and train maps that are provided free of charge at the front desk of your hotel. And you can always take a taxi, which would run not more than the yen equivalent of $5 from almost anywhere in Tokyo.

One point which should be made here is that if you do purchase a tax-free item at one of the tax-free stores, the shop clerk will put something in your passport to indicate such. Upon departing Japan, you will be required to show the merchandise that you bought as evidence that you haven't sold it at a profit. Therefore, do not pack your purchases in your luggage. Have them in your hand. Otherwise, you could be slapped with an unpleasant tax.

If you would like current information on stores, locations, and phone numbers, a good idea would be to call the Tokyo International Amateur Radio Association (TIARA) for current information. Call 947-8221 and ask for Yutaka Kasahara (JA1CLN) in the daytime, or at night call 585-2236 and ask for Joe Speroni (AHØA).

Have fun.



LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Republic of Liberia

The Ministry of Post and Telecommunications and the Ministry of Transportation jointly celebrated World Communications Year with a seminar held at the University of Liberia. The seminar lasted two days. Papers presenting in-depth studies of conditions as they exist in Liberia were read and discussed.

And the amateurs were there.

The amateurs presented a paper discussing the international character of amateur radio and tried to impress the audience with the idea that the development of amateur radio in Liberia would be advantageous to the nation in many ways. The paper presented international amateur radio as the greatest self-supporting and free community service in the world.

Two aspects of this activity of service were given as examples. It was pointed out first of all that in time of real disaster, it is the amateurs who come through and set up emergency communications, sometimes within hours. The well-known story of the amateurs at work at the time of the earthquake and resultant tidal wave in Alaska was recalled. Then the story, perhaps better known in Liberia, of the Great Lhasa Fever Epidemic was related.

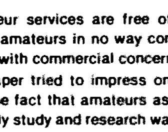
The work of amateurs in time of emergency is so important that other examples really are not needed, but amateurs are not idle when no emergency situation exists. The paper pointed out that in normal day-to-day activity, the amateurs are out there running phone patches for servicemen, furnishing communication for parades, and doing legwork for things like collecting funds for the American Cancer Society. The Red Cross also routinely utilizes the services of amateurs.

It was pointed out that amateur radio is completely noncommercial, and this aspect was developed for the benefit of the audience. The fact was stressed that all amateur services are free of charge and that amateurs in no way compete or interfere with commercial concerns.

The paper tried to impress on the audience the fact that amateurs as a group constantly study and research ways of improving communication. It stated that their record of achievements and contributions in this area are impressive.

Lastly, the friendship developed by amateurs in different countries of the world was mentioned to illustrate the fact that amateur radio promotes understanding between nations. The impact is small, but it is there. The paper made much of the fact that by and large, amateurs are really a great group of people. They are patient, considerate, and polite. They are law-abiding and, to a great extent, monitor themselves. They help each other and others. Any amateur, I think, could recite a long list of instances to illustrate these facts.

Along with the presentation of the paper, an actual amateur-radio station was set up and operated before the whole assembly. Conditions were not the best, but about six contacts were made.



MEXICO

Mark K. Toutjian XE1KMT
Apartado Postal 42-048
06470 Mexico, D.F.

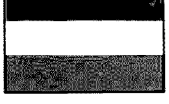
I recently received a letter from Pablo A. Mooser XE1SR, president of the Mexican League of Radio Experimenters (something like the ARRL), congratulating me for the Mexico column in "*73* International." He is the author of various Spanish publications for the League and to the benefit of all Spanish-speaking hams. I was also happy to have received his informative letter with up-to-date information for the Mexico column.

At present, there are 3,240 licensed hams in this country and a total of 65 official radio clubs that are actively promoting interest in ham-related events such as communications experiments by satellite and communications via moonbounce. New licenses are constantly being authorized when individuals pass exams, which include theory, regulations, and Morse code (depending upon the type of license that is solicited). Classes are given for newcomers, dealing with theory and Morse code. It's a special occasion for local clubs to have new licensed members.

During July of this year, the Saltillo (a city in the state of Coahuila) Radio Experimenters Club celebrated its 50th anniversary. This particular radio club is considered the senior member of the Mexican League since it was the first that joined the country's Radio Experimenters League. It was a special occasion for hams nationwide. During the first ceremony of this 50th national meeting of ham-radio operators, the Aztec Diploma was awarded to Jose Luis Jimenez XE1BBF for his outstanding peformance within Mexican ham-radio operations during the past 25 years. Furthermore, the Golden Aztec Award was presented to Fernando Loyola Urquiza XE1FL, Luis Alvarez Urquiza XE1YO, and Juan Lobo y Lobo XE1A for having accomplished 50 years as ham-radio operators and in honor of their outstanding performances over the years in their support of Mexican ham radio.

Ham radio got its start in Mexico in 1926. At present, I am accumulating information pertinent to its history, with the aid of President Pablo A. Mooser, who has kindly offered to provide this and other data.

At present, I'm working on improving my own station, XE1MKT. The tower is being built and I'm purchasing the Hy-Gain TH7DX antenna. I use the Kenwood TS-13-0S barefoot. Look for me on 40-10 meters. You can find me usually around 14.307 MHz or 21.375 MHz, Wednesdays and Sundays. I'd be more than happy to answer your questions with regards to visiting Mexico and keep you informed of current events here in Mexico. Maybe with the new antenna, I'll get a better signal to you! *Saludos* from Mexico. *73* and happy DXing!



THE NETHERLANDS

H. J. G. Meerman PDØDDV
Zandvoorterweg 33
211 GR Aerdenhout
The Netherlands

THE NBTVA

Do you remember the old televisions with mirror drums and Nipkov disks? The NBTVA (Narrow Bandwidth Television Association) is a club with active members who still use and develop the old low-defi-

Pieter Takens PA3BSR.

nition television system and have their own newsletter. They use homemade cameras and homemade monitors. They have also their professional standards, so that recorded pictures can be exchanged and can be transmitted (if allowed by PTT). Let me give you a sample of the capacities of the system.

Here are the NBTV standards: Lines number 32, scanned vertically upwards; picture repetition frequency—12.5 Hz, scanned right to left; line frequency—400 Hz (32 × 12.5); picture format—3 units vertical by 2 units horizontal; sync pulses (line frequency)—about 5% of the line-duration black.

The picture is basically restricted to close-ups, like a moving passport photograph. For long shots, the definition is too low. Many among you will say, what is the use of a system like this when in today's world you can buy full-color cameras and excellent TV sets and monitors!

Remember well that the practical use is very low; the main reason for building an NBTV camera and monitor is the excitement of using old techniques and to get a picture on the screen with only the very simplest and very basic methods.

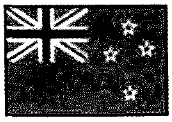
It can easily be explained how the whole thing works. Most of the equipment used at present is based on the Nipkov disk. A Nipkov disk is a thin circular sheet of aluminum with a regular spiral of holes. This disk is rotated on a horizontal axis by a constant-speed motor. In front of the disk there is a lens to focus the image. Behind the disk, there is a photomultiplier or another photosensor. A simple receiver has a similar disk and a motor with accurate speed control and also a modulated light source, replacing the camera's photomultiplier. A large viewing lens replaces the camera lens.

If you're interested in NBTV, the membership of this British/Dutch club is open worldwide. The annual subscription is DFL.11 for Dutch members. Overseas subscription rates on request. Addresses for information: Treasurer: Mr. S. Kujawinski, 54 Park Drive, Hucknall, Nottingham NG15 7IU, United Kingdom; Chairman: Mr. D. B. Pitt, 1 Burnwood Drive, Wollston, Nottingham, United Kingdom; Mr. A. Meyer, 'sGravenpoldersestraat 24, 4433 AH Hoedekenskerke, The Netherlands.

VHF FM ACTIVITY

The photo shows Pieter Takens PA3BSR, who is making a two-way radio contact on the 11th of July on Het Kopje van Bloemendaal, which is said to be the highest dune-top of the Netherlands. It is located near Pieter's QTH and is about 50 meters above sea level. On this spot you have a marvelous view overlooking the city of Haarlem and a part of the North Sea. Amateurs come often from miles around to take advantage of the height of the hill, located about 20 kilometers west of Amsterdam and 5 kilometers from the Dutch coast.

At the time that this photo was taken, Pieter was making a QSO with G6MOP located in Long Sutton, Norfolk (United Kingdom). The hand-held Pieter was using is a converted Storno HT with an output of 350 mW on two meters. The distance covered was 300 km! No wonder hams often go there.



NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

RECIPROCAL LICENSING IN ZL

Countries having reciprocal license agreements with New Zealand are the Netherlands, Sweden, the United States of America, France, and Switzerland. Other countries which New Zealand has amateur-certificate recognition with are Australia, Botswana, Canada, Cook Islands, the Republic of Ireland, Papua New Guinea, Niue, the United Kingdom, and Zimbabwe.

A visitor to ZL-land from any of the above countries may obtain a visitor's license valid for 14 days by presenting a copy of his amateur certificate, his current license, and a receipt for annual fees to any of the Radio Inspector's Offices of the Regional or District Engineer's Offices of the New Zealand Post Office at Whangarei, Auckland, Hamilton, Rotorua, Gisborne, Napier, New Plymouth, Palmerston North, Masterton, Wellington, Nelson, Greymouth, Christchurch, Timaru, Dunedin, and Invercargill.

The visiting amateur will be issued with a ZLØ callsign immediately, provided papers are in order. Each Radio Inspector's Office has its individual allotment of ZLØ callsigns for immediate issue to the 14-day-visitor licensees.

Should the visitor want to stay longer than 14 days, then he must make written application, sending copies of his amateur certificate and current license information so that they are received by the Radio Inspector's Office where he wishes to pick up his visitor's ZLØ call one month before the date the visitor's license is required.

This longer-period ZLØ call for visitors is issued from Post Office Headquarters, Wellington, and is valid for periods of over 14 days and up to one year from the date of issue. The long-term-visitor's ZLØ license is renewable, but after the first year, a normal resident-ZL callsign will be issued in place of the visitor's ZLØ call.

As an example—a visitor using the callsign ZLØXXX/W6 has the prefix of his home call given after the slash following the ZLØ call.

BITS 'N' PIECES

Packet radio (*73*, September, 1983) was used in ZL recently for traffic handling during the recent 24-hour telethon held to raise money for charitable purposes. The Amateur Radio Emergency Corps was asked to provide communication nets for the transmission of pledge messages advising the amounts of money donated, and our regulatory authority, the New Zea-

NEMAL ELECTRONICS

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RG214U dbl silver shield, 50 ohm $1.55/ft.
100 ft. RG8U with PL-259 on each end $19.95
BELDEN Coax in 100 ft. rolls
RG58U #9201 $11.95
Grounding strap, heavy duty tubular braid
3/16 in. tinned copper 10¢/ft.
3/8 in. tinned copper 30¢/ft.

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RG59/U mil spec 96% shield	14¢/ft.
RG213 noncontaminating 95% sheild mil spec	36¢/ft.
RG174/U mil spec 96% shield	10¢/ft.
RG11U 96% shield, 75-ohm mil spec	25¢/ft.
RG8U 96% shield, mil spec $29.95/100 ft. or	31¢/ft.
RG6A/U double shield, 75-ohm	25¢/ft.
RG58AU stranded mil spec	12¢/ft.
RG58 mil spec 96% shield	11¢/ft

LOW LOSS FOAM DIELECTRIC

RG8X 95% shield $14.95/100 ft. or	17¢/ft.
RG59/U 70% copper braid	9¢/ft.
RG8U 80% shield	18¢/ft.
RG58U 80% shield	07¢/ft.
RG58U 95% shield	10¢/ft.
RG59U 100% foil shield, TV type	10¢/ft.
RG8U 97% shield 11 ga. (equiv. Belden 8214)	31¢/ft.
Heavy Duty Rotor Cable 2-16 ga, 6-18 ga	36¢/ft.
Rotor Cable 8-con. 2-18 ga, 6-22 ga	19¢/ft.

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Amphenol PI-259	79¢
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PL-258 Double Female Connector	98¢
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Reducer UG-175 or 176	10/$1.99
UG-255 (PL-259 to BNC)	$2.95
Elbow (M359)	$1.79
F59A (TV type)	10/$2.15
UG 21D/U Amphenol Type N Male for RG8	$3.00
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FREE CATALOG
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land Post Office, allowed the NZART AREC to use the occasion as a 24-hour traffic-handling exercise for the amateur emergency nets around the country.

In most areas, VHF/HF traffic nets were used, but at one of the regional telethon centers, Palmerston North, a group of interested amateurs with a mutual interest in packet radio decided to use the Manawatu data repeater to relay the telethon information. Three branches, Dannevirke, Pahiatua, and Hawera, used the system.

The pledge messages were entered in groups of five to ten at a time into the computer, compiled into a standard text form, and sent by datacom (packet radio) via the Manawatu data repeater to a Palmerston North home station, where the demodulated signal was fed into another 6809 computer system, printed out, and delivered to the Central Region Telethon Center. The computers used were Motorola user-group 6809 systems, combining keyboard, computer disk drive, and a user-group modem to couple the VHF transceiver. A local printer was used for the hard copy, although the message files were held on magnetic disk. The whole system was never pushed and could have handled a lot more traffic if it had been available, despite the slow typing speed of most operators.

As luck would have it, the Palmerston North data-station operator lived just over the road from the stadium where the Central Region Telethon Center was located, so the printouts were delivered from time to time by hand.

Participating operators were ZLs 2AYF, 2BNP, and 2TPQ from Dannevirke, ZLs 2TDA, 2TDB, 2TOU, and 2TXC from Woodville, and ZL2TMD, the base station at Palmerston North.

Hamfests, swap and shops, swapfests, flea markets, and swapventions are some of the names of North American activities where amateurs get together and buy or sell their used equipment. They are the source of bargains galore and a place where hams can meet, socialize, and fraternize. Down under in ZL-land, we have another name for these functions, and they operate on a different selling system than on the North American scene. In New Zealand, we call these functions "junk sales"...an occasion where the average ham can clean out the workshop of all surplus equipment, some of it junk, and usually some of it that he purchased at the last junk sale attended. In one or two areas, the junk sales are a little more sophisticated, as they have trading tables and displays of the latest new equipment available by the local representatives of the name overseas manufacturers of amateur equipment. There is also at least one area where a flea market just like those in the US and Canada is organized.

Let's take a closer look at a ZL junk sale.

They are always organized by one of the local branches of NZART (clubs). The branch committee first looks at the year's schedule of junk sales and selects a time which does not clash with another nearby district's sale. Once the date has been set, then an auctioneer must be obtained (and there are one or two good ones within our amateur ranks)—one with sympathetic leanings towards amateur radio. The auctioneer's services are not free of charge, but they cost only an honorary payment.

Next is the venue, a local hall in a central position with plenty of parking space, as amateurs will be coming from as far as 200 miles away. In some very extreme cases, amateurs bitten by the junk-sale bug have been known to travel 500 miles to attend a sale.

Then come the administrative arrangements, the catering arrangements (coffee breaks and lunch), the financial arrangements, and the gathering of the necessary branch members to staff the various departments on the day of the sale. Somewhere between 20 and 30 helpers are needed to run the day properly.

On the day of the junk sale, the various "lots" are presented for recording on the auction forms, and the vendor is given a receipt for his/her surplus equipment (junk). An an average ZL junk sale, there are about three to four hundred lots for auction during the course of a 7- or 8-hour auction period. Selling starts about 9:30 or 10 am and continues nonstop until the lunch break around 12:30 pm. Selling resumes again about 1 pm, continuing nonstop until all the lots have been sold, maybe around 5 pm.

Sales are made on a commission basis, the organizing club getting the commissions charged—usually 15% for their club funds. The range of items for sale covers from *absolute* junk through to near-new transceivers, and in some cases, brand-new components or accessories that have been purchased but never used.

Before the sale starts, the lots are available for inspection up until the time the auction commences, and again at the lunch break, but not during the auction periods.

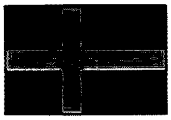
Besides the auction sale, there are trading tables organized by the club committee, direct-selling small bags of components and/or anything saleable that does not conflict with the auction. Club committees scour the sources of cheap components and then have working bees (collective working parties of members) to bag up the items into saleable quantities. Your correspondent has been counting out 32,000 ½-Watt resistors into 10s and twisting the tails together for what seems like days in preparation for our junk sale to be held soon. My fingers are a bit sore and I'm counting tens in my sleep. The final stage of this working bee will be to bag up the resistors into bags of 32 values, 10 of each value, for sale on the trading table.

On the social side, a junk sale provides the opportunity for a large number of amateurs to congregate together for at least a whole day, and in some cases, where hams travel some distance, possibly overnight, to swap the usual amateur stories of the DX they have worked, etc. Junk sales are great happenings on the ham scene here in ZL; they are occasions when one can empty out the shack or workshop of all that surplus gear you have accumulated over the past year or so and a time when you can go looking for that special piece you need to complete the project you have in mind. It is also one of those times for some amateurs when they bring home more junk than they took to the sale.

ZL junk sales have their regular followers who travel considerable distances to be present and participate in the day's activities, both business and social. From the number on the year's program, they seem to be on the increase in popularity. Each year we see new ones starting up in areas not previously catered to by the sales already operating.

Awards: For certificate hunters, a little bit of advance information on a special award—the City of Hastings Centennial Award—to celebrate the 100th birthday of Hastings, a city of about 50,000 population located in Hawkes Bay, North Island of ZL. The award will be available during the month of February, 1984, all bands, all modes, and those working the required number of stations will receive a handsome colored certificate for their efforts. Details of the requirements will be included in next month's column, in sufficient time for those wishing to participate. Information will also be circulated on most of the overseas nets, but if you miss out, do not hesitate to write to me. Please remember to include 2 IRCs for a reply by aerogramme so that you get the information in time to participate for this special award.

Well, that's about all for this month, as I have to clean out the shack and workshop to get ready for the club junk sale next Saturday. Maybe I'll make enough from my sales to buy that rotary coil I need for the ATU I'm planning. Or maybe I'll be lucky and pick up a whole ATU at a reasonable price. See you all next month.



SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

THE MATCH TOWN AWARD

In 1984, the city of Jonkoping in southern Sweden celebrates its 700-year anniversary. The Swedish chemist Gustav E. Pasch (1788–1862) got a patent in 1844 on his invention of the first safety matches. In 1852, a Swedish manufacturer, John Lundstrom, began to produce them in large quantities in Jonkoping. Between 1916 and 1929, the Swedish export for safety matches was 50 million kilograms annually. Today the Swedish Match Company is a giant international diversified empire that owns factories, forests, mines, and oil wells.

The Match Town Award is a beautiful silk streamer in several colors. You should contact radio amateurs in the Jonkoping community (F6 for the Swedish Commune Award) during the calendar year of 1984. The award is issued by the radio club SVARK, Sodra Vatterbygdens Amatorradioklubb. Every QSO with Jonkoping Commune counts as 1 point. The club station, SK7AX, counts as 2 points. Points required for the award: SM = 4 points, Europeans = 3 points, and DX = 2 points. There is no requirement for QSL cards as proof for contact. The necessary verification can easily be done by the club. Just give the regular QSO data in your application.

Application shall be made to SVARK, PO Box 2035, S-581 02 Huskvarna, Sweden. The fee is either 30 Swedish kroner, 10 IRCs, or US$5.00.

PREFIX OF

Finland has joined the countries that celebrate the 1983 World Communications Year by issuing a special prefix. Between November 18 and December 18, 1983, any Finnish radio amateur can switch the regular OH to the OF prefix.

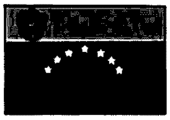
FINNISH *SISU*

The Finns are known for having extraordinary stamina and endurance, called *sisu*. For the 1982 CQ WW DX contest, the club of OH2s, OH2AA, put up a contest effort in order to beat the European record.

The station was OH9W from the Aland Islands, Finnish islands close to Sweden both geographically and linguistically. They have a special status and are a separate DXCC country. On their QSL card, the contest group at OH0W sent a message to all fellow contesters that said:

"We were all born in Finland—a country on the Arctic Circle. It is a country we love, we are even proud of it. We are used to a weather of four seasons—from a swimming July to a freezing February, from a gently awakening April to a reclining October. We are even fortunate enough to have the world's most beautiful archipelago, reaching all the way to the easternmost of the Aland Islands, the OH0. So, why don't we make it from here—be fanatic enough to perfect every bit of action and bring together all the Finns around the fireworks. And win the world from the north of Europe—that's what OH0W was all about. It included 60 potent hams, each given the most suitable assignment, best equipment, massive KLM hardware, all built up in what still is a rare one—OH9. It was crazy all the way through. A storm kept taking down the antennas at the rate we were raising them; the conditions were poor just as the antennas were good and it was like 60 men fighting against the power of Mother Nature. It was kind of fun, however—a once in a lifetime experience—fun you would never repeat. It was 30,000 QSOs in 130 hours and a new European record with a comfortable margin. We are Finns—that's why we go for all this."

The equipment included Yaesu and Drake Twins, Henry and DenTron linears; KLM 6-el Big Stickers and Hy-Gain 5-el monobanders were mounted on seven 100-foot towers made by OH8QD. For the low bands, some highly advanced multiple loops and 1/4-wave verticals laid out straight in the ocean. All in all, the installation required some 3,000 feet of RG-8/L cable. As additional help, they had intercoms, radiotelephones, 25 IC-2E handhelds, and even a helicopter! Maybe this *sisu* makes them always able to beat the Swedes and the other Nordic countries in the Scandinavian Activity Contest as well as the NRAU, Nordic Radio Amateur Union Contest, every year!



VENEZUELA

Luis E. Suarez OA4KO/YV5
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Caracas 1061-A
Venezuela

During my last trip to California, bought a Lunar GaAsFET preamplifier fo my Kenwood TR-9130. It was intended t be used for satellite work. Back in Cara cas, the preamp was tested and worke like a dream. In fact, it is worth every cen of the US$170 price tag. I have installe this amplifier at several repeater sites i commercial VHF and UHF repeaters an the result is not only more sensitive re ceivers, but less intermodulation, too. I the commercial installations, I used crystal filter ahead to improve selectivity After playing with the jewel, I realized tha it was dangerous to use the preamp in transceiver with no protection against power that would be fed through the inpu You may destroy the GaAsFET in a blink the PTT is accidentally pressed, if only fo a fraction of a second.

I devised a gadget that would disabl the transmitter once the preamp is co nected to the transceiver antenna plu The simplest way I could figure out to do was to place a ring in a PL-259 plug i such a way that, once plugged in, it serve as a lever to actuate a microswitch that u timately will be used to break the PTT lin

The best way to do the task is to break the line going to pin 7 at plug 13 in the drive unit and place a normally-closed micro-switch in between. As the microswitch would be externally installed, the wires connected to it would also be routed outside the radio. I planned to use either of the available auxiliary jacks at the unit rear panel, since I don't like to drill holes in equipment when doing modifications unless there is no other practical way. Should you desire to restore the unit, then it is easy to reverse the procedure, and everything remains as new. Finally, the special PL-259 would be fitted to a short piece of RG-58/U with a BNC male connector at the other end. The BNC connector may then be plugged to the preamp and when you wish to work the satellites, the modified plug would be safely connected to the transceiver and automatically the PTT would be disabled.

That was a planned project and remained like that. Then, yes, it happened. On June 16, I heard OSCAR 10 and hastily plugged in the preamp; the OSCAR 10 beacon came in loud and clear. Two seconds later, the GaAsFET was burned by an accidental touch of the PTT button...

REQUIREMENTS FOR A RECIPROCAL LICENSE

You must request a license from the Ministerio de Transporte y Comunicaciones (form FC-1). The form has 21 boxes to be filled in as follows:

1. Your name and address in your country.
2. In this box you must specify the kind of station you are applying for: AT-F for fixed stations, AT-M for mobile stations, AT-P for portable stations. You must use separate forms for each type of station.
2b. You should specify AFIC (contraction of amateur).
3a. 1 kW.
8a. Base-station address.
8b. City corresponding to above address.
8c. State corresponding to above city.
9a. Make and model of vehicle, if mobile.
9b. Plate or registration number of above vehicle.
9c. "Area del Territorio Nacional."
12. "Instalacion."
18. Your birthplace and date, city, country, nationality, place and date of the application, and signature.
21. In this box you must specify the reason for your application for an amateur license.

Note: Do not fill in boxes 2c, 2d, 4a, 6d, and 7.

You must also include a photocopy of your license and evidence of good standing. A letter stating the reasons for the application is also necessary, along with a photocopy of your passport and visa. You must include a stamp of Bs. 1.00.

The address, if you send the form by mail, is: Ministerio de Transporte y Comunicaciones, Direccion General Sectorial de Comunicaciones, Direccion de Ingenieria, Edificio Centro de Valores, Piso 6 Oficina 6-4, Luneta a Caja de Agua, Caracas 1010, Venezuela. Don't be afraid—addresses are quite long down here in Caracas.

The only problem you may have is that you must apply for the type of station you intend to use: fixed station, mobile station, or portable station. This means that if you intend to operate mobile, you must include vehicle references which may be almost impossible to get if you are going to rent a car. Even when fixed station is your choice, you must know in advance the place where you will be staying. Maybe the portable license is the best choice, in case you carry an HT. If you plan to operate both fixed and mobile, you must apply for both licenses separately.

The best procedure, officially recommended, is to have somebody here, friend or relative, help you with the application. Normally it should take 20 days, but sometimes things go more slowly.

CORRECTIONS

In "Six Antennas from Three Wires," which began on p. 10 of the October, 1983, issue, an incorrect variable was used in the formula for return loss on p. 14. In that formula, "R1" should be "RL."

"New England's Nicad Per-Charger," which appeared in the April, 1983, issue of *73*, contained two errors. In Fig. 1 on p. 39, switch S1A was incorrectly drawn. The common switch lead should be connected to the positive meter line. And in the text, PL2 was mistakenly referred to as J1.

Avery L. Jenkins WB8JLG
73 Staff

FCC

Bowing to pressure from several amateur organizations wishing to rebroadcast the STS-9 shuttle flight, the FCC waived prohibitions against all such transmissions. The Commission added that rebroadcasting would give amateurs experience in space-Earth linking, a skill which may become important in disaster and emergency communications.

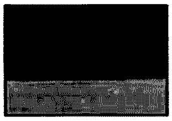
The following is a summary of the FCC's decision as it appeared in the *Federal Register*.

Amateur Radio Service Rules; Waiver

AGENCY: Federal Communications Commission.

ACTION: Rule Waiver.

SUMMARY: This document grants a rule waiver to permit retransmission by any licensed amateur radio operator of Space Shuttle audio and video communications on amateur radio frequencies for the exclusive use of licensed amateur radio operators. The waiver is necessary in order to obviate individual waiver requests for each scheduled Space Shuttle flight. By this rule waiver, amateur radio operators will gain experience in establishing *ad hoc* radio links and networks to carry the Space Shuttle information to amateur radio licensees, thereby increasing their technical skills for handling disaster and emergency communication.



WEST GERMANY

Hans J. Schalk DJ8BT
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West Germany

DLD AWARDS

The "Deutschland Diplom," DLD

The DLD was introduced by the Deutscher Amateur Radio Club (DARC) on September 1, 1956. It is awarded in two classes, DLD 100 and DLD 200. German and European radio amateurs get the DLD 100 for OSOs on the 80m band only. Radio amateurs of non-European countries get the DLD for OSOs on 80, 20, 15, and 10 meters (mixed). OSOs on 80 meters will be counted twice. Only OSOs since January 1, 1956, are taken into consideration for the DLD.

The "Deutschland Diplom 40-Meter," DLD 40-Meter

The DLD 40-Meter was introduced on May 7, 1959. It is also awarded in two classes, DLD 100/40-Meter and DLD 200/40-Meter. The DLD 40-Meter can be obtained for OSOs on the 40m band. Only OSOs since May 7, 1959, are taken into consideration for the DLD 40-Meter.

Proficiency Badges

The DLD proficiency badges are awarded upon application. The badges will be issued in three classes: *bronze* for DLD 300 (300 confirmed DOKs), *silver* for DLD 400 (400 confirmed DOKs), and *gold* for DLD 500 (500 confirmed DOKs). Note: Blocks of full 100 DOKs per each band must be shown. For example, the bronze badge (DLD 300) may be obtained for any of the following combinations: DLD 100 and DLD 200/40-Meter; DLD 200 and DLD 100/40-meter; DLD 200 and 100 additional confirmed DOKs on 80 meters only; DLD 200/40-Meter and 100 confirmed additional DOKs on 40 meters only. The silver and gold badges are available for analogous combinations.

Stickers

Holders of the DLD 500 may get stickers upon application. These stickers are issued in four classes: *green* for 600 confirmed DOKs, *red* for 700 confirmed DOKs, *silver* for 800 confirmed DOKs, and *gold* for 900 confirmed DOKs. For these classes, the DOKs are summed up regardless of the band (DLD plus DLD 40-Meter).

The "Deutschland Diplom 1000," DLD 1000

Holders of the DLD 500 and any sticker up to 900 may obtain the highest class of the DLD awards, the DLD 1000. Therefore, it is necessary to present the remaining DOKs on 80 and 40 meters (European radio amateurs) or on 80, 40, 20, 15, and/or 10 meters (non-European radio amateurs).

Requirements

DOK means "Distrikts-Ortsverbands-Kenner" (district area indictor). The DOK must be shown in printed form on the OSL cards. Official DARC stamps are admissible for substitution.

There are no restrictions in type or mode of transmitting. The DLD will be awarded if the applicant presents OSL cards with at least 100 different DOKs on a single band only (non-European amateurs on 80, 40, 20, 15, and/or 10).

The fees for DLD awards are as follows: DLD 100, DLD 200, DLD 100/40-Meter, DLD 200/40-Meter, Bronze badge (DLD 300) and DLD 1000—10 DM or 15 IRCs each; Silver badge (DLD 400)—12 DM or 20 IRCs; Gold badge (DLD 500)—15 DM or 25 IRCs; any sticker from 600 up to 900—5 DM or 10 IRCs. The fees should be enclosed with application.

All applications are handled by the "Referat fuer Funkbetrieb" (section for amateur-service operations of DARC). The holders of DLD awards will be published regularly in *cq-DL*, the official club magazine of DARC. Applications accompanied by the original QSLs should be addressed to: H. P. Guenther DL9XW, Am Strampel 22, D-4460 Nordhorn, W. Germany. Note: On request, special applications forms for the DLD awards are available.

The "Deutschland Diplom 10-Meter," DLD 10-Meter

The DLD 10-Meter was inaugurated by the Deutscher Amateur Radio Club (DARC), to liven up the 10m band. Its purpose is to save this band for amateur-radio traffic.

The DLD 10-Meter can be acquired by all radio amateurs holding a license. It will be awarded in the basic class by presenting necessary OSL cards for 50 different DOKs on the 10m band only. Only two-way contacts since January 1, 1976, are taken into consideration. There are no restrictions in the type or mode of transmitting. Endorsement stickers are available for each additional 25 different DOKs worked exclusively on 10-meters.

For the DLD 10-Meter, only those cards which show the DOK in printing can be accepted. Official DARC stamps are admissible for substitution. The fees for the basic award are 10 DM or 15 IRCs; for any additional sticker, the fee is 5 DM or 10 IRCs.

All applications are handled by the "Referat fuer Funkbetrieb" (section for amateur-service operations of DARC). For the handling of the DLD 10-Meter, special application forms are necessary. They can be obtained from DL9XW.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Required by 39 U.S.C. 3685). 1. Title of publication, 73 Amateur Radio's Technical Journal. A. Publication no. [illegible] 2. Date of filing, Oct. 1, 1983. 3. Frequency of issue, Monthly. A. No. of issues published annually, 12. B. Annual subscription price, $25.00. 4. Location of known office of publication (Street, City, County, State and ZIP Code) (Not printers), 80 Pine Street, Peterborough, Hillsborough County, N.H. 03458. 5. Location of the headquarters or general business offices of the publishers (Not printers), 80 Pine Street, Peterborough, Hillsborough County, N.H. 03458. 6. Names and complete addresses of publisher, editor and managing editor. Publisher (Name and Address), Wayne Green, 80 Pine Street, Peterborough, N.H. 03458. Editor (Name and Address), Wayne Green, 80 Pine Street, Peterborough, N.H. 03458. Managing Editor (Name and Address), Jack Burnett, 12-C Granite St., Peterborough, N.H. 03458. 7. Owner (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.) Name, International Data Group, PO Box 1450, 5 Speen St., Framingham MA 01701. Patrick J. McGovern, PO Box 1450, 5 Speen St., Framingham, MA 01701. 8. Known bondholders, mortgagees and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities (if there are none, so state) Name, none. 9. For completion by nonprofit organizations authorized to mail at special rates (Section 411.3, DMM only) The purpose, function and nonprofit status of this organization and the exempt status for Federal income tax purposes (check one) Not applicable. 10. Extent and nature of circulation. (X) Average No. copies each issue during preceding 12 months. (Y) Actual No. copies of single issue published nearest to filing date. A. Total No. of copies printed (Net Press Run) (X) 62,532 (Y) 64,594. B. Paid circulation 1. Sales through dealers and carriers, street vendors and counter sales, (X) 11,512 (Y) 17,192. 2. Mail subscriptions (X) 42,162 (Y) 39,839. C. Total paid circulation (Sum of 10B1 and 10B2) (X) 53,674 (Y) 57,031. D. Free distribution by mail, carrier or other means, samples, complimentary, and other free copies (X) 448 (Y) 479. E. Total distribution (Sum of C and D) (X) 54,122 (Y) 57,510. F. Copies not distributed 1. Office use, left over, unaccounted, spoiled after printing (X) 4,347 (Y) 7,084. 2. Returns from news agents (X) 4,063 (Y) 0. G. Total (Sum of E, F1 and 2—should equal net press run shown in A) (X) 62,532 (Y) 64,594. 11. I certify that the statements made by me above are correct and complete. Signature and title of editor, publisher, business manager, or owner: Debra Wetherbee, Vice President/General Manager

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	3A	3A	3A	3A	3A	14	21	21A	21
ARGENTINA	14	7	7B	7B	7	7	14A	21	21A	21A	21A	21
AUSTRALIA	21	14B	7B	7B	7B	7B	7B	14B	14	21	21A	21A
CANAL ZONE	14	7	7	7	7	7	14	21	21A	21A	21A	14A
ENGLAND	7	7	3A	3A	7	7B	14	21A	21A	14	7	7
HAWAII	21	14	7	7	7	7	7	7B	14	21A	21A	21A
INDIA	7	7B	7B	7B	7B	7B	14	14A	14B	14B	14B	7B
JAPAN	14A	7B	7B	7B	7	7	7	7B	7B	7B	7B	14A
MEXICO	14A	7A	7	7	7	7	7A	14A	21A	21A	21A	21
PHILIPPINES	14	7B	7B	7B	7B	7B	7B	14B	14B	14B	14B	14
PUERTO RICO	14	7	7	7	7	7	14	21	21A	21A	21	21
SOUTH AFRICA	14	7	7	7	7B	14	21	21A	21A	21A	21	14A
U.S.S.R.	7	7	3A	3A	7	7B	14	21A	14	7B	7B	7
WEST COAST	14A	14	7	7	7	7	7	14	21A	21A	21A	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	7	7	3A	3A	3A	3A	3A	14	21	21A	21A
ARGENTINA	14A	7	7B	7B	7	7	14	21	21A	21A	21A	21
AUSTRALIA	21A	14	7B	7B	7B	7B	7B	7B	14	21	21A	21A
CANAL ZONE	14A	7A	7	7	7	7	14	21	21A	21A	21A	21
ENGLAND	7	7	3A	3A	7	7B	14B	21	21A	14	7B	7B
HAWAII	21A	14	7	7	7	7	7	7	14	21A	21A	21A
INOIA	14	7B	7B	7B	7B	7B	7B	14B	14B	14B	14B	7B
JAPAN	21	14B	7B	7B	7	7	7	7	7B	7B	14B	21
MEXICO	14	7A	7	7	7	7	7	14	21	21A	21A	21
PHILIPPINES	21	14B	7B	7B	7B	7B	7	7	14B	14B	14B	14A
PUERTO RICO	14	7	7	7	7	7	14	21	21A	21A	21A	21
SOUTH AFRICA	14A	7	7	7	7B	7B	14	21	21A	21A	21	14A
U.S.S.R.	7B	7	3A	3A	7	7B	7B	14	14	7B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	7A	7	3A	3A	3A	3A	3A	7	14	21	21A
ARGENTINA	21	14	7B	7B	7	7	7B	14A	21A	21A	21A	21A
AUSTRALIA	21A	21	14	14	7B	7B	7B	7B	14	21	21A	21A
CANAL ZONE	21	7A	7	7	7	7	7	14A	21A	21A	21A	21A
ENGLANO	7B	7	3A	3A	7	7B	7B	14B	21A	14	7B	7B
HAWAII	21A	21	14	7	7	7	7	7	14	21A	21A	21A
INDIA	14	14	7B	7B	7B	7B	7B	7B	14B	14B	14B	7B
JAPAN	21A	14A	7B	7B	7	7	7	7	7	7B	14	21A
MEXICO	14A	14	7	7	7	7	7	7A	21	21A	21	21
PHILIPPINES	21A	21	14B	7B	7B	7B	7	7	7	14B	14B	21
PUERTO RICO	14A	14	7	7	7	7	7	14	21A	21A	21A	21A
SOUTH AFRICA	14A	7	7	7	7B	7B	7B	14	21A	21A	21	14A
U.S.S.R.	7B	7	3A	3A	7	7B	7B	7B	14	7B	7B	7B
EAST COAST	14A	14	7	7	7	7	7	14	21A	21A	21A	21

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

DECEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
				1 P/F	2 F/F	3 F/G
4 G/G	5 G/G	6 G/G	7 F/G	8 F/G	9 F/F	10 F/G
11 F/G	12 F/F	13 F/F	14 F/F	15 F/G	16 G/G	17 G/G
18 G/G	19 F/F*	20 P/F*	21 P/F*	22 F/F	23 F/G	24 F/G
25 F/G	26 G/G	27 G/G	28 P/F	29 P/F	30 F/F	31 F/F

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